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PREFATORY NOTICE

TO

VOLUME XXIX.

The Editor apologises to the Fellows for the great delay experienced in the issue of the final part of the present volume. That delay is entirely the Editor's fault – or perhaps he might more truthfully say it is the result of the wonderful growth of the Society of recent years, rendering it impossible for one individual to perform both the Secretarial and the Editorial work of the Society.

It will be remembered by some of the Fellows, that the present Secretary was elected in February 1888, when the Society left South Kensington with a total roll of only 1,329 Fellows, of whom, 773 were subscribing Fellows, and 556 Life Fellows (whose commutation money had already been spent) ; and even of these 773 Subscribing Fellows, 221 immediately resigned, so that on accepting office the Secretary found :

(1) A debt of £1,152.

(2) An annual expenditure of £3,500.

(3) A subscription income little if at all more than £1,500 a year.

(4) The Publication of the Society's Journal suspended.

During 1888 and 1889 the debt of £1,152 was paid off, and the income increased by £626, and (with the single exception of 1894, when there was the trifling decrease of £41) every year since 1889 there has been an annual average increase in the Society's income of £753.

In 1888 the Society was homeless and houseless, driven from pillar to post, not knowing where to find shelter for either its Shows or its Offices. It now has a magnificent Hall of its own, superior for the purpose to any Hall in London, with most convenient and suitable Offices, Council Chamber, Library, Lecture and Committee Rooms.

In number of Fellows the Society has grown from 1,108 in February 1888, to almost 10,000 in November 1905. The Gardens no longer consist of about thirteen acres, in the smoke-begrimed district of Chiswick, but exceed sixty acres, in the beautiful open country and clear air and sky of Wisley, near Weybridge.

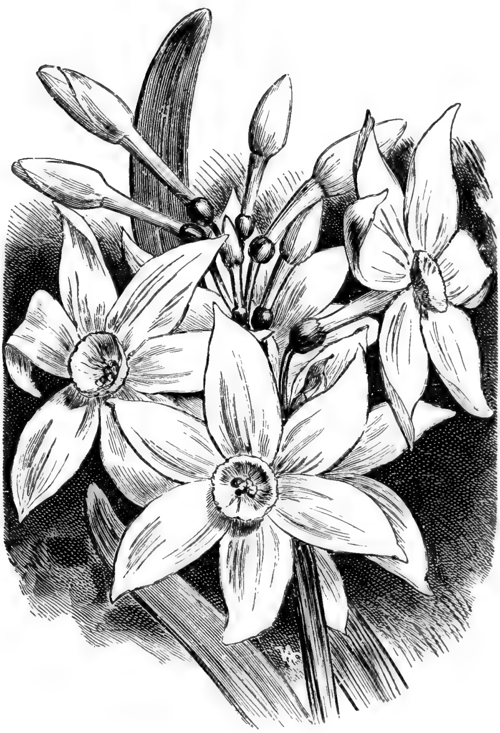
In 1889 the Journal was recommenced. It was modestly published in small octavo, and numbered 404 pages without any illustrations. It has grown *pari passu* with the growth of the Society's income and numbers, and in 1905 is published in large octavo, and has more than 1,200 pages, with 234 illustrations and six coloured plates.

In 1888, as we said, there was a debt of £1,152; in 1903 we had (and still have) a reserve fund of £16,536, which would have been considerably increased had we not devoted all our surplus in 1904 and 1905 to paying for the new buildings, over and above the subscriptions received.

Such is a general outline of the work and growth of the last seventeen years; and when it is considered that the Secretarial and the Editorial work was considered amply sufficient in 1888, it can be easily imagined how it has long since grown beyond the fair compass of any one person's powers. But in order to economise and build up the Society on a thoroughly reliable basis, the present Secretary-Editor has struggled to perform both duties in one, until now, at last, it has become beyond human power, and the result has been a slight (but entirely temporary) breakdown with the Journal, which will quickly resume the even tenor of its way under the able guidance of Mr. George S. Saunders, F.L.S., the newly appointed Editor, the first fruits of whose labours will be published early in the New Year.

A few of the Fellows may blame the Secretary-Editor for not relinquishing one or other of his offices sooner, but the vast majority will condone the offence on account of the object which he has had ever in view, viz. the growth and prosperity of the Royal Horticultural Society.

W. Wilks,
Secretary and Editor, 1888–1906.



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Volume XXIX. has been issued in two numbers, each containing the "Journal" proper, paged with Arabic figures, and "Extracts from the Proceedings," paged with Roman figures. This title and contents sheet should be placed first, and be followed by pages 1 *to* 360, *and then by pages* 361 *to* 936. *After that should come the "Extracts from the Proceedings," pages* i *to* cxxviii *and* cxxix *to* cclxii, *concluding with the three Indices*

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The Rev. W. WILKS, M.A., Secretary.

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Errata

Page 8, line 20, to page 15, line 26, *for* Pl. XVI. *read* Pl. XVII.
„ 15, „ 39, „ 16, „ 7, „ „ „ Pl. XVIII.

JOURNAL

OF THE

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VOL. XXIX. 1904.

PARTS I. AND II.

PESTS OF THE ORNAMENTAL SHRUBBERY.

By M. C. COOKE, M.A., LL.D., A.L.S., F.R.H.S., V.M.H.

NOTWITHSTANDING the entirely artificial character of such subdivision, it appears to be the most practical method to separate ornamental shrubs into the two groups of evergreen and deciduous, independently of anomalies which may here and there obtrude themselves. The same parasite very rarely attacks both coriaceous- and tender-leaved plants.

CORIACEOUS-LEAVED SHRUBS,

or Evergreens, are represented by the following.

RHODODENDRON GALLS.

Exobasidium rhododendri (Cram.), Pl. XVI. fig. 1.

The gall-like swellings on the leaves of *Rhododendron ferrugineum* and *R. hirsutum*, and possibly of other species, are sufficiently striking not to escape the notice of even a casual observer. They vary in size from that of a pea to that of a marble, and are often found several of them together in a cluster. At first they are of a pale yellowish-green colour, then they acquire a reddish or roseate tint, especially on the sunny side. When fully and properly mature, the surface is covered with a delicate frosty bloom, like the bloom on a plum. It is in this "bloom" that the fungus exhibits itself, for the mycelium is concealed within the tissues of the gall.

The fruiting consists in the development of erect stout spore-bearers, called *basidia*, which resemble the same organs on the gills of an Agaric. The apices of these basidia carry a definite number, usually four, spicules, each of which supports a spore, or basidiospore. These spores are colourless, elliptical ($8–10 \times 6–7\,\mu$), and readily fall away. These galls differ essentially from the peach blister in the spores being naked and exposed, *not* enclosed in asci, and in being produced upon the outer and convex, not on the inner and concave surface.

Known also in France and Germany.

Diseased leaves should be burnt as soon as the fungus shows itself, and before spores are produced.

Sacc. Syll. Hym. ii. 7797; *Gard. Chron.* 1879, p. 119, 182; *Mass. Pl. Dis.* 168, 398, fig.

Similar galls are produced on Bay-Laurel.

Rhododendron Leaf-spots.

Several kinds of leaf-spot are known on species of *Rhododendron*, but have never caused anxiety, as they simply disfigure the leaves. Some of these may be enumerated.

Phyllosticta Saccardoi, forming orbicular spots with a tawny margin, and small sporules ($4 \times 1\,\mu$), in France and Portugal.

Phyllosticta rhododendricola, with large irregular grey spots having a brown margin, and larger sporules ($8–10 \times 3\,\mu$), in France.

Phyllosticta rhododendri, with rusty-brown spots, chiefly marginal, and the sporules oozing out in flesh-coloured tendrils. Found in Belgium and Britain.

Phyllosticta maxima, with large brown spots with dark margin, and rather large sporules ($10–12 \times 6–8\,\mu$), confined to North America; with

Septoria rhododendri, having orbicular pallid spots girt by a dark purple margin, and thread-like sporules ($40\,\mu$ long), and a similar

Septoria solitaria, with sporidia half as long, on *Rhododendron occidentale* in California.

There are also two species of anthracnose known.

Glœosporium rhododendri, with large irregular spots, which are zoned, and have a black margin, the sporules $15–20 \times 4–5\,\mu$, found in Italy, but not certainly British. And

Glœosporium succineum, with sporules about the same size, but globose and yellowish. Altogether a doubtful Siberian species.

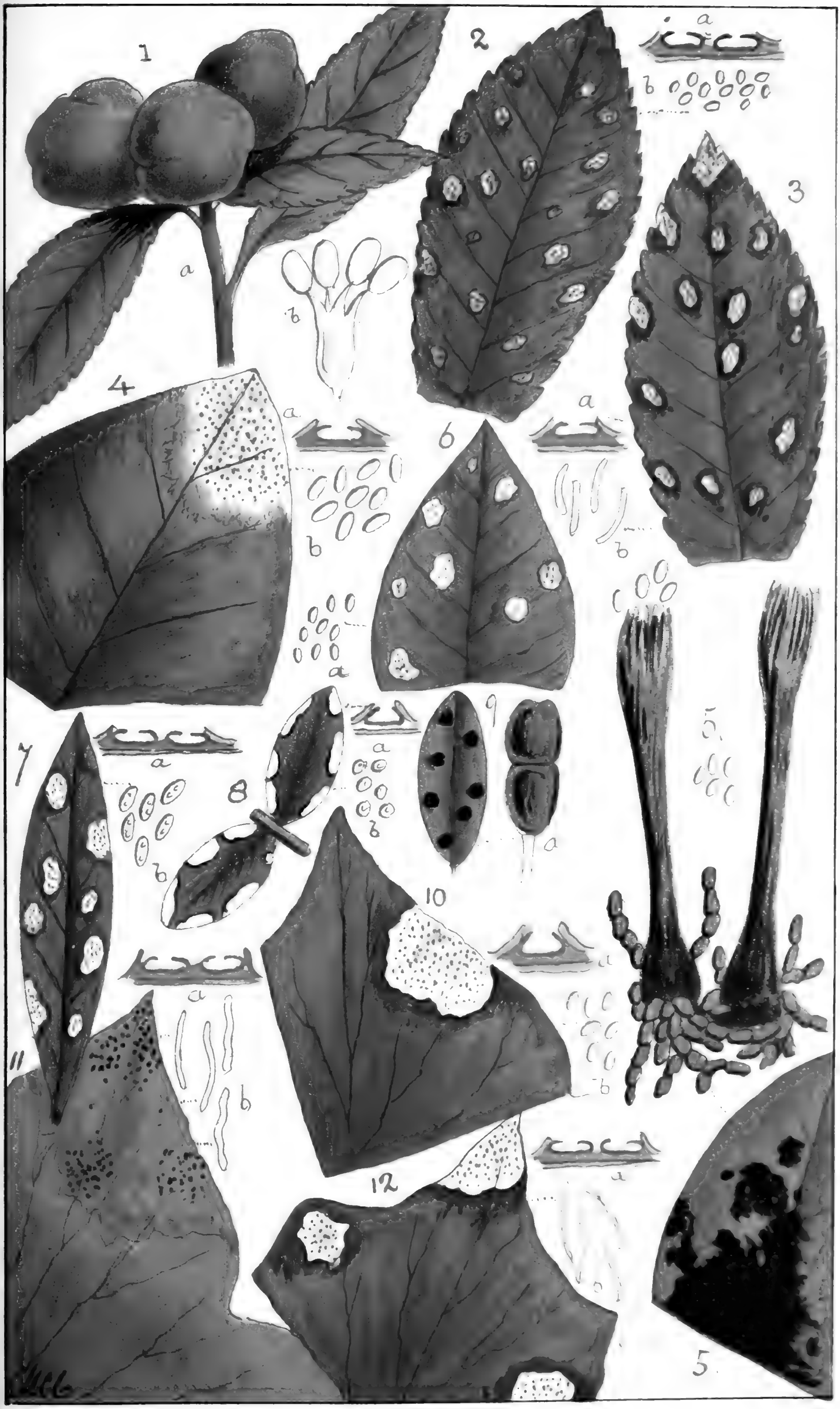
Rhododendron Brand.

Puccinia rhododendri (Fckl.).

This brand has been found on the under surface of the leaves of *Rhododendron ferrugineum* in the Tyrol, but there is no record of it elsewhere. The teleutospores are ovate, slightly constricted at the middle ($26 \times 18\,\mu$), brown.

Sacc. Syll. vii. 2474.

A rust on the leaves of *Rhododendron ferrugineum, dauricum,* and *hirsutum,* distinct from the above, has been found in Italy, France,



PESTS OF ORNAMENTAL SHRUBBERY.

Germany, and Asiatic Siberia. It is known as *Chrysomyxa rhododendri* (DC.). Teleutospores (10–14 μ broad) obtusely rounded above. Uredospores warted, orange-yellow ($17–28 \times 15–22\ \mu$).

Sacc. Syll. vii. 2660.

Leather-leaved Bristle Spore.

Pestalozzia Guepini (Desm.). Pl. XIV. fig. 17.

This disease attacks numerous plants with coriaceous leaves, besides Rhododendrons, such as *Hoya, Camellia, Citrus*, and *Magnolia.*

Greyish spots are formed on the leaves, often near the apex, usually with a distinct and perhaps elevated margin. The pustules are scattered like little black specks over the spots. The conidia are large, produced within the pustules, and extruded when mature. They are somewhat narrowly elliptical (20–25 μ long), attenuated at each end, and divided by three or four transverse septa; the end cells smallest, conical, and colourless, and the intervening cells brown. The apical cell furnished with three or four long divergent hairs, as long as the conidia, the basal cell attached to a colourless footstalk or peduncle.

Diseased leaves should be collected and burnt before the sporules are matured.

Sacc. Syll. iv. 4146; *Cooke, Hdbk.* No. 1401; *Mass. Pl. Dis.* p. 432.

Oleander Leaf-spots.

On the Continent, where *Nerium Oleander* is cultivated much more extensively than in this country, its pests and parasites are of far more interest, whereas we have no record of a single occurrence.

Phyllosticta nerii has rather large sporules ($15–18 \times 5–6\ \mu$).

Ascochyta oleandri, with septate sporules rather smaller ($11–15 \times 2–2\frac{1}{2}\ \mu$).

Septoria neriicola has short thread-like sporules, and so also has *Septoria oleandrina*, both of which are known in Italy; and *Rhabdospora oleandri* which is parasitic on the twigs, and not upon the leaves, in Algeria. The latter is apparently the *Septoria oleandri* of Montagne.

Arbutus Leaf-spot.

Phyllosticta arbuti (Desm.), Pl. XVI. fig. 2.

The parasites of the Strawberry tree are, for the most part, confined to the ordinary leaf-spots of small importance, and of these the most common is the above-named, which forms small dingy spots scattered over the leaves.

The receptacles are very small and sprinkled like little dots over the upper surface of the spots, sometimes densely clustered together. The sporules are also very minute, ovoid, and colourless ($5 \times 3\ \mu$), often exhibiting two small nuclei. The attacked leaves are in most instances at first fading.

This has been recognised in France and in Britain.

To pick off and burn infected leaves is to help preventing the spread of the parasite.

Sacc. Syll. iii. 118; *Grevillea*, xiii. 72.

Another species has been detected in Portugal and Algiers (*Phyllosticta microsticta*, Dur.) with small spots which soon become white, with a distinct dark brown margin. The sporules are even smaller than in the above.

Arbutus Purple Spot.

Septoria unedonis (Rob.), Pl. XVI. fig. 5.

This is apparently the most common of the *Arbutus* parasites, and causes small whitish spots upon the leaves, which are circumscribed by a broad purple margin. The receptacles are scattered over the upper surface of the spots, and the sporules are elongated and thread-like ($25 \times 1\frac{1}{2}\,\mu$), but without indication of septation.

It is recorded for France, Portugal, Italy, and Austria, as well as in Britain.

Sacc. Syll. iii. 2661, x. 6282; *Cooke, Hdbk.* No. 1322.

A form of leaf-spot has been found in Italy, supposed to be a variety of the above, although that seems to be doubtful, since the sporules are twice as long and distinctly septate (50–80 μ long).

Another leaf-spot (*Septoria arbuti*) has been found in Italy, which much more resembles the above type than the assumed variety, since the sporules are almost the same.

Arbutus Tuft Mould.

Cercospora Molleriana (Wint).

The only mould which is recorded as attacking the foliage of the Strawberry tree has occurred in Portugal, but its appearance in any other part of Europe is open to doubt. The spots are normally circular, but often marginal, and pallid grey, with a distinct margin. The mould appears in tufts upon the spots, with quite short threads, but the conidia are elongated, slightly curved and attenuated upwards, divided transversely into numerous cells ($95 \times 3\frac{1}{2}\,\mu$). Both threads and conidia are tinged olive.

Sacc. Syll iv. 2269.

Magnolia Leaf-spot.

Phyllosticta Cookei (Sacc.), Pl. XVI. fig. 4.

As might be anticipated, the fungus attacks on *Magnolia* are far more numerous in America than in England, and even those which we do recognise are but seldom to be met with. The one above named, when first found, was called *Phyllosticta magnoliæ*, but that name was afterwards found to have been previously appropriated. The pale bleached spots on the leaves are rather large and without any definite margin. The minute receptacles are scattered over the spots, on the upper surface; and the sporules are narrowly elliptical ($8–12 \times 3–4\frac{1}{2}\ \mu$) and uncoloured.

There is no probability of this ever becoming a troublesome pest in this country on the leaves of *Magnolia grandiflora*, on which it was first discovered.

Grevillea, ix. 94, xiii. 72; *Sacc. Syll.* iii. 130 *bis.*

The older *Phyllosticta magnoliæ* is very similar in external appearance, and has occurred in Italy, but the sporules are not one half as large ($4 \times 1\frac{1}{2}–2\ \mu$).

Phyllosticta glauca on leaves of *Magnolia glauca* is exclusively American.

Spots caused by species of *Ascochyta* and *Septoria* are also known, but not hitherto as British.

Evergreen Leaf-spots.

It is somewhat fortunate that the Evergreen shrubs, which are so commonly and extensively cultivated in this country, are remarkably free from leaf-spotting fungi.

Aucuba japonica can boast of several in Continental Europe, but not a single British record.

Prunus lusitanica is just as fortunate, or it has not been found out.

Prunus Laurocerasus has its fungi on fallen leaves, but not upon the living, except in other parts of Europe.

Laurus nobilis sometimes exhibits spotted leaves, but hitherto there is no evidence that they result from the incursions of parasitic fungi, elsewhere than in Italy or Portugal. (*Phyllosticta lauri*, Sacc. 84.)

Ilex Aquifolium. Even the Holly escapes the incursions of leaf-spots of fungoid origin, although the leaves may sometimes show traces of *Fumago vagans* or the mysterious *Capnodium Footii* and have occasionally been visited by *Phyllosticta ilicicola.*

Leaf Sooty Mould.

Capnodium Footii (Harv.), Pl. XVI. fig. 5.

This very common black mould is found upon the leaves of a great variety of plants, and often upon leathery leaves, such as Holly, Ivy, Cherry Laurel, &c., forming thin sooty spots on the upper surface with much the appearance of *Fumago vagans.* The creeping mycelium is composed of a mixture of colourless and brown threads, divided into chains of cells. The receptacles are erect and bristle-like, acute, and fringed at the mouth, but genuine sporidia have never been found, so that it remains a doubtful species. Minute sporules or conidia have been met with, but the life-history of the parasite is still very much of a mystery.

It is advisable to pick off and burn these sooty leaves, which are usually conspicuous.

Journ. R.H.S. iv. p. 254, f. 10; *Sacc. Syll.* i. 352; *Cooke, Hdbk.* No. 2807.

Laurustinus Leaf-spot.

Phyllosticta tinea (Sacc.), Pl. XVI. fig. 6.

The spots are formed on the upper surface of Laurustinus leaves, and are either roundish or irregular, and bleached, becoming whitish. The receptacles are dot-like and flattened, scattered over the surface. The sporules are minute and oblong ($4-5 \times 1\ \mu$).

Except in Britain this parasite is only recorded for Italy, where it was first discovered.

Sacc. Syll. iii. 75.

Another spot (*Phyllosticta tineola*) of a similar kind is known to occur on leaves of Laurustinus in France. The spots are vague and ochraceous, but the sporules are cylindrical, and very much larger ($15 \times 3\ \mu$).

A third species has also been recorded in France (*Phyllosticta Roumeguerii*), with grey indefinite spots, and medium-sized sporules ($7\text{–}8 \times 3\frac{1}{2}\ \mu$).

Privet Leaf-spot.

Phyllosticta ligustri (Sacc.), Pl. XVI. fig. 7.

Although Privet has the reputation of suffering from the attacks of at least a dozen different species of fungi, it is seldom that it is a victim in this country, escaping both cluster-cups and rust, for occasional leaf-spots.

The above common species has variable spots which are soon pale and encircled by a tawny margin. The receptacles are dot-like and minute, and the sporules are narrow, rounded at the ends, with two nuclei ($6\text{–}8 \times 3\mu$).

It has occurred in Italy and Portugal.

Sacc. Syll. iii. 107; *Grevillea*, xiii. 72.

The most probable other form of leaf-spot is caused by *Septoria ligustri*, but that has not hitherto been recorded for Britain, although known in France and Belgium. Similar spots have been found upon leaves in this country, but sporules have never been discovered.

The Privet cluster-cup, *Æcidium ligustri* (Str.), has only been found in Germany, and a *Uredo* has also been observed in the same country.

Box Leaf White Spot.

Phyllosticta limbalis (Pers.), Pl. XVI. fig. 8.

The only leaf-spot on the common Box is itself not so very common, although conspicuous. There may be some half-dozen other kinds of leaf-spot, at one time or other described, on so widespread a plant, but they are not British, and the present one is rather a curiosity than a pest.

The spots are of ivory whiteness, and marginal, so as to appear like a broken ring, or fragments of a ring around the edge of the leaves. The receptacles, when present, are minute and scattered, sometimes conspicuously absent, but when fertile they enclose subglobose colourless sporules, enclosing each a minute guttule (3–4 μ diam.).

This species has been found in Britain, France, Belgium, Germany, and Italy.

Fungicides will scarcely be required, as it is rarely to be met with.

Just such a similar leaf-spot, which is not to be distinguished from it by the naked eye, has been found in Portugal and Italy, the sporules of which (15×2 μ) are long and narrow, and divided across the centre into two cells—but this is called *Ascochyta limbalis*.

Sacc. Syll. iii. 124 ; *Grevillea,* xiii. 72 ; *Cooke, Hdbk.* No. 1350.

Box Leaf-rust.

Puccinia buxi (DC.), Pl. XVI. fig. 9.

Occasionally the leaves of Box shrubs are seen plentifully sprinkled with the brand or rust, but unaccompanied by either cluster-cup or uredo. The pustules are usually very formally discoid and cushion-like, compact and not powdery, of a very dark brown colour, and on both surfaces of the leaves. The teleutospores are oblong-clavate, rather thickened and obtuse at the apex, the lower cell almost wedge-shaped, and longer than the upper, constricted at the division (55–90 $\times$ 20–35 μ), even, and of a bright cinnamon colour. At first with a long uncoloured pedicel.

Known in Britain, France, Belgium, Switzerland, Germany, Italy, and Portugal.

Pick off and burn infected leaves, whenever observed.

Sacc. Syll. vii. 2372 ; *Cooke, M. Fr.* p. 201 ; *Cooke, Hdbk.* No. 1514 ; *Sow. Fun.* t. 439.

Ivy Leaf-spot.

Phyllosticta hedericola (Dur. & Mont. f.), Pl. XVI. fig. 10.

This spot has been known for many years on Ivy leaves and occurs on the upper surface, causing round bleached spots with a rather broad brownish margin. The small receptacles are dotted over these spots, and enclose the oblong hyaline sporules ($6 \times 2\frac{1}{2}$ μ).

Although first recognised in Algeria, it has since been recorded in Britain, France, Italy, and Austria.

Sacc. Syll. iii. 100 ; *Grevillea,* xiii. 71.

Two other species of the same genus of leaf-parasites have occurred on Ivy leaves in Europe : *Phyllosticta hederæ* on large brown spots, with smaller sporules (4×1 μ), in France and Belgium, and *Phyllosticta concentrica* with broad pallid spots, on which the receptacles are disposed concentrically, with sporules which are nearly globose (10 $\times$ 8–9 μ), only at present recognised in Italy.

Ivy Brown Spot.

Septoria insularis (B. & Br.), Pl. XVI. fig. 11.

This parasite was first recognised by Berkeley as causing large brown spots on languid Ivy leaves in Britain, sometimes occupying a large portion of the leaf. The receptacles are scattered over the spots, raising and afterwards splitting the cuticle. The sporules are long and thread-like, slightly curved, but without division (38 μ long).

Berk. Ann. N. H. No. 747, t. 15, f. 8; *Sacc. Syll.* iii. 2646; *Grevillea,* x ii. 7 ; *Cooke, Hdbk.* No. 1308.

Ivy Ringed Spot.

Septoria hederæ (Desm.), Pl. XVI. fig. 12.

This is a much more common species than the above, and forms smaller, almost circular, bleached spots, encircled by a broad purple margin. The receptacles are seated on the upper surface, and the sporules are similarly thread-like ($30–40 \times 1–2\ \mu$), the difference being chiefly in the character of the spots.

It has been known in Britain, France, Belgium, Italy, and Germany.

Sacc. Syll. iii. 2644; *Grevillea,* xiii. 76; *Cooke, Hdbk.* No. 1316.

Ivy Leaf Anthracnose.

Glœosporium paradoxum (De Not.), Pl. XVI. fig. 13.

Of the two species of European anthracnose on Ivy, one has been reported to have been found in Britain. This was apparently first observed in Italy, and occurs on both surfaces of the leaves, without forming any definite spots. The pustules are honey-coloured and flattened, covered by the cuticle. When mature the conidia escape by rupture of the cuticle ($8 \times 5–6\ \mu$), produced in clusters, each supported by a colourless pedicel, which is nearly double the length of the conidia.

This is reported to be an early and imperfect stage of an asci-bearing fungus, which appears on the dead leaves after they have fallen.

The species is also known in France, Belgium, Germany, Portugal, and Italy.

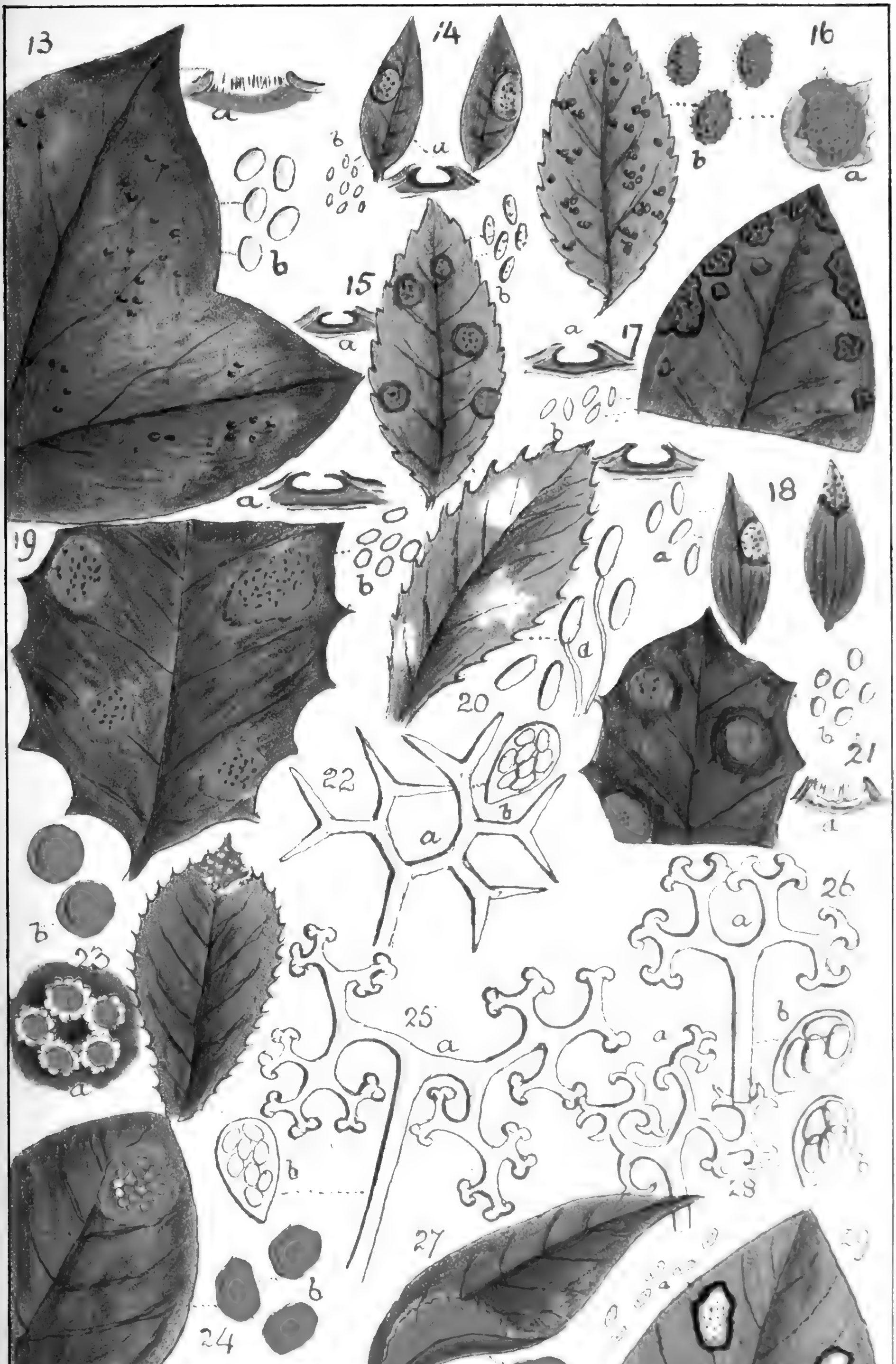
Sacc. Syll. iii. 3697; *Cooke, Hdbk.* No. 1407, note.

Another species, which occurs on Ivy, has brownish spots with larger conidia (*Glœosporium helicis*), and has been found in France and Holland.

Myrtle Leaf-spot.

Phyllosticta nuptialis (Thüm.), Pl. XVI. fig. 14.

The only parasite on Myrtle which we have yet encountered in this country has been the occurrence, on one or two rare occasions, of the above species. The spots are somewhat rounded and bleached, either white or of a pale ochre, with a broad violet margin showing brown on



PESTS OF ORNAMENTAL SHRUBBERY.

the under surface. The receptacles are scattered over the upper face of the spots and enclose the very minute subglobose sporules ($2-2\frac{1}{2} \times 1\frac{1}{2}$ μ).

This species was first detected in Portugal.

Sacc. Syll. iii. 32.

A black mould (*Cercospora myrti*) has been detected upon leaves under cultivation at Stockholm, but this seems to be the only record.

Phillyrea Leaf-spot.

Phyllosticta phillyreæ (Sacc.), Pl. XVI. fig. 15.

This spot is found on the leaves of *Phillyrea media* and *Phillyrea latifolia*, affecting the upper surface, and producing variedly shaped spots, of an ochraceous grey colour, with a reddish margin. The receptacles are scattered over the spots, and enclose the oblong, almost spindle-shaped sporules ($6-7 \times 3$ μ), each containing two minute guttules.

It has been recorded in France and Italy, as well as Britain, and should be treated as other leaf-spots.

Sacc. Syll. iii. 113 ; *Grevillea*, xiii. 72.

Another species is known in Portugal (*Phyllosticta phillyrina*), occurring on leaves of *Phillyrea obliqua*, but with smaller sporules ($4-5 \times 2-2\frac{1}{3}$ μ).

Phillyrea Rust.

Uredo phillyreæ (Cooke), Pl. XVI. fig. 16.

This uredo is found sometimes rather plentifully on shrubs of *Phillyrea media*, not only in Britain but also in Germany, Italy, and in Algeria. The pustules are round, yellow, and either solitary or collected together, arranged in rings. At first covered by the cuticle, but at length exposed. Uredospores globose, pear-shaped, or elliptical, delicately spinulose or almost smooth, orange ($17-28 \times 12-16$ μ), without definite pedicels, and with a thick hyaline outer coating.

Sacc. Syll. vii. 3090 ; *Plow. Br. Ured.* 258.

Phillyrea Cluster-cups.

Æcidium phillyreæ, DC.

These cluster-cups, which appear to be independent of uredo or teleutospore, occur on the leaves and twigs of *Phillyrea media* and *latifolia*, sometimes contorting and deforming the latter.

The cups are clustered in roundish patches on the leaves, for the most part crowded, with the margins nearly entire. Æcidiospores very variable in form, being sometimes globose, or elliptical, or pear-shaped ($18-35 \times 14-20$ μ), externally warted, orange-yellow. On the stems the clusters are more elongated, thickened, and distorted.

Known in France, Germany, and Italy.

Sacc. Syll. vii. 2852.

Cotoneaster Spot.

Phyllosticta sanguinea (Desm.), Pl. XVI. fig. 17.

This species, which is usually found on the dead leaves of the Bird Cherry, has occurred in this country on the living leaves of *Cotoneaster frigida.* The spots are roundish and brown, girt by a darker line, outside which the tissue is stained of a blood red. The receptacles are scattered over the spots, and are black, point-like, and shining. The sporules are ovate, with two nuclei (8 μ long), and uncoloured.

Known in France and Britain.

Sacc. Syll. iii. 14; *Grevillea,* xiii. 71.

Butcher's Broom Spot.

Phyllosticta ruscicola (Dur. & Mont. f.), Pl. XVI. fig. 18.

This pest occurs on the phyllodes of the Butcher's Broom, *Ruscus aculeatus,* and other species. The spots are roundish or indistinct, whitish, with a brown border, and the perithecia, which are seated upon these spots, are at first covered. The sporules are oblong and colourless ($7–8 \times 3\frac{1}{2}\ \mu$).

Probably this is an imperfect condition of an ascomycete, which is developed on the dead phyllodes.

It is not only common in Britain, but is known also in France, Belgium, Portugal, Austria, and Italy.

Sacc. Syll. iii. 319; *Cooke, Hdbk.* No. 1346.

As the phyllodes are persistent, this may be regarded for our purposes as an evergreen shrub.

Mahonia Leaf-spot.

Phyllosticta mahoniæ (Sacc. & Speg. f.), Pl. XVI. fig. 19.

Mahonia leaves are rather given to discoloration and sometimes to spotting, but in this instance no definite spots are formed, and the receptacles are scattered over the surface. In British specimens the leaves were still living and adhering to the plant, but the receptacles were rather larger than usual, containing broadly elliptical sporules ($4–6 \times 3–4\ \mu$).

It has been found also in France and Italy.

Sacc. Syll. iii. 131; *Grevillea,* xiii. 72.

Another spot is known to occur on the leaves of *Mahonia japonica,* in which large bleached spots occur with a brownish margin. The sporules are scarcely different in size ($4–4\frac{1}{2} \times 2\frac{1}{2}–3\ \mu$), but the spotting is quite distinct. It has been found at present only in Portugal.

The ordinary leaf-spots (*Phyllosticta berberidis* and *Septoria berberidis*) on leaves of the common Berberry have not yet been observed in Britain.

Grevillea, xiii. 72.

Æcidium berberidis sometimes occurs on the leaves and berries of *Mahonia.* See *Smith, Field Crops,* fig. 87.

DECIDUOUS-LEAVED SHRUBS

here enumerated are succeeded by a small subsection, which includes coniferous and allied shrubs, to which, perhaps, should have been added some of those hereafter included with *Coniferæ,* under the "Pests of Forest Trees."

Berberry White Mould.

Ovularia berberidis (Cooke), Pl. XVI. fig. 20.

This mould occurs on the fading leaves of *Berberis asiatica,* forming greyish-white patches, reminding one of *Oidium.* The short, slender, unbranched threads are collected in tufts, bearing about their apices the elliptical, uncoloured conidia ($15–18 \times 8–9\ \mu$).

These moulds are susceptible to the influence of fungicides, should they prove troublesome.

Sacc. Syll. x. 746 ; *Grevillea,* xvi. 62, xiii. 98.

Berberry Anthracnose.

Glœosporium berberidis (Cooke), Pl. XVI. fig. 21.

This anthracnose on the leaves of *Berberis asiatica* was first observed in this country in 1884. The spots are on the upper surface, and are broad, somewhat circular, brown, with a reddish margin. The pustules are numerous upon the spots, convex, at length splitting at the apex to liberate the conidia, which are ovoid and colourless, comparatively small ($5 \times 3\ \mu$).

Sacc. Syll. x. 6756 ; *Grevillea,* xiii. 98.

Purple Berberry Spot.

Phyllosticta asiatica (Cooke).

This spot was found on the leaves of *Berberis asiatica* about the same time as the anthracnose, which to some extent it resembles externally. The spots are circular or irregular, and pale brown, with a broad purplish margin, which becomes crimson as it passes into the leaf. The receptacles are seated on the upper surface upon the spots, and are very minute and point-like. Sporules very small, hyaline ($4 \times 1\frac{1}{2}\ \mu$).

Sacc. Syll. x. 4865 ; *Grevillea,* xiii. 91.

Berberry Leaf Mildew.

Microsphæra berberidis (DC.), Pl. XVI. fig. 22.

The Berberry Mildew is a common pest of *Berberis vulgaris,* and partakes of the character of the mildew of the Gooseberry, the Garden Pea, and the Dogwood. The leaves are at first covered with the thin white creeping mycelium, which imparts a chalky appearance, and is then epiphytal; soon the erect branches become jointed, and the cells become conidia, which fall away successively, and add to the mealy appearance of the leaves. This stage is the *Oidium,* but whether it is the *Oidium* *berberidis* of Thümen is not fully determined. If so, the conidia are reported to be oval and rather small ($7-8 \times 3-3\frac{1}{2}\ \mu$).

Succeeding this stage the globose receptacles appear on the surface of the mycelium, dotted about like little black points. Each receptacle is surrounded by a circle of about ten appendages, the apex of each twice or more forked, the branches spreading, with the tips obtuse. Each receptacle encloses about six asci, and each contains from six to eight sporidia.

This mildew is recorded for Britain, France, Belgium, Germany, Finland, and Italy.

Should it be required, the sulphur remedy is applicable.

Sacc. Syll. i. 47 ; *Cooke, M. F.* p. 219 ; *Cooke, Hdbk.* No. 1921.

Berberry Cluster-cups.

Æcidium berberidis (Gmel.), Pl. XVI. fig. 23.

These cluster-cups have the merit of being historical, since it is over them that the battle has been fought which has sought to establish the theory that cluster-cups may be produced on one species of plant, such as the leaves of the Berberry, while the uredospores and teleutospores belonging to the same cycle may be produced upon quite a different species of plant, such as the leaves of wheat. We have no cause to espouse or reject that theory here, since we have only to regard the cluster-cups as a disease of the Berberry shrub, and leave the diseases of the wheat plant to take care of themselves.

It is in the spring that the leaves of *Berberis vulgaris* exhibit the thickened discoloured spots (2–5 mm. broad), which ultimately are fissured to allow of the extrusion of the cluster-cups, such spots being somewhat orbicular and convex. The cluster-cups are rather elongated and closely packed side by side upon the spots. The margin of the cups is white, spreading, and toothed. The æcidiospores are produced in chains from the base towards the apex of the cup, and are somewhat globose, becoming angular by compression ($14-26\ \mu$), with a smooth surface, and of an orange colour.

Spermogonia are produced in small clusters on honey-coloured spots, and are supposed to have some influence in the cycle of which they are believed to form a part. With the spermogonia and the cluster-cups, the story, in so far as the Berberry is concerned, comes to an end.

They are produced on the leaves and fruits of several species of *Berberis*, and on *Mahonia*.

This fungus is reported for the greater part of Europe, North America, Asiatic Siberia, and uncertainly for parts of the Southern Hemisphere.

Certain theorists are at war with the Berberry bush on account of the wheat mildew, and, whether with *Æcidium* or not, cry aloud for its extirpation.

Sacc. Syll. vii. 2191 ; *Cooke, Hdbk.* No. 1612 ; *Cooke, M.F.* 195, t. 1, f. 7–9 ; *Mass. Pl. Dis.* p. 247 ; *Smith, Field Crops*, p. 159, figs. 82 to 86 ; *Plow. Br. Ured.* 163.

It may be noted that another species of *Æcidium* (*Æ. graveolens*) has been discovered on the leaves of the same species of Berberry in Switzerland, with the cluster-cups scattered over the surface of the leaf, and having an appreciable odour.

Sacc. Syll. vii. 2716; *Cooke, Fungi, their Uses*, p. 201.

And yet another species (*Æ. magelænicum*), also on the leaves of *Berberis vulgaris*, in Hungary, Austria, Germany, and the Straits of Magellan, also with the cluster-cups scattered over the leaves.

Sacc. Syll. vii. 2715; *Berk. Hook. Fl. Ant.* ii. 450.

Buckthorn Leaf-spot.

Phyllosticta rhamni (West).

The leaves of the Buckthorns are rather subject to spotting. This spot is to be found on the leaves of *Rhamnus Frangula* and *Rhamnus Alaternus* in Belgium, Portugal, and Italy, and sometimes in Great Britain. The spots are variable in form, ochraceous, with a brown marginal line. The receptacles are gregarious in the centre of the spot. Sporules ovoid ($5–6 \times 3–4\ \mu$), with a tinge of olive.

Sacc. Syll. iii. 62; *Grevillea*, xiv. 71.

A similar species (*Phyllosticta rhamnigena*) occurs on *Rhamnus cathartica* in France, Portugal, and Italy, with dirty white circular spots and small sporules ($4\frac{1}{2}–5 \times 3\mu$), which seems to be very little different.

The Italian species on *Rhamnus catharticus* has the roundish spots, with a reddish-brown margin, and the sporules larger ($10 \times 4\ \mu$) and uncoloured.

In Belgium a spot is known on the leaves of *Rhamnus Frangula* in which the round spots are brown, then grey (*Phyllosticta frangulæ*), with a vinous-red margin.

Buckthorn Cluster-cups.

Æcidium crassum (Pers.), Pl. XVI. fig. 24.

The cluster-cups of the different species of *Rhamnus* now lose their identity under the name of *Puccinia coronata*, because the presumed teleutospores are to be found on the leaves and culms of grasses. Fortunately we are privileged to retain the old name, as we regard it solely as a disease of Buckthorn leaves.

The cups are clustered upon thickened yellowish spots, and are cylindrical, with a spreading margin, which is finely toothed and white. The æcidiospores are angular by compression ($17–26 \times 13–21\ \mu$), warted, and of an orange colour.

This disease is reputed to prevail over the greater part of Europe, in North America, and in South Africa.

Should it be found necessary to check the spread of this parasite, it will doubtless be found sufficient to pick off and burn the diseased leaves, which are seldom numerous.

Sacc. Syll. vii. 2192; *Cooke, M. F.* p. 196; *Plow. Br. Ured.* p. 164; *Cooke, Hdbk.* No. 1613.

Buckthorn Powdery Mildew.

Microsphæra divaricata (Wallr.), Pl. XVI. fig. 25.

This mildew makes its appearance on the leaves of *Rhamnus Frangula*, and very often, as in this country, proceeds no further than the production of conidia. The mycelium is thin and evanescent, producing the usual erect septate threads, which separate in joints, and constitute the conidia. The receptacles are minute and globose, with a few divergent appendages, about five times as long as the diameter of the receptacles. About four asci are contained within each mature receptacle, each of which encloses four sporidia.

It is found in France, Germany, Belgium, and Finland.

Subject, like other epiphytes, to the influence of sulphur.

Sacc. Syll. i. 37; *Lev. Ann. Sci. Nat.* 1851, xv. t. 8, f. 18.

Guelder Rose Leaf-spot.

Septoria viburni (West).

This leaf-spot is to be found both on *Viburnum Opulus* and *Viburnum Lantana*. The spots are on the upper surface, and are of irregular form, whitish in the centre and brown at the circumference. The receptacles are minute, like black dots, and the sporules cylindrical, obtuse at the ends with from five to seven guttules.

Known in Belgium and Italy.

Sacc. Syll. iii. 2657; *Cooke, Hdbk.* No. 1321; *Grevillea,* xiv. 101.

Guelder Rose Mealy Mildew.

Microsphæra Hedwigii (Lév. f.), Pl. XVI. fig. 26.

The leaves of *Viburnum Lantana* are subject to the mealy mildew, which covers them with a thin mycelium, giving a frosty appearance for a time, but finally vanishes. The receptacles are minute and globose, as usual, scattered over the mycelium. The appendages which surround the receptacles are few, and a little longer than the diameter of the receptacles.

The number of asci in each receptacle is limited to four, and each encloses four sporidia.

This mildew is known in Belgium, Italy, Germany, and North America.

Sacc. Syll. i. 35; *Cooke, Hdbk.* No. 1918, fig. 316.

Spindle-tree Rust.

Cæoma euonymi (Gmel.), Pl. XVI. fig. 27.

This golden rust has been several times found on the leaves of *Euonymus europæus*, seated upon paler spots; the pustules are small, and densely aggregated, sometimes disposed in circles, becoming confluent in large masses, of a pale orange colour, and powdery. No æcidiospores or teleutospores are known to be associated with it. The uredospores are produced in chains, somewhat as in *Æcidium*, and are globose or ovate ($17–28 \times 12–24\ \mu$), very variable in size, and delicately punctate.

It has been recorded in Belgium, Germany, Switzerland, Italy, and Russia.

Sacc. Syll. vii. 3140; *Cooke, M. F.* p. 216; *Cooke, Hdbk.* No. 1576*a*.

About fourteen different kinds of leaf-spots have been described on species of *Euonymus*, but they have not been observed in Britain, excepting *Phyllosticta euonymi* on *Euonymus europæus*.

Sacc. Syll. i. 68; *Grevillea,* xiii. 71.

Spindle-tree Mildew.

Microsphæra euonymi (DC.), Pl. XVI. fig. 28.

This common mildew is not unusual in autumn on uncultivated plants of *Euonymus europæus,* although, like others, it has had to suffer a change of name from *Microsphæra comata,* by which it has long been known.

The delicate thin mycelium attacks the upper surface of the leaves, and imparts a chalky appearance, at first sprinkled with the conidia. Later on the little globose receptacles are scattered over the mycelium, as in other species. Each of these encloses eight pear-shaped asci, which contain four sporidia. The appendages which surround the receptacles are six times as long as the diameter of the receptacles.

It is reported for Britain, France, Belgium, Germany, and Italy.

Sacc. Syll. i. 38; *Cooke, M. F.* p. 226; *Cooke, Hdbk.* No. 1923.

Cornel Leaf-spot.

Phyllosticta cornicola (DC.), Pl. XVI. fig. 29.

This form of leaf-spot is by no means uncommon on leaves of *Cornus sanguinea* and other species. The spots are rather large, and dark blood-red, turning pale in the centre. The receptacles are rather larger than usual, and the sporules oblong, narrowed towards each end ($7–9 \times 3–4\ \mu$), enclosing two guttules.

It has been recorded in France, Italy, Siberia, and North America.

Sacc. Syll. iii. 103; *Grevillea,* xiii. 72.

Another species (*Phyllosticta corni*) is known on the leaves of *Cornus alba* in Belgium with very dark brown spots, becoming white in the centre, and only from three to six receptacles scattered over each spot. Sporules elliptical ($10 \times 5\ \mu$).

Cornel Grey Leaf-spot.

Septoria cornicola (Desm.), Pl. XVI. fig. 30.

The leaves of *Cornus sanguinea* are often spotted by this parasite, which produces roundish grey spots on the leaves, with a dark purple margin. The receptacles are scattered over the spots on the upper surface. Sporules cylindrical, or rod-like, curved ($35–40 \times 2–2\frac{1}{2}\ \mu$), with two to four obscure septa, expelled when mature in whitish tendrils.

It is common in Western Europe.

Sacc. Syll. iii. 2652 ; *Grevillea,* xiii. 76 ; *Cooke, Hdbk.* No. 1312.

Dogwood Mildew.

Erysiphe tortilis (Wallr.), Pl. XVI. fig. 31.

The powdery mildew of the Dogwood is by no means an uncommon infliction, the thin white mycelium entirely overspreading the leaves, with an evanescent coating. The conidia are first produced as in other species, and these are followed, later on, by the small globose receptacles, which are scattered over the mycelium. The appendages are very long, and even ten times as long as the diameter of the receptacles, but neither branched nor divided at the apex. The number of asci in each conceptacle is four, and each encloses four sporidia.

This mildew is recorded for France, Belgium, Germany, and Italy.

May be checked by the application of powdered sulphur.

Sacc. Syll. i. 65 ; *Cooke, Hdbk.* No. 1929 ; *Cooke, M. F.* f. 245, 246.

Lilac Leaf-mould.

Ovularia syringæ (Berk.), Pl. XVIII. fig. 32.

This white mould on lilac leaves was first observed by Berkeley in 1881. The flocci are for the most part decumbent, surmounted by the simple conidia, which are at first subglobose, with a terminal wart or papilla ; at length they become elliptic and then ovate, being very large for such a mould ($50–70\ \mu$ long).

It was discovered in Scotland, but is very little known, and has never come under our observation.

Sprinkle with Bordeaux mixture.

Sacc. Syll. iv. 747 ; *Gard. Chron.* 1881, fig. 135 ; *Grevillea,* 1882, x. 115, xi. 15.

A black mould (*Cercospora lilacis),* of a destructive character, is known in France, Belgium, Austria, and Italy, but at present has not been recognised in Britain. It forms grey or reddish oblong spots, and has pointed septate olive conidia ($15–25\ \mu$ long).

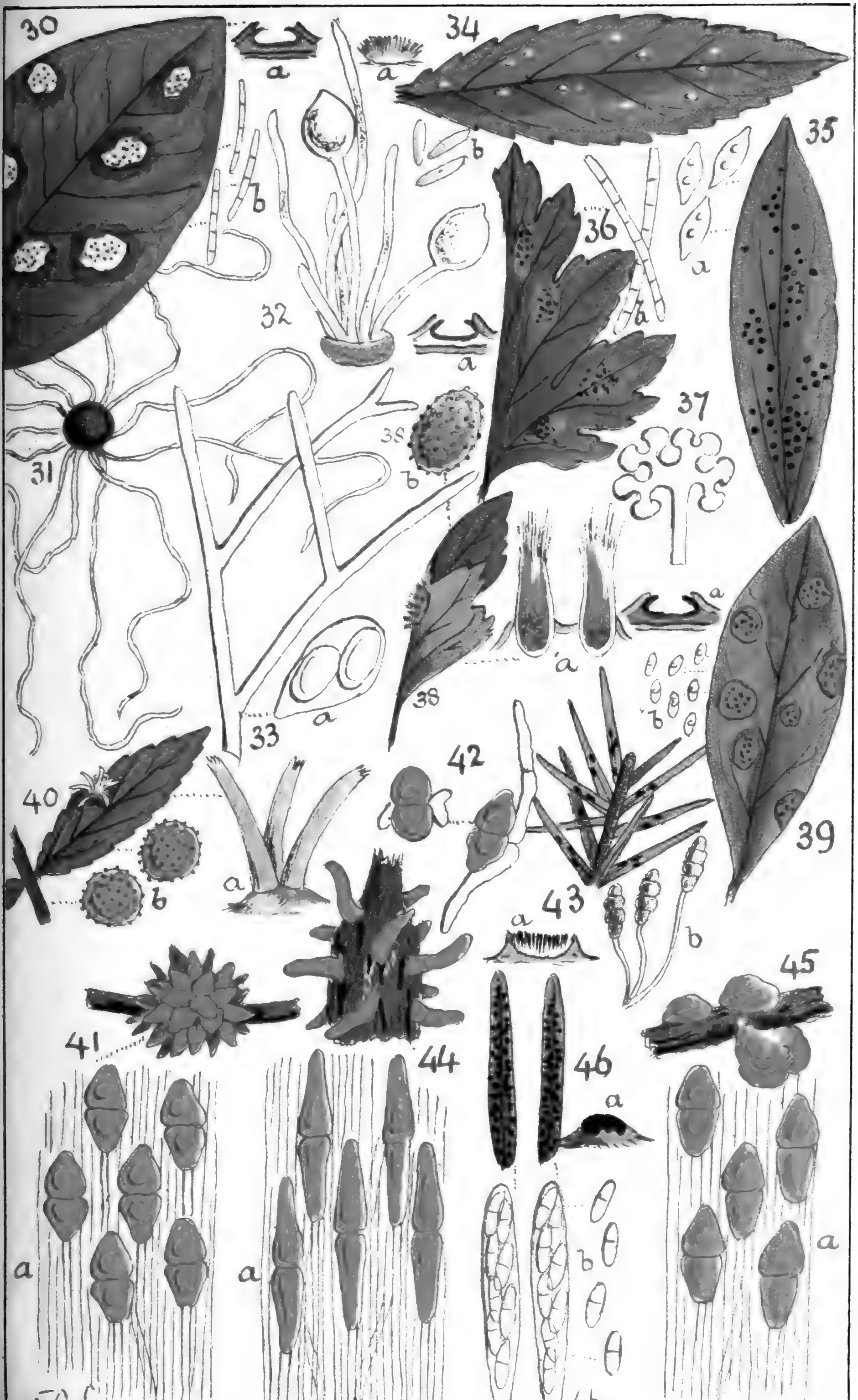
Lilac Leaf-spot.

Phyllosticta syringæ (West).

One of the most common causes of the spotting of Lilac leaves is the above-named parasite, which forms broad bleached spots of an irregular form, with a brownish margin. The receptacles are seated on the upper surface of the spots, and are minute and dot-like. The sporules are oblong ($8 \times 3\ \mu$), with two guttules, and uncoloured.

It is known in France, Belgium, Portugal, and Italy.

Sacc. Syll. iii. 109 ; *Grevillea,* xiv. 72.



PESTS OF ORNAMENTAL SHRUBBERY

Another species (*Phyllosticta syringicola*) is known in France with reddish-brown spots and larger sporules ($12–15 \times 2\ \mu$).

Tea-tree Mildew.

Microsphæra lycii (Lasch.), Pl. XVIII. fig. 33.

This powdery mildew is very common on the leaves of *Lycium barbarum*, but in this country it is rarely seen proceeding beyond the conidial stage, when the leaves are covered with *Oidium*. The mycelium is persistent, adhering by means of suckers, or haustoria, entirely covering the leaves and twigs with a coating of white. When the receptacles make their appearance they are minute and flattened, globose, with a great number of spreading appendages, twice as long as the diameter of the receptacles, about four times forked at the apex, with the tips obtuse. Each receptacle contains from twelve to sixteen asci, and each ascus only two sporidia.

It is recorded in France, Germany, Italy, and in North America.

If necessary, sprinkle with powdered sulphur.

Sacc. Syll. iii. 33; *Cooke, M. F.* p. 240.

Sida Leaf-spot.

Phyllosticta sidæcola (Cooke).

Hitherto only this kind of leaf-spot has been observed in this country on leaves of *Sida* and *Hibiscus*, and this upon leaves of *Sida Napæa*, forming brown indistinct spots, pallid in the centre. The sporules are minute and elliptical ($4 \times 2\ \mu$).

Grevillea, xiv. p. 39, 72.

There is another species found on the leaves of *Hibiscus syriacus* in Portugal and Italy, but we have not heard of it in Britain (*Phyllosticta syriaca*). The spots are bleached, with a broad tawny margin, and the sporules are almost ellipsoid ($7 \times 3–4\ \mu$).

Calycanthus Leaf-spot.

Although *Calycanthus* is not uncommonly cultivated in gardens, it appears hitherto to have escaped the pests which attack it on the Continent.

Phyllosticta calycanthi (S. & S.) occurs in Italy and causes variable spots, which become bleached, and bear the usual small perithecia, which contain ellipsoid sporules ($7–9 \times 5–6\ \mu$).

Sacc. Syll. iii. 35.

Ascochyta calycanthi (S. &. S.) also is found in the same country, forming variable bleached spots on the leaves, and producing uniseptate sporules ($11–14 \times 2\frac{1}{2}–3\ \mu$).

Sacc. Syll. iii. 2165.

Septoria calycanthi (S. & S.) is yet another Italian leaf pest which forms ochraceous spots on the leaves of *Calycanthus*, and evolves numerous thread-like sporules ($15–25 \times 1\frac{1}{2}–2\,\mu$), with one central division or septum. It has also been found in Portugal.

Sacc. Syll. iii. 2639.

Staphylea Leaf-spot.

Although *Staphylea* is common enough, it seems to have escaped attack from fungus parasites in this country, although liable abroad. Leaf-spot caused by *Septoria staphyleæ* (Pass.) is known in Italy, where it produces rufous spots bearing the small perithecia, which eject thread-like sporules ($16–20 \times 1\,\mu$).

Sacc. Syll. iii. 2585.

Forsythia Leaf-spot.

The leaves of *Forsythia* do not appear to suffer from spot in this climate, although *Phyllosticta forsythiæ* (Sacc.) is recorded in Italy. The spots are rounded, ochraceous, with the small perithecia concentrically disposed upon them. The sporules are small ($5–7 \times 2\frac{1}{2}–3\,\mu$), with two minute guttules.

Sacc. Syll. iii. 139.

A species of *Phoma* has been found in Britain on dead twigs, but not as a parasite.

Garrya Leaf-spot.

Phyllosticta garryæ (C. & H.).

This leaf-spot was first recognised on leaves sent from North America, but has since been found upon shrubs under cultivation in this country. The spots are elliptical, grey, with a purple margin. The receptacles are scattered over the upper surface and are point-like, as usual. The sporules are narrowly elliptical ($10–12 \times 2–2\frac{1}{2}\,\mu$) and uncoloured.

Grevillea, ix. 84 ; *Sacc. Syll.* iii. 121.

Another leaf-spot has been found on the leaves of *Garrya elliptica* in France, which has variable spots encircled by a black line, and two-celled sporules (*Ascochyta garryæ*), which are fusiform and slightly greenish-yellow ($8–10 \times 3\,\mu$).

Sacc. Syll. iii. 2167.

Yet another leaf-spot has been discovered on *Garrya elliptica* in France, which has bleached spots (*Septoria garryæ*) and rod-like sporules ($15–18 \times 1\frac{1}{2}\,\mu$). Whether there is any connection between these three species we cannot say.

Sacc. Syll. iii. 2701.

Deutzia Pink Mould.

Fusidium deutziæ (Cooke), Pl. XVIII. fig. 34.

This delicate little mould affected the under surface of the leaves of *Deutzia* and appeared to be parasitic, forming small convex tufts of a flesh colour. The conidia spindle-shaped, straight ($16–20 \times 3–4\ \mu$), supported on very short pedicels or spore-bearers.

Although this is a kind of mould which is apt to be troublesome, we have not heard of it lately; should it appear, the effect of spraying with Bordeaux mixture should be tried.

Grevillea, xvi. 48, 58.

A kind of leaf-spot is known on *Deutzia scabra* in France (*Septoria phyllostictoides*), which may find its way into this country.

Mezereum Anthracnose.

Glœosporium mezerei (C. & M.), Pl. XVIII. fig. 35.

This species was not recognised until 1890, when it was found to produce small brown pustules on the upper surface of the leaves, without definite spots, but mostly upon fading leaves, probably induced by the presence of the parasite.

The sporules are somewhat elliptical or almond-shaped, with one or two guttules, and colourless, produced at the apex of short pedicels ($15 \times 6\ \mu$).

Sacc. Syll. x. 6768; *Grevillea*, xix. 8.

The above can scarcely be the same species as the French anthracnose (*Marsonia daphnes*), which has been found upon greenish and afterwards brownish spots, and has ovoid curved sporules ($20 \times 4–5\ \mu$), acute at each end, and divided into two unequal cells. This has been recorded for France and the Netherlands.

Hawthorn Leaf-spot.

Phlœospora oxyacanthæ (Kze.), Pl. XVIII. fig. 36.

This common leaf-spot has been known to occur on Hawthorn for many years. The spots are mostly yellowish, or scarcely distinct, the receptacles are seated on the upper surface, from which the mature sporules are extruded in yellowish tendrils. Sporules rod-like, a little thickened downwards ($70–80 \times 6–8\ \mu$), at first with granular contents, afterwards divided by from six to eight transverse septa.

Known in Sweden, Germany, Austria, Portugal, and Italy.

Sacc. Syll. iii. 3139; *Cooke, Hdbk.* No. 1299.

Hawthorn Powdery Mildew.

Podosphæra oxyacanthæ (DC.), Pl. XVIII. fig. 37.

It is by no means uncommon to see the leaves of Hawthorn whitened with this mildew, which sometimes does not pass beyond the *Oidium* stage, and the leaves are powdered with the fallen conidia. When the receptacles appear they are minute, globose, and scattered over the mycelium. The appendages which surround the receptacles are from eight to ten, and about equal in length to the diameter of the receptacles. They are shortly branched at the apex, with the tips of the branchlets dilated and rounded. Only one ascus is contained in each receptacle, and this encloses eight hyaline ovoid sporidia.

This mildew is believed to be found over the whole of Europe, extending into Algeria. Formerly known as *Podosphæra clandestina.*

Sacc. Syll. i. 1; *Cooke, Hdbk.* No. 1917; *Cooke, M. F.* p. 239.

Hawthorn Cluster-cups.

Ræstelia lacerata (Mer.), Pl. XVIII. fig. 38.

It is usual in these days to call this species of fungus *Gymnosporangium clavariiforme*, because it is believed to be the first stage, or cluster-cups, of a gelatinous exudation from the branches of the common Juniper. For our purpose it is better to continue to call it the Hawthorn cluster-cups, and regard it as a disease of the Hawthorn.

The leaves, and sometimes the fruits, are swollen in places, and from these swellings burst out the tufts of cluster-cups, seated on orange spots. The cups are at first flask-shaped, then cylindrical, and split nearly to the base in reflexed filaments enclosing the chains of yellowish æcidiospores, which are separately nearly spherical, compressed, angular ($22–45 \times 10–35\ \mu$), and warted.

It is reported for France, Belgium, Germany, Finland, Austria, Hungary, Dalmatia, Italy, and North America.

Sacc. Syll. vii. 2606; *Cooke, M. F.* figs. 22–26; *Cooke, Hdbk.* No. 1599; *Gard. Chron.* 1861, p. 336; *Sow. Fun.* t. 318.

Laburnum Leaf-spot.

Phyllosticta cytisi (Desm.), Pl. XVIII. fig. 39.

Living leaves of Laburnum are subject to spotting from the attacks of this parasite, which produces circular bleached spots, turning brownish, but with scarcely a distinct margin. The receptacles are dot-like, and scattered over the spots. Sporules oblong, rounded at the ends, curved, containing one guttule ($6 \times 3–4\ \mu$).

In addition to Britain this fungus is known in France, Belgium, Austria, and Italy.

Sacc. Syll. iii. 40; *Cooke, Hdbk.* No. 1347.

Another spot, caused by an allied species (*Phyllosticta laburnicola*), has been observed in Italy. There are no definite spots, and the sporules are smaller ($3–5 \times 1\ \mu$).

Not an uncommon fungus on branches of Laburnum is *Cucurbitaria laburni* (Pers.), which has been claimed as a wound parasite, but it is commonly seen on dead twigs.

Hart. & Som. in Dis. Trees, p. 87; *Sacc. Syll.* ii. 3937.

Laburnum Anthracnose.

Glœosporium cytisi (B. & Br.).

This anthracnose was first recognised by Berkeley on leaves of Laburnum in Scotland, but does not appear to have spread southward.

The spots are whitish, and at one time or other circled with red. Pustules minute, seated on the spots. Sporules small, elliptical.

This is another of the species which appears to have been hurriedly described from a single set of specimens, and has not been seen again.

Berk. & Br. Ann. N. H. No. 1897; *Grevillea,* x. 1881, p. 49; *Sacc. Syll.* iii. 3686.

Parasites do not appear hitherto to have caused much trouble with *Colutea arborescens,* notwithstanding its extensive cultivation, so that we have no record of any British species.

Mountain Ash Cluster-cups.

Rœstelia cornuta (Gmel.), Pl. XVIII. fig. 40.

Under the name of *Gymnosporangium juniperinum,* the presumed teleutospores which succeed these cluster-cups on twigs of Juniper, the original name is concealed. Our parasite, or at any rate that part of it which concerns us, makes its appearance on the leaves of the Mountain Ash and *Amelanchier.* They are seated in tufts upon yellow spots, on the upper surface. The cups are long horn-like tubes (up to 8 mm. long), which are curved, and whitish at first, then yellowish or reddish, with a toothed margin. The æcidiospores are spherical, then compressed and angular, of a brownish-yellow colour ($20-28 \times 16-24\ \mu$), delicately warted on the surface.

The pest is known in Britain, Belgium, Germany, Finland, Switzerland, Italy, Austria, and North America.

Sacc. Syll. vii. 2607; *Cooke, M. F.* f. 18, 19; *Cooke, Hdbk.* No. 1598, f. 218; *Sow. Fun.* t. 319.

Sumach Leaf-spots.

Leaf-spots are numerous, and common, on various species of *Rhus* in North America, but we have no record of their occurrence in Britain. There are not less than fifteen species of leaf parasites that are known and described, but probably not five of them are European.

GYMNOSPERMS.

Savin Jelly-rust.

Gymnosporangium sabinæ (Dicks), Pl. XVIII. fig. 41.

According to theory, the proper cluster-cups of this pest are produced upon the leaves, twigs, and fruits of the Pear tree, and it was formerly known as *Rœstelia cancellata.* The teleutospores are exuded in a gelatinous mass from the branches of *Juniperus Sabina.* We deal with the cluster-cups as a disease of the Pear tree.

The teleutospores cause gouty swellings in the branches of the host-plant, and at length break through in irregular conical or cylindrical, obtuse, gelatinous, orange-coloured masses, sometimes compressed, and sometimes divided (10 mm. long) like little flabby tongues. This gelatinous mass consists of teleutospores with their stems adhering together.

The former are ellipsoidal (38–50 × 23–26 μ), divided transversely into two cells, and of an orange-brown colour. The stems or pedicels are very long and colourless.

Each cell is capable of germination, as in *Puccinia*, and produces a filament, called a promycelium, the extremity at length divided off into three or four cells, each of which develops a secondary spore.

Journ. Q.M.S. 1871, t. xix. fig. 2; *Sacc. Syll.* vii. 2608; *Plow. Br. Ured.* p. 230; *Journ. R.H.S.* 1902, xxvi. p. 724, fig. 303; *Cooke, Hdbk.* No. 1517; *Berk. Outl.* t. 2, f. 4; *Hart. & Som. in Dis. Trees*, p. 158.

Confounded Savin Jelly-rust.

Gymnosporangium confusum (Plowr.), Pl. XVIII. fig. 42.

This is another gelatinous rust which affects the twigs of the Savin, which is said to resemble so closely the other species that it cannot be distinguished from it; hence we are at a loss to discover how its sponsors are to recognise it. The difference is said to exist in its life-history; that its first stage, or cluster-cups, are found upon the Medlar, Quince, and Hawthorn. No one can tell how to distinguish the teleutospores on the Savin from the teleutospores of the other and original species. It is a pretty fairy tale, and should be kept in the nursery.

Teleutospores smooth, oval or elliptical, generally acute at both ends, of two kinds, the more numerous with hyaline spore-walls and orange-yellow contents, the other with dark brown thick walls (40–50 × 20–25 μ) with from two to four germ tubes, pedicels long (80–100 μ), hyaline.

Plow. Br. Ured. p. 232, t. iv. figs 13, 14; *Mass. Pl. Dis.* p. 287.

Gymnosporangium tremelloides has its teleutospores on *Juniperus communis*, and its æcidium form on *Pyrus Aria* in the Bavarian Alps.

Hart. & Som. in Dis. Trees, p. 159.

Savin Leaf-dot.

Coryneum Berkeleyi (Cooke), Pl. XVIII. fig. 43.

In the English Flora, Berkeley described a parasite on the leaves of *Juniperus Sabina*, which he called *Podisoma foliicola*. In 1871 we demonstrated that this was not a *Podisoma* at all, having examined his specimens, so that we applied the name of *Sarcostroma Berkeleyi*. Since that time we have doubted whether it had not better be referred to *Coryneum*. In no form is it recognised in Saccardo's "Sylloge."

It makes its appearance in spring, on living leaves, as small subelliptic black excrescences, not larger than the head of a pin. Internally it consists of a tremelloid stroma, from which radiate long hyaline peduncles, surmounted each by an elliptical or subfusiform spore or conidium, of a dull brown colour when mature, and divided by three, or rarely five, transverse septa (30 × 8 μ).

This parasite does not appear to have been observed anywhere else, and only on rare occasions in this country, so that it has not really developed into a pest.

Journ. Q.M.S. 1871, pl. xix. fig. 4; *Cooke, Hdbk.* No. 1518.

Juniper Jelly-rust.

Gymnosporangium clavariiforme (Jacq.), Pl. XVIII. fig. 44.

The proper cluster-cups of this species are said to be produced on the leaves and fruits of the Hawthorn, and were formerly known as *Ræstelia lacerata.*

The teleutospores are developed on the living twigs of *Juniperus communis,* which are previously swollen, and then the fungus issues through fissures in the bark in soft gelatinous club-shaped orange tongues, often flattened, sometimes forked, and curved or flexuous.

The teleutospores are oblong-fusiform, divided across the centre into two cells, and yellowish ($70–120 \times 14–20\ \mu$), on very long colourless pedicels

Each cell is capable of germination, in the same manner as the Savin rust.

It has been recorded for France, Belgium, Germany, Finland, Austria, Hungary, Dalmatia, Italy, and North America.

The teleutospores are nearly twice as long as in *Gymnosporangium juniperinum.*

Journ. Q.M.S. 1871, t. xix. fig. 1 ; *Cooke, M. F.* p. 214 ; *Sacc. Syll.* vii. 2606 ; *Plowr. Br. Ured.* p. 233 ; *Cooke, Hdbk.* No. 1516 ; *Hart. & Som. in Dis. Trees,* p. 158.

Juniper Jelly-mass.

Gymnosporangium juniperinum (Linn.), Pl. XVIII. fig. 45.

This jelly fungus has its reputed cluster-cups on the leaves of Mountain Ash, under the former name of *Ræstelia cornuta,* and the teleutospores are developed on the branches of *Juniperus communis.* Thus it will be observed that two similar gelatinous fungi are produced on the branches of the same kind of Juniper.

The gelatinous masses in this species are more expanded than in the preceding, at first mostly hemispherical, then pear-shaped, pleated in folds or collapsing, at first tawny-yellow, and afterwards golden-yellow. The teleutospores are ellipsoid or oblong, narrowed towards each end, and divided across the centre into two cells ($40-75 \times 17-27\ \mu$), on very long slender pedicels. This species was the only one originally called a *Gymnosporangium.*

Known in Belgium, Switzerland, Germany, Finland, Austria, Italy, and North America, and sometimes called *Gymnosporangium conicum.*

Journ. Q.M.S. 1871, t. xviii. fig. 2 ; *Cooke, M. F.* p. 214 ; *Plowr. Br. Ured.* p. 235 ; *Cooke, Hdbk.* No. 1515 ; *Berk. Outl.* t. 2, f. 5 ; *Hart. & Som. in Dis. Trees,* p. 157.

Yew Leaf Sphærella.

Sphærella taxi (Cooke), Pl. XVIII. fig. 46.

This parasite was first observed in the south of England, where it was at work destroying Yew trees by infesting all the leaves, and it has since been observed elsewhere. The black prominent receptacles, like pins' heads in size, thickly cover the green leaves, over entire branches, so as speedily to complete the work of destruction. The receptacles are nearly globose, immersed in the leaves, and enclose a gelatinous nucleus, which consists of a mass of cylindrical tubes or asci, each containing eight sporidia. These sporidia are elliptical, colourless ($18–20 \times 5–6\ \mu$), and divided by a transverse septum into two cells. Asci ($70–75 \times 12–14\ \mu$) without paraphyses.

This is so deep-seated an endophyte that it is doubtful whether the application of fungicides would make any impression. We can only advise the removal of all affected twigs, as soon as discovered, and burning them.

Sacc. Syll. i. 1836 ; *Grevillea*, vi. 128.

EXPLANATION OF PLATES XVI., XVII., XVIII.

Fig. 1.—*Exobasidium rhododendri*, Cram.—*a*, cluster of galls; *b*, basidium with spores × 350.
2.—*Phyllosticta arbuti*, Desm.—*a*, section of perithecia ; *b*, conidia × 400.
3.—*Septoria unedonis*, Rob.—*a*, section of perithecium ; *b*, conidia × 400.
4.—*Phyllosticta Cookei*, Sacc.—*a*, section of perithecium ; *b*, conidia × 400.
5.—*Capnodium Footii*, Harv.—Perithecia with mycelium and sporules × 400.
6.—*Phyllosticta tinea*, Sacc.—*a*, section of perithecia ; *b*, conidia × 400.
7.—*Phyllosticta ligustri*, Sacc.—*a*, section of perithecia ; *b*, conidia × 400.
8.—*Phyllosticta limbalis*, Pers.—*a*, section of perithecium ; *b*, conidia × 400.
9.—*Puccinia buxi*, DC.—*a*, teleutospore × 400.
10.—*Phyllosticta hedericola*, D. & M.—*a*, section of perithecium ; *b*, conidia × 400.
11.—*Septoria insularis*, B. & Br.—*a*, section of perithecium ; *b*, conidia × 400.
12.—*Septoria hederæ*, Desm.—*a*, section of perithecia ; *b*, conidia × 400.
13.—*Glœosporium paradoxum*, De Not.—*a*, section of pustule ; *b*, conidia × 400.
14.—*Phyllosticta nuptialis*, Thüm.—*a*, section of perithecium ; *b*, conidia × 400.
15.—*Phyllosticta phillyreæ*, Sacc.—*a*, section of perithecium ; *b*, conidia × 400.
16.—*Uredo phillyreæ*, Cooke.—*a*, pustule enlarged ; *b*, uredospore × 400.
17.—*Phyllosticta sanguinea*, Desm.—*a*, section of perithecium ; *b*, conidia × 400.
18.—*Phyllosticta ruscicola*, D. & M.—*a*, section of perithecium ; *b*, conidia × 400.
19.—*Phyllosticta mahoniæ*, S. & S.—*a*, section of perithecium ; *b*, conidia × 400.
20.—*Ovularia berberidis*, Cooke.—*a*, hyphæ with conidia × 400.
21.—*Glœosporium berberidis*, Cooke.—*a*, section of pustule ; *b*, conidia × 400.
22.—*Microsphæra berberidis*, DC.—*a*, tip of appendage ; *b*, ascus and sporidia × 400.
23.—*Æcidium berberidis*, Gmel.—*a*, cluster-cups, enlarged ; *b*, æcidiospores × 400.
24.—*Æcidium crassum*, Pers.—*a*, section of cluster-cups, enlarged ; *b*, æcidiospores × 400.
25.—*Microsphæra divaricata*, Wallr.—*a*, tip of appendage, enlarged ; *b*, ascus and sporidia × 400.
26.—*Microsphæra Hedwigii*, Lév.—*a*, tip of appendage, enlarged ; *b*, ascus and sporidia × 400.
27.—*Cæoma euonymi*, Gmel.—*a*, uredospores × 400.
28.—*Microsphæra euonymi*, DC.—*a*, tip of appendage, enlarged ; *b*, ascus and sporidia × 400.
29.—*Phyllosticta cornicola*, DC.—*a*, conidia × 400.
30.—*Septoria cornicola*, Desm.—*a*, section of perithecium ; *b*, conidia × 400.
31.—*Erysiphe tortilis*, Wallr.—Receptacle with appendages ; *a*, ascus and sporidia × 400.
32.—*Ovularia syringæ*, Berk.—Tuft of hyphæ bearing conidia × 400.
33.—*Microsphæra lycii*, Lasch.—*a*, tip of appendage ; *b*, ascus and sporidia × 400.
34.—*Fusidium deutziæ*, Cooke.—*a*, tuft of conidia ; *b*, conidia × 400.
35.—*Glœosporium mezerei*, C. & M.—*a*, conidia × 400.
36.—*Phlœospora oxyacanthæ*, Kze.—*a*, conidia × 400.
37.—*Podosphæra oxyacanthæ*, DC.—*a*, tip of appendage enlarged,
38.—*Rœstelia lacerata*, Mer.—*a*, section of cups, enlarged ; *b*, æcidiospore × 400.
39.—*Phyllosticta cytisi*, Desm.—*a*, section of perithecium ; *b*, conidia × 400.
40.—*Rœstelia cornuta*, Gmel.—*a*, three cups, enlarged ; *b*, æcidiospores × 400.

FIG. 41.—*Gymnosporangium sabinæ*, Dicks.—Pustule, nat. size ; *a*, teleutospores × 400.
42.—*Gymnosporangium confusum*, Plowr.—Teleutospores germinating × 400.
43.—*Coryneum Berkeleyi*, Cooke.—*a*, section of receptacle ; *b*, conidia × 400.
44.—*Gymnosporangium clavariiforme*, Jacq.—Pustule, nat. size ; *a*, teleutospores × 400.
45.—*Gymnosporangium juniperinum*, L.—Pustules, nat. size ; *a*, teleutospores × 400.
46.—*Sphærella taxi*, Cooke.—*a*, perithecium enlarged ; *b*, ascus and sporidia × 400.

HIMALAYAN RHODODENDRONS AND THEIR HYBRIDS.

By Sir John D. Llewelyn, Bart.

[Paper read before the Horticultural Club.]

What a blessing it is that in horticulture we do not all aim at the same goal! What a dull world it would be if we all grew only Cabbages, or only Roses, or only Apples, and nothing else! No doubt we should have each kind larger or brighter, or more tempting, if possible, than they are; but variety is charming, our pleasures are pure, and our opportunities are endless in the pursuit of hybrids or varieties in vegetables, flowers, and fruits. Spring, summer, autumn, and winter call for new and improved plants, and our aim is to provide them; and if the increasing interest of the public, as illustrated and evinced by the ever-growing crowds at our shows, or the membership of the R.H.S., be taken as an indication, our success as horticulturists is emphatic and pronounced. Some are interested by one branch, others by another. Florist, Botanist, Pomologist, let them all come; we cater for them all!

Perhaps, as president of the club, I run less risk of being called to order for digression from the strict letter of my theme than if some unsympathetic critic occupied the chair; but I will try to be merciful, not to worry you too long, or too dictatorially in the way specialists are tempted to do. Restriction, indeed, is needed, for the claim of the genus *Rhododendron* to admiration is testified to by the fact that the "Botanical Magazine" figures illustrations of nearly 100 species, varieties, or hybrids, as being worthy of notice in its highly critical pages, and our excellent secretary invited me to read this paper on the Himalayan species only, afterwards adding the words "and their hybrids." Had I objected to this qualification, of course I should have disclaimed at once, and indeed I was at first inclined to do so, for I cannot pretend to know what everybody else is doing in the domain of hybridisation. As, however, our object is to learn by discussion, I let the title of the paper alone, and I hope we may have some criticisms and additions to what I have to say here to-night.

Here I hold myself excused from treating of Mr. Veitch's lovely hybrids of *jasminiflorum, javanicum, Teysmanni*, and *multicolor*; they have given me pleasure which I should fail in describing, they have a delicacy and richness all their own, but they are greenhouse plants and not Himalayan. Far too lightly must I touch on Davies of Ormskirk's hybrid *Edgeworthii*; they are not quite hardy enough for the outdoor garden, though the parent is a Himalayan, but Mr. Paul and Mr. Luscombe have given us some *Fortunei* hybrids. *Fortunei* comes from China. Much advantage and pleasure are to be obtained by those who will exercise their judgment and utilise their experience in discriminating between the species of Himalayan Rhododendrons which have proved and are being proved hardy in this country. I fear it is idle to expect that some of the most glorious species, such as *Nuttalli* and *Maddeni*, which grow low down on the Himalayan slopes, can be as hardy or stand winters as well as those which flourish right up towards the eternal snows of the mighty mountain ranges of Sikkim, Nepal, and Bhotan, to altitudes of 14,000 or 15,000 feet.

But the word "hardy" is so comparative a term, so apt to be misunderstood, so liable to be upset under conditions which I was about to call "abnormal," but which are only too well known to British horticulturists, that I only use the word with the large reservation that several species are quite hardy enough for the conditions they usually find in my climate and soil in South Wales, and still more so in the extreme south-western corner of England, Cornwall, and in Ireland.

My experience is that if the wood is well hardened after the summer's growth they will stand any amount of winter frost—28° below freezing point—and that the greatest risks are incurred by the species whose leaf action is early and which thus are more liable to be checked by our May frosts. Observe, I speak of leaf action, rather than of the inflorescence.

March and April are the blooming period of our most common species, *arboreum, barbatum, Thomsoni, ciliatum, Campbelliæ*, and *campanulatum*, and few seasons pass without some loss of trusses of the bloom, but as leaf action will not commence till the end of May or early in June the plant is none the worse, and there is no greater delight to the lover of his favourites than to see the way they come up again to the scratch after the knock-down blow in the first round between, say, *barbatum v.* Jack Frost on "St. David's Day." Here is an original note copied verbatim from a memorandum made eleven years ago:

"*Monday, February* 27, 1893.—Wet, turning to heavy snow. P.M. Thawed at dusk, but before morning 12 degrees of frost. My trusses of *R. barbatum* spoilt—but eight days later fresh trusses were out in unclouded beauty."

Another instance of the way in which the early bloom will contend with bad weather occurred about the same time, when towards the end of March my *Thomsoni* trusses were retarded for a fortnight by severe frost. They had already expanded enough to show the deep blood-red colour, but waited quiescent until the thaw came and then bloomed as though nothing had interfered with them.

In various seasons our British spring amuses itself with a display of alternate sun and rain, snow, wind, and frost, and I think the kaleidoscopic vagaries of the weather are more marked in the west country than near London. Seldom indeed do we escape mischievous spring (May) frosts, and in different years I have known Oak, Ash, Bracken, Bramble cut off wholesale, just as the frost chances to find the sap in the plant.

We do not hesitate to call these native British trees and plants "hardy," but the fact is a fair illustration of my argument that the word hardy must be a *comparative* term.

Though the climate has much influence in success or non-success, soil also is probably a more important factor in the treatment of the Rhododendron, and though I have no evidence before me to show if the species from the great Himalayan range of mountains, or any of them, and if so, which, resent the limestone formation in the same way as hybrids of *ponticum* and *catawbiense* are well known to do, yet, so far as I have seen, all Rhododendrons appear to like the same treatment—cool, peaty, or loamy soil in which the plant can shade its own roots.

I have no peat, but loamy earth and leaf-mould will supply all my plants require.

The prolongation of the blooming season of our favourite plant is surely an object worth aiming at. We all do it, Rosarians, Chrysanthemists, Carnation growers, and all others.

Most of the Himalayan species bloom in March and April, and so, beginning with the hybrid classes of *Nobleanum* and *Jacksoni*, which commence blooming in November and December and continue till the spring, the first species to come out is *barbatum*, so called from the hairy petiole of the leaf.

Barbatum is apparently the only species which has the peculiarity of bristles on the petiole of the leaf. This character gives the species its name, and though they are occasionally absent, so also are they sometimes present not only on the leaf-stem but all over the young wood of the year. The blossoms develop in February and they are at their best throughout the month of March, the truss being rather closely packed with flowers and of a fine blood-red colour. It is followed in March by *Thomsoni*, a favourite species, and by a variety or hybrid called *Campbelli*, which has created some discussion, for the sort usually known in gardens as *Campbelli* appears to be not the variety of *arboreum* to which Sir Joseph Hooker gave that name, but a plant fairly intermediate between *arboreum album* and *campanulatum*, possibly a hybrid between these species, and which in the leaf seems to me to favour the probability of *campanulatum* being, if anything, the predominant partner.

Many species of *Rhododendron* from the Himalayas are worth cultivating for the foliage alone, the lower side of each leaf being covered with a rich red, brown, or white tomentum, the size and shape of each leaf varying with the particular species, and attaining in the case of *Falconeri* to a very large size, and as the plants attain size and height the effect of colour on the foliage under the winter sun is very beautiful and striking, even at that season of the year.

The species which habitually bloom well with me unprotected, and really seem to thrive, are *arboreum* (red, white or pink); *barbatum*; *Thomsoni*; *grande*; *Falconeri* and its var. *eximium*; *niveum*; *campanulatum*; *campylocarpum*; *Griffithianum* or *Aucklandii*; *ciliatum*; *Campbelli*; *glaucum*; *setosum*; *Anthopogon*; *cinnabarinum*; *triflorum*.

I have flowered under shelter, *Dalhousiæ*, *Edgeworthii*, *Maddeni*, *Nuttalli*, and *formosum*; and I have got but have not flowered *Hodgsoni* and *fulgens*, which I believe to be hardy.

The authorities by which I prefer to be guided in this paper are Sir William and Sir Joseph Hooker in their work on the Rhododendrons of the Sikkim Himalayas, 1849, beautifully but very inadequately illustrated, and Sir Joseph Hooker's excellent "Flora of British India," 1884; Messrs. Nicholson and Thomson's books; and last, not least, our excellent secretary Mr. Cook's "Trees and Shrubs for English Gardens."

In the third volume of Sir Joseph Hooker's "Flora of British India" will be found 94 species and synonyms of the genus *Rhododendron*; of these 43 are considered distinct species, and of these again 37 come from the Himalayan range of mountains, and Mr. Cook names 42 Rhododendrons, of which 13, I think, come from the Himalayas.

Colour is, of course, highly attractive in Rhododendrons.

In *arboreum* we have fine reds, pinks, and whites. In no species is there finer red than in *barbatum*, *fulgens*, and *Thomsoni*, purple in *niveum*, yellow in *campylocarpum*. Hooker's figure of the yellow *Wightii* is attractive, but I fear delusive, and I fear it may prove too much like *lanatum*, which I have only seen as a poor buff, and not fit to hold a candle to *campylocarpum*. *Boothii* I do not know.

For whites the influence of *Griffithianum* or *Aucklandii* is much sought in hybrids; from it we obtain size and firmness of texture with a fine open corolla, and in the *Edgeworthii* hybrids a sweet scent. *Maddeni* is very sweetly scented, but though I have bloomed it out of doors it is not to be reckoned as a hardy Rhododendron; it is a late-flowering Himalayan, and as a greenhouse species a very desirable one.

No Himalayan Rhododendron varies more than *arboreum*, and perhaps it is no wonder that it should be so, for the species and its varieties are found commonly throughout the hill countries of India—in Ceylon, the Nilgherries, Simla, and in the Himalayas; and as the elevation above the sea-level at which it is found is a very large factor in the hardiness of the plants imported, it follows that we should only trust out of doors those which come to us from the upper Himalayas.

The varieties are many, red, white, and pink, and some of these varieties are so much finer than others as almost to suggest a different type.

It is with diffidence I launch this paper before so large and critical an audience. The subject is one worth discussion, for the hybrid race we have hitherto raised seems to be capable of a wide further improvement in the prolongation of the flowering season, in the size and in the colouring of the bloom.

Hardy yellows are undoubtedly to be had from *campylocarpum*, and I cannot think the fine red forms of *arboreum* have yet been sufficiently used.

Griffithianum or *Aucklandii* is undoubtedly a useful parent, and we are destined in the near future to see a very noble family of children from so august a mother, and also in the *barbatum Thomsoni* cross I have a useful strain which seems to me to unite the good qualities of both parents in their grand colour and in their early bloom.

A large part of the hardy hybrids were raised more than fifty years ago, by crossing the species of Himalayan *arboreum*, Asiatic *ponticum*, American *catawbiense*, and Caucasian *caucasicum*.

The season begins with the classes called *Nobleanum* and *Jacksoni*, which open their trusses in the late autumn, and continue for some months till cut away by severe frost.

Altaclerense, raised at Highclere and figured in 1835, is one of the early and hardy kinds. It is said to be derived from the seed of *catawbiense* fertilised by the pollen of crimson *arboreum* (Burbidge, p. 121), or according to Mr. Cook it is the result of *catawbiense* and *ponticum* (Cook, p. 425). Then we have Van Houtte's 'Prince Camille de Rohan,' 'Auguste Van Gheert' and *campanulatum* 'Fleur de Roi,' 'Standish's Ascot Brilliant,' which are cut in April and precede the May army of delightful and well-known varieties. In this class, were I to give preference to one, I should select *Broughtoni* for size of truss, flower and leaf, and free habit.

We are indeed much indebted to such men as Mr. Anthony Waterer of Knaphill, Mr. John Waterer of Bagshot, Mr. William Paul of Waltham Cross, Mr. George Paul of Cheshunt, Mr. Veitch of Chelsea, Mr. Russell, Mr. Broughton, Mr. Standish, Mr. Luscombe, Mr. Moore, Mr. Ingram, Mr. Paxton, Mr. Mangles, Messrs Fisher, Son, and Sibray; and in recent years Mr. Gill, gardener to Mr. Shilson of Tremough, has given us some notable hybrids in *Shilsoni* (*barbatum* and *Thomsoni*), 'Beauty of Tremough,' 'Glory of Penjerrick,' hybrids of *Griffithianum*, and 'Duke of Cornwall,' new this year.

Mr. Harris, of Singleton, Swansea, has raised a very fine dark red *arboreum* called *Harrisi*. Everyone must have admired the large white form of *Manglesi*, exhibited at the Drill Hall by Mr. Mangles on May 17 last: a white delicately spotted *Griffithianum* hybrid of the ordinary *Manglesi* type, but firm and large, and well grown above its fellows.

Mr. John Waterer's 'Pink Pearl' varies very much according as it is grown, and at its best deserves the verdict the public has undoubtedly passed on it as A 1.

Mr. Mangles's white hybrid *Griffithianum* was very similar to varieties called *Standishi*, *Gauntletti*, and *Manglesi*, and a number of unnamed seedlings of the same type which were in bloom at the same time both in the temperate house at Kew and out of doors in the Rhododendron Dell there, and also in my own woods at Penllergaer. My plants, having been raised from probably the same seed as they, were given me by the late Mr. J. H. Mangles.

The hybrid Rhododendron has now become a florist's flower, and as such wants a definition as to what constitutes a good one. (1) Each corolla, pip, or flower in the truss should be large and of good thickness or substance, so as to endure the longer; it should open out flat and should have either (*a*) an effective bright colour or (*b*) a clear distinct spotting. (2) The truss should be of a good conical shape, with fifteen to twenty flowers, which should hold themselves well, not too crowded or too loose.

No appreciation of mine of the Himalayan species of *Rhododendron* and their new hybrids should be understood as detracting one iota from my admiration for that beautiful class usually known as the hardy hybrid; these belong to the months of May and June almost exclusively. What I require is an extension of my blooming period into March and April, and I find my opportunity in the Himalayas.

The growing popularity of the hardy hybrids is partly due to the effective way in which they are prominently presented to the notice of the many in our public gardens, notably in Hyde Park towards Rotten Row and Hyde Park Corner, and also in the Rhododendron Dell at Kew.

Kew is a place that, whenever I go there, I feel thoroughly proud of. I meet all sorts and conditions of men there, bent some on pleasure and some on study, but all feel that it is a national property and one to be proud of, for there is nothing to touch it on the continent of Europe.

Mr. Waterer's exhibition of Hardy Hybrid Rhododendrons at the Botanic Society's garden in Regent's Park is always worth seeing. The plants are set up with great taste and judgment, and are admirably calculated to excite public admiration by the artistic combination of arranged colours, while the flowers themselves maintain the high standard associated with Mr. John Waterer's name.

You will probably expect me to say something about the propagation of the plants. This is done in three ways. Probably the commonest way in the trade is grafting; but multiplication by seed or by layering is more satisfactory.

The seedling plants of most species take a long time, perhaps twelve to fifteen years, before they attain blooming size, but *ciliatum* is a notable exception, and will give bloom in three years.

By layering you get the true plant on its own roots, and it is a good and natural mode of increase.

Some propagators train a graft on to one stem with an umbrella-like crown, and these are admired by some people, though they can scarcely be called natural, and the story is told of an indignant botanist who stated the plant looked like a "mop on fire."

I had such a plant from Mr. Van Houtte many years ago, and finding the flower was a fine *campanulatum* hybrid, distinct from but after the way of his 'Fleur de Roi,' I replanted it on its side, layered the branches, and now have a strong plant with what were grafts now growing on their own roots.

Whenever a plant can be induced to layer down its lower boughs so that they may form rootlets, a double advantage is obtained, as, in addition to the opportunity for removing rooted pieces, a better shade is afforded to keep the soil cool round the stem of the parent.

The cloudy character of the West of England gives us a cooler climate, and probably affords us better facilities, than others have where the sun is powerful. Let me conclude by hoping that as years roll on we may see fresh crosses and fresh breaks brought to our notice by the fostering care of fresh generations of hybridists, who will, I think, be wise if they employ the agency not only of Himalayan species, but of hybrids from these, and especially of the finer forms of the red *arboreum*.

NOTES ON PRIMULA DEORUM, SHORTIA UNIFLORA, AND RHODOTHAMNUS CHAMÆCISTUS.

By W. T. Hindmarsh, F.L.S., Alnbank, Alnwick.

Primula deorum (Vel.).

This fine and distinct *Primula* is undoubtedly a rare plant, and probably has not been flowered in this country before the present spring (1904). The plate, fig. 1, which is about two-thirds of the natural size, clearly shows the form and habit of the plant as it bloomed in my rock garden in May last, and which I had procured from Herr F. Sundermann in 1902, but it is a matter of regret that the colour is absent, as it is a striking feature, the blooms being rich purple-violet, and the leaves deep bluish-green. I may add that there were twenty flowers (though Velenovsky's description in "Flora Bulgarica," 1891, p. 479, gives the usual number as only from five to ten), and that the dark colour of the flower-stem and the viscid gum upon it and the bracts and calyx are very distinctive characteristics.

P. deorum is growing with me on a north exposure at the foot of a broad stone, in sandy loam, and the only protection it has had is a pane of glass tilted over it (open of course at the ends) during some very heavy winter rains, and even this was probably unnecessary, as the plant appears to be perfectly hardy, and so the eminent authority Herr Max Leichtlin, of Baden-Baden, found it, but he told me it was very difficult to keep in good health.

This *Primula*, discovered by Velenovsky in 1889, is a native of Mount Rilo in Bulgaria, where it grows at an elevation of 8,000 feet in moist grassy pastures near the sources of brooks beneath the snowfields. My friend the Rev. David Paul, LL.D., of Edinburgh, in his able address to the Botanical Society of Edinburgh in 1901 on the European *Primulæ*, furnishes some interesting notes (to which I am much indebted) on *P. deorum*, and quotes Widmer's criticism of the want of qualification of the plant for its most distinguished name, but adds that the critic had not seen the living plant. From the very handsome appearance of my specimen this year and its robust growth—it now has two strong crowns—I am disposed to think that with a little time it will justify its title of "The *Primula* of the Gods."

Shortia uniflora (Maxim.).

The accompanying plate (fig. 2) is from a photograph taken by Mr. J. C. Ruddock of Alnwick in my rock garden of *Shortia uniflora*, the Japanese form of *Shortia*, on April 2, 1902, and is about one third of the natural size. The plant had then 24 blush-coloured blooms of a wax-like appearance, and foliage of somewhat leathery texture, dull green, with very prominent lighter-coloured veins.

It may be interesting to give a translation of remarks made by Maximowicz in 1868 and 1871, especially having in view the apparent confusion that has existed as regards S. *uniflora* in its relation to the North Carolina form S. *galacifolia* and other members of the *Diapensiaceæ*,

FIG. 1.—PRIMULA DEORUM. (Photographed by J. C. RUDDOCK.)

for which, and other extracts, I am indebted to Mr. B. Daydon Jackson, Secretary to the Linnean Society.

Maximowicz writes as follows :

Schizocodon uniflorus.—Leaves transversely heart-shaped, orbicular, sinuate-retuse at the apex, with an apiculus, apiculate-serrate, somewhat shining, with nerves and veins prominent above the surface. Scapes one-flowered, equalling the leaves in length, bracts ovate, acuminate, corolla (unknown), style slender, falling off in fruit.—*Bull. Acad. St. Petersb.* xii. (1868) col. 71.

SHORTIA (Torr. & Gray).

S. galacifolia Torr. & Gray, at the place cited. Leaves rounded, somewhat heart-shaped, retuse, crenate-serrate, the crenatures mucronate. In the mountains of Carolina (Michaux), according to Torrey and Gray. Only one specimen known.

S. uniflora, my species, in the place cited under *Schizocodon*. Leaves heart-shaped, broader than long, sinuate-dentate, the teeth apiculate, very strongly retuse at the apex.

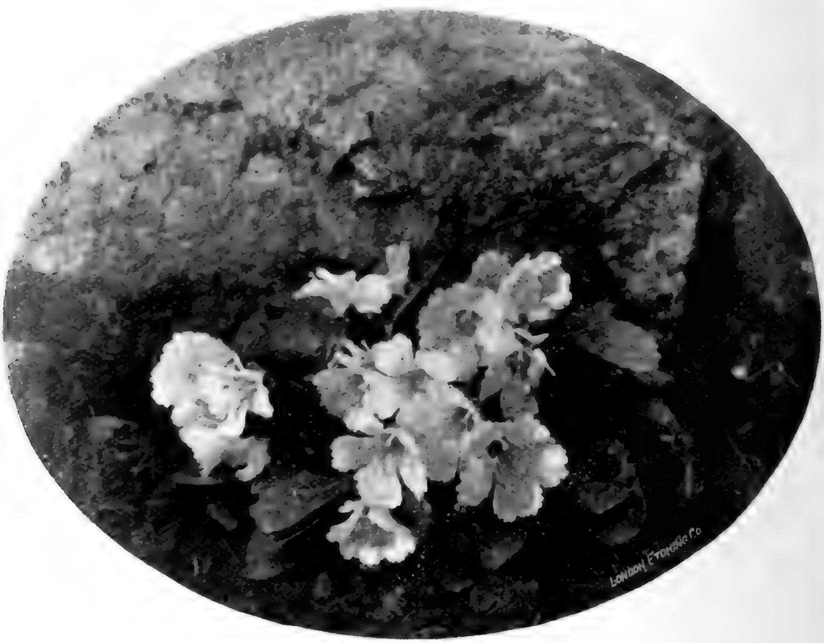


FIG. 2.—SHORTIA UNIFLORA.

In the alpine woods in Northern Nippon, and among rocks in the highest alps of Central Nippon (Tschonoski).

More than thirty specimens collected.'

The Japanese figure quoted shows rounded leaves, sometimes attenuated into a wedge-shaped petiole, sometimes, more rarely, slightly subcordate, mucronate-serrate, seldom or never retuse; it therefore agrees better with the former, though it still seems to differ from the latter. Corolla nearly an inch long, pale rose colour with white veins. Stamens white. (Maximowicz in *Bull. Acad. St. Petersb.* xvi. (1871) 225.)

Six years ago I purchased from the Guildford Hardy Plant Company two plants, much alike in size, that depicted being planted in a pocket on the south side of my rock garden in peat, and the other on the north side, partly open to the west, in a mixture of peat and loam, but I have recently transplanted the latter on the east side in peat alone. The last-named plant has not bloomed very satisfactorily, having only six blooms this year, but the colour is a fine bright rose, and it is showing signs of improvement under the new conditions.

I have not protected the Shortias, and a rainy and damp winter evidently suits them, the subject of the illustration (now about one foot across) being this spring much finer than previously, with some 27 blooms of $1\frac{3}{4}$ inch diameter.

The beauty and interest of *S. uniflora* by no means terminate with the flowering season. Up to 1902 I observed that the autumn and winter foliage tints were not so pronounced as I had seen in *S. galacifolia*, but for the last two years—coinciding with the greatly increased vigour of the plant—the position has been reversed, and from August to the new growth in spring the leaves are of a brilliant red, most beautifully veined and shaded. Indeed, altogether the plant is one of the most charming objects on the rockery it has ever been my good fortune to grow.

The illustration speaks for itself, and, I think, very clearly demonstrates that *S. uniflora* is quite distinct from *S. galacifolia* and other members of the *Diapensiaceæ*. The more striking differences between it and the North Carolina form are (1) the larger and more expanded blooms; (2) the broader leaves, which seem somewhat more prostrate; (3) the more prominent veins in the leaves; (4) and the shorter flower-stalk of *S. uniflora*.

I have not, as yet, succeeded in raising seedlings, and the appearance of the seeds I have gathered, prior to this year, did not make me very hopeful of any result.

Inquiries made in 1902 led me to believe that the true *S. uniflora* was then extremely rare, and I fear that the interim has not materially increased the number of plants in cultivation, as, though there have been importations, they seem to have succumbed very rapidly. I had a few sent me by the Yokohama Nursery Company by parcel post *viâ* Canada (which I have no reason to think were other than the true plant though they have not bloomed), and they reached me at the end of February last, admirably packed and looking very fresh, with long non-fibrous roots, which I should surmise from their appearance had been growing in a damp, deep, perhaps mossy situation. The latent vitality and reserve material in these plants must have been very considerable, for the great majority, until the end of May, looked as if they would grow. Since then, however, they have with one exception gradually collapsed; but I see no reason why plants could not be established in pots at home by our good friends the Japanese—amongst the most skilled gardeners in the world—and sent hither by sea.

As I have not had opportunities of comparing notes with growers of this *Shortia*, I am at a loss to suggest why my plant has succeeded so well where the great majority have failed, also bearing in mind that the correct treatment for Northumberland will probably be incorrect treatment for Kent; but I have indicated how mine are grown, and I do not think they would long exist if baked in the sun without very adequate moisture.

RHODOTHAMNUS CHAMÆCISTUS (Reichb.).

I have been in possession of the plant of *Rhodothamnus* (otherwise called *Rhododendron*) *Chamæcistus* shown in the accompanying plate

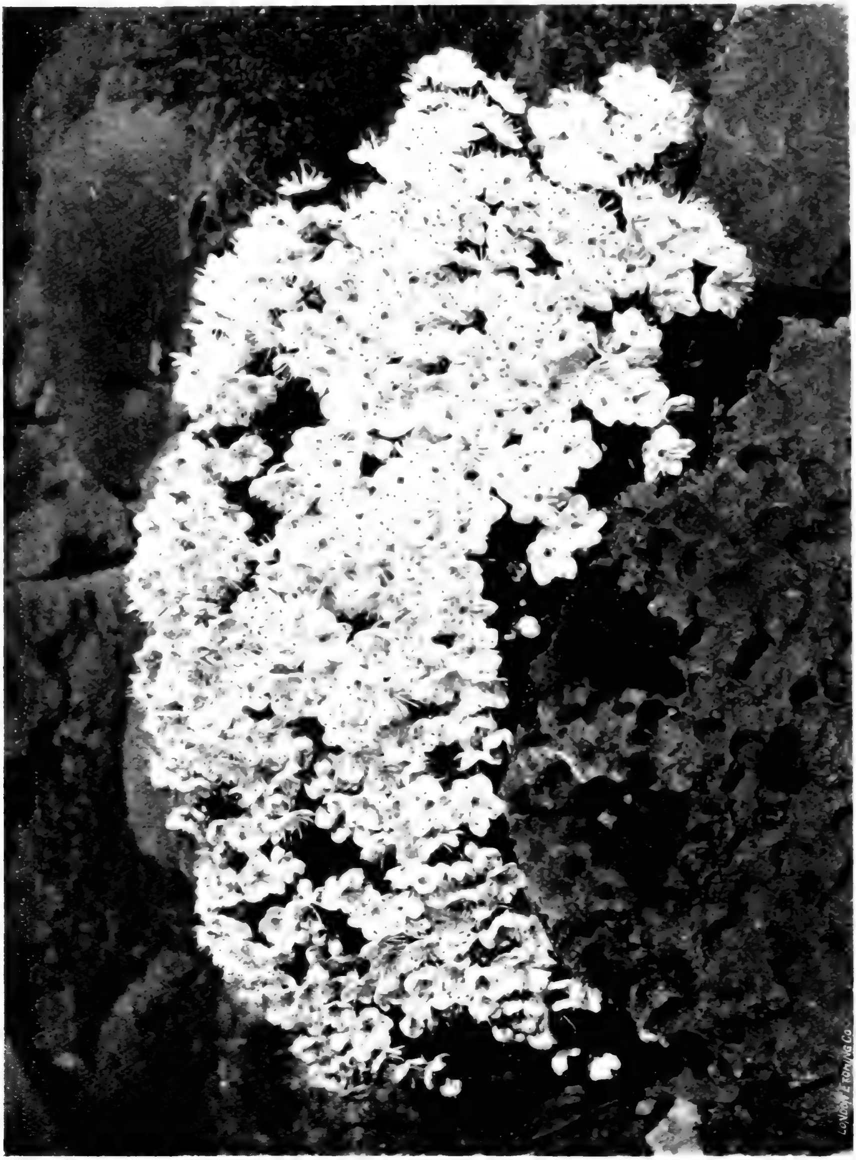


FIG. 3.—RHODOTHAMNUS CHAMÆCISTUS.

(fig. 3) for twelve years at least, but it has only recently developed into so fine a specimen.

The photograph was taken by Mr. Ruddock of Alnwick on April 7, 1903, and there were then over 1,000 expanded blooms of a rosy-pink colour crowded into a space of some 22 inches by 12, very different from the usual condition of the plant, as it is most frequently a loose-growing object with a very small number of flowers.

R. Chamæcistus is not rare and is perfectly hardy, and I am unable to say why it generally thrives so badly. Mine has grown on the south side of the rockery from the first, in peat, which I have taken care to renew and to add to when I thought requisite. Mr. A. W. Bennett, in his "Alpine Plants," says that to grow it successfully small pieces of lime or mortar must be scattered among the stems, but this I have not done.

I may say that the supreme effort last year seems to have been too severe a strain, as there were no blooms this spring, though abundant growth is being made.

Rhodothamnus Chamæcistus is a native of the Tyrol and the mountains of Carniola in Austria.

ON THE HYBRIDISATION OF THE GENUS *ROSA*.

By Monsieur Viviand-Morel.

Roses have been cultivated in Europe and Asia from the remotest ages. Poets and historians have handed down to us written testimony which leaves no doubt on the subject. We have not, it is true, any precise data as to the varieties cultivated by the ancients, but it is not too much to suppose that they were not very numerous. In the sixteenth century botanists only described a small number of different ones, and at least one half of these were single.

Two hundred years later the number had but little increased, and if we consult Philip Miller, one of the best English gardeners who wrote on horticulture, we learn that in his time, in England, there were only twenty-one species in cultivation, of which several were ordinary Briers. As to double Roses, he enumerates about thirty varieties.

We have enormously advanced upon those days, as is proved by the 2,562 species or varieties cultivated in France, and enumerated and briefly described by Monsieur R. Desportes in 1829.

It would have been difficult to understand why the Rose, cultivated as it had been for centuries, produced so few varieties with double flowers, while in comparatively a few years recently there should all at once have sprung up thousands, if it were not that a new factor, or rather a new influence, has arrived upon the scene, to throw new life into the genus *Rosa*, until then so chary of producing new varieties. This new factor is the hybridising and crossing of European with Asiatic species.

The Roses actually in cultivation in amateurs' gardens may, as regards their origin, be classed in several categories, viz.:

(1) Varieties or variations found in a wild state and transplanted into gardens.

(2) Varieties or variations produced by existing ones and raised from seed without having been artificially fertilised.

(3) Varieties of hybrid origin.

(4) Varieties arising from partial reversion and obtained from seed saved from hybrid subjects.

(5) Crosses obtained by crossing hybrids which, though sterile with their own pollen, have proved fertile with pollen from another plant.

(6) Second crosses springing from the preceding or their offspring.

(7) Teratological varieties.

You may perhaps think that, arranged in this way, the origin of Roses is very complicated, and no doubt it is so, but no other arrangement based on origin is possible. I have indeed somewhat simplified the classification and diminished the number of categories. My object in drawing up this paper on the hybridising of Roses is to show nurserymen and amateur growers that it is still possible to obtain fine new varieties, and also to create new sections, but, on one condition ; and that is, no longer to trust to chance as a guide in seed-saving, as the laws of atavism are now well known, and we know fairly well what will be the result from seed obtained from the derivative crosses, now so numerous in our collections.

It is from working without discernment that many raisers of seedlings have so often obtained the same varieties, hardly to be distinguished from one another. When a series is exhausted it is useless to endeavour to obtain endless new varieties from it.

The changes that upset the genus *Rosa* were contemporary, or nearly so, with the French Revolution. It was about this time, in fact, that there was introduced into cultivation the Rose called 'the Bengal,' which transformed the genus and altered it from top to bottom. Before the introduction of 'the Bengal' the varieties were relatively few. It is only necessary to consult the horticultural catalogues before the time of its introduction to establish this point. The Bengal, and certain other species introduced a little later, appear to have evidently introduced a germ of variation, unknown in the genus *Rosa* before they were cultivated in Europe.

Varieties or Variations found in a Wild State and transplanted into Gardens.

The first Roses cultivated were evidently of this origin. Before Roses were grown from seed, man began to transplant into his garden any remarkable varieties that he came across in the hedges and woods. It so happens that I myself found 'Alexis Jordan' and introduced it into garden cultivation, and it is a Rose which would assuredly have delighted amateurs less than a century ago. Roses of bright colouring, with large and semi-double flowers, in our country belong principally to the section of the Gallicas or Provins Roses. The hedges and copses of Tassin, Francheville, Charbonniers, and Limonest, villages in the department of the Rhône, were formerly particularly rich in them, and one still comes across very fine specimens of them at the present time. Very enthusiastic rosarians have not hesitated in recognising as distinct species some of the most brilliant forms which they have met with.

Among the curious varieties noticed in a wild state there seems to be no doubt that some of them were of hybrid origin. Schleicher appears to have been of this opinion when he gave the name of *Rosa hybrida* to a Gallica Rose whose styles were united into a column. Two years ago the Abbé Boullu presented to the Botanical Society of Lyons quite a number of Roses, collected by himself round about Lyons, to which he attributed a hybrid origin, basing his opinion on certain characteristics peculiar to their two supposed parents. One of our most accomplished writers on Roses, Monsieur François Crépin, director of the Botanical Gardens at Brussels, who studies the Roses from all quarters of the world, does not hesitate in recognising, among a crowd of wild Roses, some natural hybrids. In his magnificent book entitled "Rosæ Hybridæ" (Studies of Hybrid Roses), published at Ghent in 1894, he draws attention to a large number of them. Let me quote some examples.

M. Crépin shows the Provins Rose, the Gallica, as producing hybrids with the following species:

Rosa gallica × *arvensis*
" × *canina*
" × *glauca*
" × *rubiginosa*
" × *sepium*
" × *tomentosa*
" × *omissa*
" × *multiflora*

According to this author, the Pimpernel-leafed Rose can equally show numerous natural hybrids, of which he mentions the following:

Rosa pimpinellifolia × *alpina*
" × *tomentosa*
" × *omissa*
" × *mollis*
" × *pomifera*
" × *? glauca*
" × *canina*
" × *rubiginosa*
" × *sepium*
" × *graveolens*
" × *humilis*
" × *rubrifolia*

From this list one sees that our Pimpernel Rose can be fertilised by Roses of the most diverse descriptions.

Our Alpine Rose, of such brilliant colouring on the mountains, and so early in the plains, is not less easy of crossing with nearly allied species. Crépin attributes to it the following crosses:

Rosa alpina × *tomentosa*
" × *omissa*
" × *pomifera*
" × *glauca*
" × *coriifolia*
" × *indica*

From the same author one could also give a certain number of wild species which have produced crosses with other species in their vicinity, but it would only be wearisome to continue this enumeration.

If I were asked on what grounds writers on Roses base their assertions as to the existence of wild hybrids, while other writers consider them to be different species or merely varieties, I should answer as follows:

"They may be mistaken sometimes, but not very often. To begin with, they have acquaintance with the characteristics observed in hybrids of known origin: then by analogy they can draw conclusions, which require confirmation it is true, but which appear to be very probable, especially as they are borne out by a series of other proofs, such as the relative sterility of the hybrids, &c."

Varieties or Variations produced from the Seeds of the Former Subjects without their having been artificially fertilised.

After the most remarkable varieties of wild Roses had been introduced into gardens, the idea at once arose of sowing their seed without any further treatment. Everybody knows that knowledge of the laws relating to artificial fertilisation is not very old.* The offspring from these seeds produced many varieties, but all very much alike, because these varieties were only the results of simple accidental changes, there not having arisen any new element to upset the laws of natural reproduction; they simply reproduced themselves with slight variations in colour or doubleness; the variations being caused by the influence exercised by cultivation, assisted by manure, which forced them into hypertrophy or the multiplication of petals. When they were placed near to each other, certain forms of the same species crossed between themselves and gave slightly more marked varieties.

The hybrid combinations of *Rosa gallica* which we have enumerated above, after M. Crépin, are not the only ones about which certain authors have suggested the idea that they were of hybrid origin. Dr. Christ adds the following: *Rosa gallica* × *gallica* var. *provincialis*? (this should be the Hundred-leaved Rose, *Rosa centifolia* L.)

Rosa gallica × *cinnamomea*
,, × *trachyphylla*
,, × *tomentella*
,, × *moschata* (*R. damascena* Mill.)

Some of the above-quoted hybrids should certainly be regarded with some reservations, and only accepted out of grace to the list, until the truth of the assertion has been proved by artificial hybridising.

Varieties of Hybrid Origin.

The varieties of hybrid origin deserve special study. This must be long and difficult, as, after making research, assertion should be checked by actual experiment, as such statements, often contradictory, are simply based on suppositions, and even sometimes are only the result of theories founded on outward appearance.

The following Roses are considered to be hybrids. Some of them are of obscure origin, doubtful descent, often uncertain, or again of which the forerunners are not well known or only guessed at.

We borrow in part the list of M. François Crépin (*loc. cit.*):

Rose 'Maria Leonida.' Probably a hybrid between the Bracted Rose, *Rosa bracteata* Wendl., and one of the varieties of the Indian section (Teas, Bengals, &c.).

* Bradley first mentioned it in 1739. He reported that the florist Fairchild, of Hoxton, fertilised a plant of *Dianthus Caryophyllus* (Clove Pink) with the pollen of *Dianthus barbatus*, and thus was the first to obtain a hybrid Pink, which was artificially reproduced a long time afterwards. In 1761 appeared the work of Kölreuter, which was the real and original forerunner of the other publications which at once appeared on the same subject.

Hardy's Rose, a hybrid between the Berberry-leafed Rose (*R. berberifolia* Pall.) and *R. involucrata* of Roxb., better known under the name of *R. clinophylla* Thory.

Rosa Lyellii Lindl. Hybrid between the Rose with drooping leaves (*R. clinophylla* Thory) and the Musk Rose (*Rosa moschata*).

The Banksian Rose of Fortune (*Rosa Fortuneana*), suggested as a hybrid between *Rosa lævigata* Michx. and the Banksian.

Rosa polyantha Hort. A hybrid between *Rosa multiflora* and different varieties of perpetuals.

Yellow-flowered Pimpernel Rose. M. Crépin believes this to be a hybrid between *Rosa lutea* and *pimpinellifolia.*

Rosa lutea × *rubiginosa,* obtained by Lord Penzance, about which there was a discussion in the *Gardeners' Chronicle* in 1871.

Rose 'Madame Georges Bruant,' hybrid between *Rosa rugosa* Thunb. and the Tea Rose 'Sombreuil.'

The Noisette Rose. Presumed to be a hybrid between the Musk and Indian Rose.

Rosa Iwara passes as a hybrid between *Rosa rugosa* and *R. multiflora.*

The Damask Rose is described as a hybrid between the Provins Rose and one of the Dog-Roses (*R. canina*).

The Boursault Rose. This is supposed to be a hybrid between the Alpine Rose (*R. alpina*) and an Indian Rose (*R. indica*).

The Bourbon is described as a hybrid between the Bengal and *Rosa bifera.*

Rosa indica major appears to be a hybrid between the Bengal and the Provins Rose.

I do not wish to insist any more upon this subject, which, to be treated scientifically, would demand certain experiments for the purpose of verifying the worth of some assertions which are generally somewhat suspected before they could be accepted as being correct.

Atavic Varieties.

Atavism is, as everybody knows, a word which serves to point out the likeness of an animal or a plant to its ancestors. It comes from the Latin *atavus,* a grandfather or ancestor. Now when plants, and especially Roses, are the result of a cross between two very different varieties, belonging to what is called the same species, it follows that they produce fertile seed, and that this seed when sown gives very many varieties presenting some of the characteristics of their ancestors.

Varieties of the second and even of the third generation often have the same tendency.

Atavism has played, and still plays, a very large part in the production of varieties in Roses. In fact, although a certain number of Roses of hybrid origin are absolutely sterile, some never producing seed fertilised by their own stamens, there are others which allow themselves to be fertilised either by a different species, or by their parents, or by a cross derived from a hybrid, in such a manner that it may happen that a Rose-seed may hold in its germ the elements of several different species. When we sow Rose-seed thus derived, we obtain plants which have peculiarities common to their ancestors and which produce very interesting and extremely remarkable combinations. This view has nevertheless been opposed, on theory only be it well understood, by Boitard,* who held that, as a hybrid could only be the issue of one father and one mother, it could only have a likeness to two individuals. I reproduce here the passage from his book, where this question is fully treated of : †

> "A child can no more have two fathers than two mothers, since it can only be the result of one single fertilisation; so that, as a hybrid is the issue of only one father and one mother plant, it can only have a family likeness to two individuals. When, therefore, M. Poiteau allows to pass in the 'Revue Horticole' an announcement of M. Foulard thus worded: '*Rosa perpetuosissima*, hybrid between Damask, Bourbon, Noisette, majalis, Bengal, Tea, and Centifolia Roses,' M. Poiteau is answerable for a gross error, because a Rose cannot be a hybrid from more than two of these varieties.
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> "As regards the single Rose 'Noisette blanche,' in the catalogue of M. Vibert, if the season of its flowering and the meeting of its styles are not taken into consideration, this plant must be classed among the Noisettes; if no regard is given to the time of blossoming and to the fact that its branches are not trailing, then it is a *sempervirens*; and finally, if you take into consideration the season of its flowering and certain of its other characteristics, then it is a *moschata*. People who explain the production of new species by hybridisation will find themselves as much embarrassed in this case as in that of M. Foulard's Rose, because here we have a plant that does not confine itself to two, but to three well-marked species. It is necessary then to suppose that two pollen-bearing parents equally contributed to its production, which is an absurdity, or to renounce for it the system of hybridisation. Some physiologists have, in fact, denied the theory of hybridisation altogether. We are not of this opinion; but we think that, without saying a word against M. Foulard, amateurs and Rose-growers have very much misused this word. They sow the seed of *centifolia*, they obtain Roses with a resemblance to the Damasks, Albas, &c., and at once decide that these Roses are hybrids between *centifolia* and Damask, *alba*, &c. This is very much stretching the point. Others, however, are still more unreasonable; they sow seed gathered by chance, then, when the individuals thus produced are in flower, they study them and class them in an arbitrary manner as hybrids between such and such species, because they think they recognise in them the specific characteristics of the two; but it often happens that these supposed hybrids were not derived from seed that belonged to either of the species the characteristics of which they appear to exhibit.
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> "All cultivators who have sown Roses for experiment know this quite well; it rests with me to point it out to those who only follow in all things a blind routine.
>
> "One day, when walking in the establishment of M. Noisette, I noticed some plants of the Pimpernel Rose across a seed-bed of Bengals, and pointed them out to him. He told me that he had only sown Bengals, but that, in spite of the precaution that he took in choosing his seed with every care and attention, it constantly happened that he found Pimpernel Roses among his seedlings.

* *Manuel Complet de l'Amateur de Roses*, Roret, Paris, 1836.

† *Lyon Horticole*, 1899, p. 15.

M. Laffay, of Auteuil, and other growers, have told me the same; and I have myself had the same experience at Wissous.

"In such a case this is what happens: The seedling Pimpernel is examined and found to have no resemblance to its seed-parent, Bengal, but certain characteristics are recognised in it belonging to Provins or *alba*; it is at once wrongly classed as a hybrid between Pimpernel and Provins or *alba*. The Rose is simply an individual that has suddenly reverted to one of its original types, without any hybridisation whatever.

"It also sometimes happens that one obtains specimens in which the usual characteristics of different species are so confused that it is not possible to determine them at all. Such, for example, are the Roses named 'Dona Sol,' 'Amélie Guérin,' 'Triomphe de Laffay,' 'Davoust,' 'Cornélie,' 'Egine,' &c. One cannot reasonably call them hybrids, but nevertheless that is what is done by our growers, who class them as hybrids of unknown origin. People who see signs of hybridisation everywhere are led into error by the importance they attach to the specific characteristics attributed to Roses by authors, and these people think that they must regard every individual that resembles any particular species as being derived from it.

"This manner of reasoning, although false, has nevertheless a logical appearance of truth, for to be consistent it is necessary to choose one of two things: either to acknowledge hybridisation wherever the specific characters of two Roses of different species are found on the same plant, or only to recognise the small number of well-known species whose characters are invariable; and this number may be reduced to three, namely: *Rosa simplicifolia*, *R. lutea*, and *R. centifolia*, and this is just what one must do.

"I cultivate an immense number of Tulips, Carnations, Ranunculuses, Auriculas, Dahlias, Camellias, &c., all differing among themselves as much and more than the varieties of Roses. Nobody has been tempted to look for signs of hybridisation in the new seedling varieties which are daily obtained, and nevertheless they give an infinite variety of combinations of shape and colour. Why cannot they allow in the case of Roses the same powers of nature, the inexhaustible richness which it displays in the flowers we have mentioned? Can it not just as well unite in one individual the shape of the *centifolia*, the leaves of the Pimpernel, the scent of the Provins Rose, just as it can produce in one Tulip the brightness, the form and grace of three other varieties, without the necessity of mixed fertilisation? Is it more difficult to explain physiologically how a wild Rose may become, by cultivation, a scented centifolia Rose, than how a wild Pear tree, with long *thorns*, may develop into a Doyenné du Comice or a Duchesse d'Angoulême?

"Besides, if hybridisation were as common a thing as they made out, why does it only take place with some species and not others? Can any gardener show me any *centifolia*, *alba*, Provins Roses, &c. which are hybrids of *Rosa simplicifolia*, *R. Eglanteria*, *R. lutea*, or *R. punicea*? No! because these Roses have invariable characteristics, which stamp them as species, and one can only obtain varieties of them by submitting them to the most careful cultivation, and by sowing their seeds, which only can produce that jonquil-yellow colour which makes them contrast so strongly with all other Roses. The same causes which produce varieties in other organic beings, also produce the variations in Roses, and these causes are numerous, although little known, without including hybridisation.

"In conclusion, I think that this phenomenon is far from being

> proved in the varieties of Roses, and that one can even reject it altogether, since there is only one fact which establishes it, the origin of the Noisette Rose, and since this fact came about in America, and has been reported in several contradictory ways, it can at least be called doubtful." *

The famous *Rosa perpetuosissima,* which made Boitard say that Poiteau had allowed a gross error to appear in print, in saying that it was a hybrid between the Damask, Bourbon, Bengal, Tea and other Roses, is perhaps analogous to some of the varieties grown now. Boitard had not a keen perception, for he did not reflect that many Roses descended from hybrids are derived from many species. In the Gladioli of Lemoine one can easily point out the influence of four quite distinct species. Since a hybrid, which is generally sterile with its own pollen, can be fertilised by the pollen of another species, also by that of another derived hybrid belonging to the same genus, one may easily find a plant which is composed of four species, from its more or less numerous characteristics.

Some few Rose-growers sometimes pretend to suspect atavism, for the purpose of misleading amateurs. It being understood that dogs do not produce cats, they make known their successes by giving them the names of their parents, which they take care are very good ones. This procedure would evidently be very interesting as regards the history of the varieties if the parentage assigned to them were correct. Unfortunately, however, these records are sometimes "made to measure," but it must be acknowledged that reliable Rose-growers, who themselves go in for hybridisation, do not act in this way.

Hybrids obtained by crossing Hybrids, which are sterile with their own Pollen but fertile with that of another Plant.

In the majority of cases real hybrids between Roses are sterile, but it is not unusual to see this sterility disappear if the pollen of one of their ancestors be made use of to fertilise them. This fact does not appear to be questioned. We have personally made experiments which leave no doubt in this respect. Our hybrid between *Rosa pomifera* and the Bengal Rose is absolutely sterile with its own pollen, but can be fertilised by the Bengal or Tea Roses. It is probably in this way that growers of Roses from seed ought to work, because it has not been shown that the very remarkable hybrids which are called Hardy's Rose, Fortune's Banksia, and Maria Leonida could not be fertilised with other species, or whether, if they were proof against being fertilised altogether, they might not still try to reproduce some analogous hybrid by simply changing one of their ancestors. Monsieur Pernet-Ducher has already shown us how we ought

* Monsieur Philippe Noisette, of America, wrote to his brother Louis Noisette, sending him the Rose bearing his name, which he had obtained by the artificial fertilisation of *Rosa indica* with *Rosa moschata.* But is it certain that Monsieur Philippe Noisette was not mistaken, and that his operation was successful, and that he had not obtained this result with a seed of *Rosa indica* which had not been so fertilised?

Our growers are continually obtaining new varieties of Noisettes, from seeds from the Bengal Rose which they have not artificially fertilised.

to proceed if we do not wish to reproduce the 'Jacqueminots' and 'Victor Verdiers' to infinity and keep on going round in the same well-known defective routine for ever.

The fine yellow Roses which had up to the present time refused to be fertilised by different species have been conquered. Taken as seed-bearing plants they refused to be crossed; but used as pollen-bearing parents they have already produced offspring which promise well for the future.

Quadroons.

We make use of the word "quadroon" to some extent to attract attention, because this substantive is not used either in horticulture or in botany. It is employed in natural history to point out the degree of relation in the crosses between the white race and the black.

White and black give mulatto.
White and mulatto give morisque.
White and morisque give quadroon.
White and quadroon give mameluke.
White and mameluke give saccatra.
White and saccatra give mixed breed.

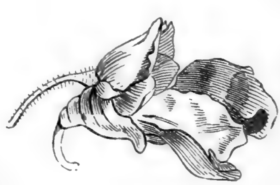
Now, with Roses, it is very seldom that one obtains a remarkable variety at the first attempt; indeed it is generally not until the third or even fourth or fifth fertilisation that one has the good luck to produce striking and distinct subjects.

I have tried for a long time to obtain what are now called Hybrid Perpetuals, a perfect chaos into which the French Society of Rose-growers might well impart a little order. I began with small perpetuals, which were hardly perpetual at all, to arrive at real perpetuals, some of which also were very little so.

Rose-growers who would like to get on faster, and obtain more rapidly Roses arising from "known patterns" and having new colours, ought to know that they should not set to work on two single-flowered types, but choose a new type and a quarter-bred cross, that is to say a Hybrid Perpetual, or a Tea, or Bengal Rose, &c.; that is, a perpetual Rose that is quite double.

Certain experiments which I have made in crossing two types with single flowers, or not perpetual, induce me to warn professionals, who as a rule have no time to spare.

This question of hybridisation in the genus *Rosa* requires to be more closely examined; but, not wishing to prolong these remarks indefinitely, I hope later on to take up the question in detail.



VARIATION IN *INDIGOFERA SUMATRANA*, GAERTN., AS INDUCED BY CLIMATIC CONDITIONS.

By H. M. Leake, M.A., F.L.S.

The plant which is cultivated throughout Northern India on account of the indigo-yielding property which it possesses is *Indigofera sumatrana*, Gaertn.* It may be found under cultivation throughout a large portion of the Indo-Gangetic plain. Met with as far west as Dera Gazi Khan and Sukkur in Scind, on the west bank of the Indus, it occurs throughout the

Fig. 4.—Cawnpur Plant.

Punjaub and North-West Provinces into Behar in Bengal. It is, however, in these latter districts that the headquarters of the industry are situated. Here the cultivation is in the hands of a European planting community, to help whom against the competition of the German synthetic product, scientific assistance has only recently been employed.

Preliminary inquiries which, on first reaching Behar, were instituted with a view to discovering what line of biological work promised to yield the most fruitful economic results, revealed at least one astonishing fact, namely, that, almost without exception, the planter is totally ignorant, not only of the locality from which comes the seed with which he particularly is supplied, but of the more general fact as to where indigo is grown to

* Prain and Baker, *Journal of Botany*, Feb. 1902, p. 65.

supply seed. Seed is never obtained locally; the entire amount which reaches Behar is supplied by contract to the various "concerns," chiefly by native dealers, who are at liberty to purchase where and how they please. Further comment on such a system of seed supply is unnecessary, and it was obvious at the outset that an investigation into this question could hardly fail, from an economic standpoint, to repay the expenditure of labour. This opinion has been fully justified, but it is not the economic side of the question with which this paper deals. It is a marked interrelation between the type of plant and the climatic conditions of the locality in which that plant is grown—brought to light by this inquiry—which forms the subject of the present communication.

The method adopted for this inquiry, which has extended over a period of more than two years, was as follows:—

FIG. 5.

SUKKUR PLANT. MULTAN PLANT.

During the first year, seed was obtained from as many localities as were at that time known to supply seed to the markets (Delhi and Cawnpur), and was cultivated in Behar. Towards the end of the season a tour was made through the seed-producing areas; growers and middle men (dealers) interviewed at the various places visited; crops were inspected and a sample of seed was taken from each field visited. These samples were cultivated during the second season, and in this way the evidence obtained during the first, was controlled and examined in greater detail during the second, season.

A casual inspection of any field of indigo in Behar at a time when the plant had reached a height of one or two feet had made it evident that there were at least two very marked types of plant; and, as a result of the cultivation of seed raised in known localities, it became at once apparent whence this variation arose. Figs. 11 and 13 bring out most prominently the general contrast between these two types. During the later stages of the work it became possible to differentiate two further types, figs. 6 and 12. These, though easily recognised when cultivated alone, are somewhat difficult to identify in a mixed crop, since they do not owe their individuality so much to the possession of characteristic features of their own as to the extent to which the characters of the two main types receive emphasis in them.

In the first of the two main types (fig. 11) the plant when fully developed is barely three feet in height. When cultivated in Behar this variety is in full flower by the end of June, and it is possible to find pods

FIG. 6.—SUKKUR PLANT.

containing ripe seeds early in July.* The most noteworthy feature, however, is that the leaves tend to take on a distichous, the simplest form of alternate, arrangement ($\frac{1}{2}$). This apparent arrangement is further impressed upon the primary and, to a large extent also, the secondary

* It may possibly be noticed, during the course of this communication, that emphasis is laid upon the date of flowering. This point becomes of considerable economic importance in the case of a plant which is required for its yield of leaf. In Behar indigo is sown during the last few days of February and early March. The exact date for the commencement of cutting depends to a great extent on the date of the break of the rains; but a commencement is usually made during the latter half of June. Plant is, however, still being cut for the first time in early August, so that, other considerations being equal, flowering should not commence much before that date.

branches; secondary branching, however, does not occur to any marked extent. The result of this torsion is that the entire plant comes to lie in one plane. This characteristic is well shown in fig. 11.

In the second principal type (fig. 13) the tendency towards a $\frac{1}{2}$ arrangement of the leaves, which is seen to be so marked a feature in the first type, is absent, and the primary branches arise on all sides of the main stem. Secondary branching also occurs to a much greater extent than in the previous type, giving to the plant as a whole a robust and bushy appearance. When fully grown the plant is at least four and

FIG. 7.—DERA GAZI KHAN PLANT.

may reach six feet in height; nor does it begin to flower till the middle of July, and is only in full flower in early August.

Of the two additional types the first (fig. 6) bears the closest resemblance to the first of the types already mentioned, and stands apart from this only in the degree in which the above-mentioned characteristics are emphasised. The apparent distichous arrangement of leaves and branches is perhaps hardly capable of further emphasis. In height, however, the plant is not more than eighteen inches, and by early July ripe seed occurs in abundance. By the end of that month the crop shows marked indications of dying off.

The second additional type (fig. 12) forms a connecting link between the two main types. The plant is stunted, being barely three feet in height when fully grown; but the tendency for the branches to lie in one plane is absent. The intermediate character is further exemplified by the period of flowering.

It now becomes necessary to note the localities in which the above four types are found, and the relative positions which these localities bear to each other.

The type which was first considered occurs in the following localities: Dera Gazi Khan, Mozuffergarh, Multan, Bahwalpur, and Hissar. With the exception of the last, these all lie in the valley of the Indus, and the

FIG. 8.—MULTAN PLANT.

area occupied by this type may therefore be conveniently termed the Punjaub area.

The second occurs at Delhi, Rhotak, Gurgaon, Kasganj, and Cawnpur. All these, without exception, lie in the Ganges valley, and, adopting the same terminology as before, the area occupied by them may be referred to as the Ganges area.

The first of the additional types occurs only at Sukkur in Scind—the most westerly place in which *I. sumatrana* is cultivated; the second only at Jhind in the Eastern Punjaub.

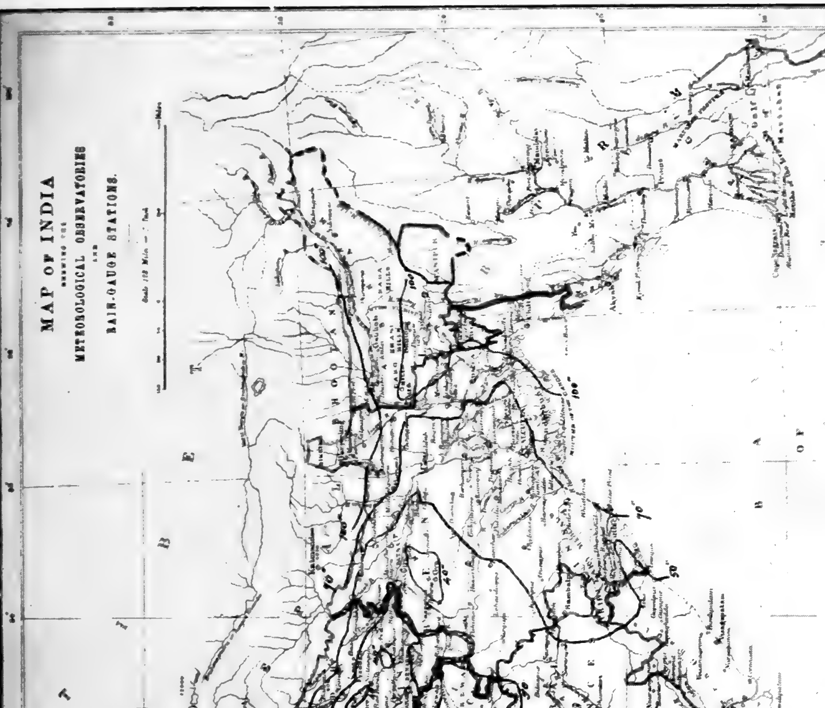
Hence it becomes evident that a series of gradations in the type of plant is encountered as a passage is made along a V-shaped line running from east to west, the two arms of the V roughly following the course of the Indus and Ganges valleys. At the extremity of the easternmost arm is found the luxuriant Ganges-area type, passing, on the west, successively into the types of Jhind and the Punjaub to reach at the other (westernmost) limit the stunted Sukkur type, the character of which may be justly described as of a distinct xerophytic nature.

From an economic standpoint it was sufficient simply to note the variations described; it seemed, however, desirable to go further, and establish, if possible, some explanation which would satisfactorily account for the observed facts. Since the variations were of such a nature as to

Fig. 9.—Mozuffergarh Plant.

suggest the agency of climatic conditions, a study of these for Northern India was undertaken.

The two most important of the meteorological conditions which have to be considered are the rainfall and the temperature. Map I. gives the lines of equal normal annual rainfall, while Map II. gives the lines of equal normal rainfall for the two periods into which the year is naturally divided, when the rainfall of the parts under consideration is taken as the basis for subdivision, namely, the dry weather (November to May inclusive) and the rains (June to October inclusive). It will be noted, on reference to the first of these maps, that Sukkur has an annual fall of


MAP OF INDIA
METEOROLOGICAL OBSERVATORIES
RAIN-GAUGE STATIONS.
ARABIAN SEA
AFGHANISTAN
BOMBAY

MAP I.

under five inches, the Punjaub area (with the exception of Hissar, of which the rainfall is 16 inches) a fall of under 10 inches, Jhind a fall of practically 20 inches, while in the Ganges-valley area the fall lies between 20 inches and 30 inches. This statement holds good when we consider the rainfall of the rains only (Map II.). The dry-weather rainfall, as this map shows, is insignificant, being less than four inches during the seven months over the entire area under consideration. It is a period, also, when little or no indigo is cultivated.

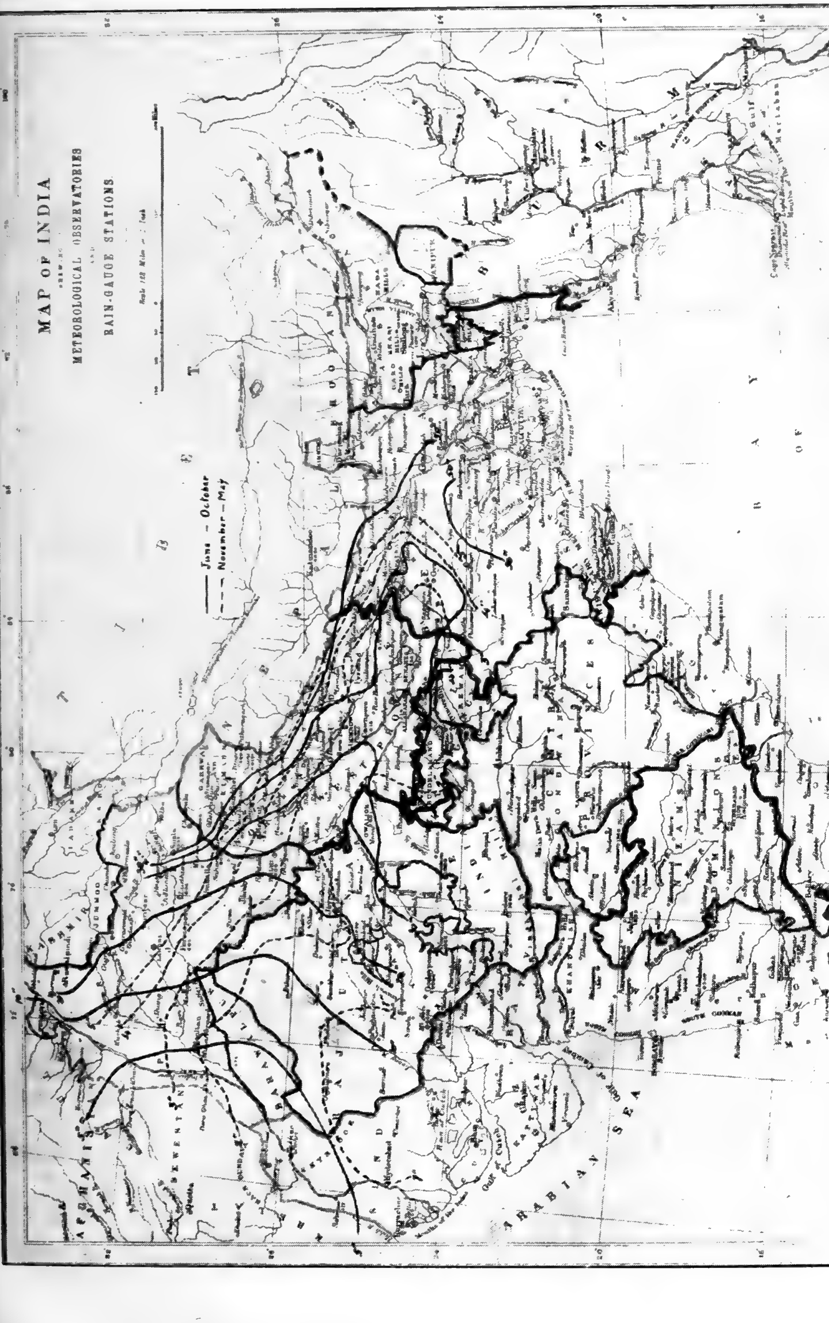
Maps III. and IV. indicate the direction of the isothermal lines; Map III. the normal annual maximum temperature; Map IV. the normal

FIG. 10.—BAHWALPUR PLANT.

mean temperature for three of the four seasons (cold weather, December to February; hot weather, March to May; rains, June to August). Of these periods the cold weather may be neglected, since the cultivation of indigo during this period is very limited.

During the hot weather—also a period of little importance *—it will be noticed that all districts lie on, or slightly south of, the 80° F. isotherm.

* Throughout the parts under consideration indigo is sown on irrigated land only. It cannot, therefore, be sown before the rise of the rivers admits of the opening of the canals. The usual, though not invariable, custom is to sow annually. Occasionally, however, the plant is left for a second year, in which case it is cut for dye the first, and for seed the second, year.


MAP OF INDIA
METEOROLOGICAL OBSERVATORIES
RAIN-GAUGE STATIONS
June – October
November – May
ARABIAN SEA

MAP II.

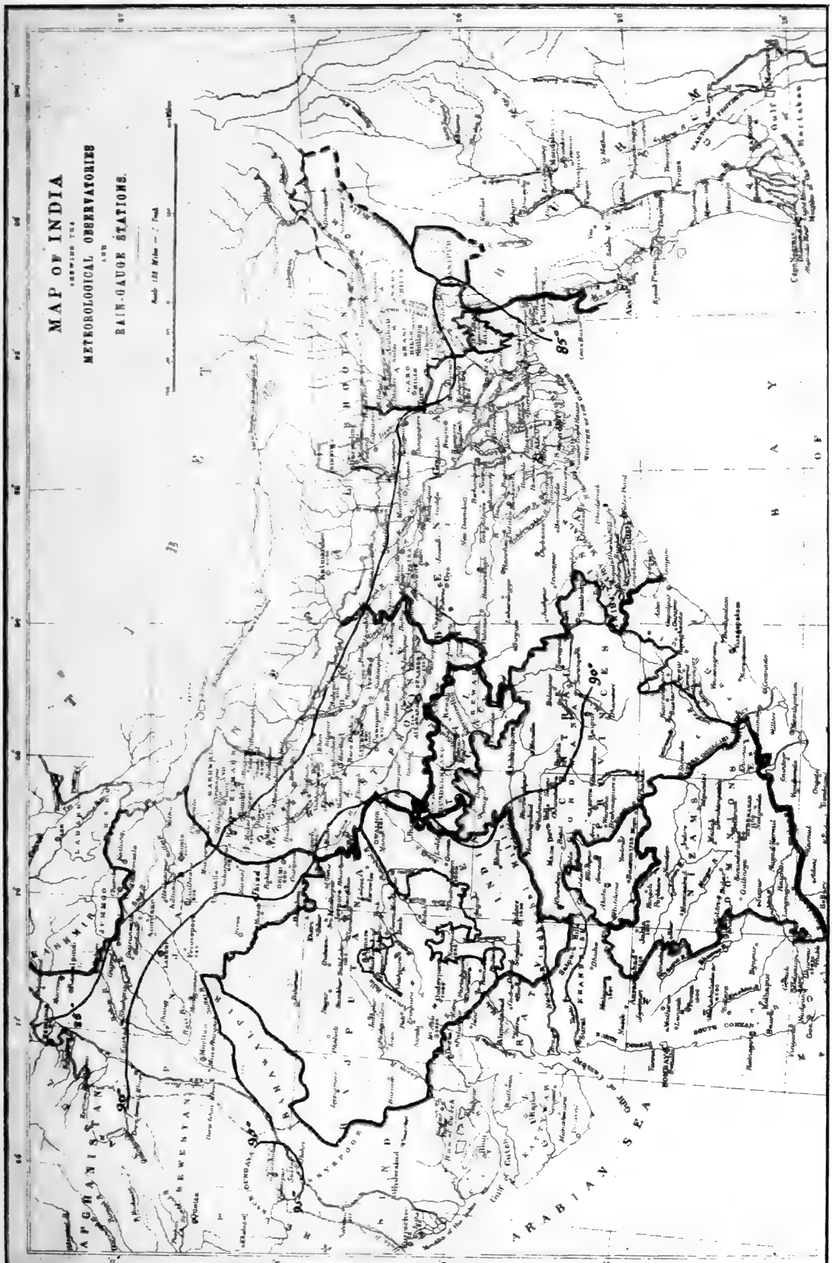
The period from June to August is the important period in any consideration of questions relating to plant growth, since it is in this period that the major portion of the rainfall occurs. Reference to the map shows that Sukkur has become the centre of a high-temperature area (above 90° F. average mean temp.). Dera Gazi Khan, Mozuffergarh, and Multan also lie within the area included by this isotherm. Hissar lies just outside this area, Jhind still further outside, while the districts of the Ganges area lie in the easterly directed loop formed by the 85° F. isotherm. The figures inserted after the names of a few stations are sufficient to indicate the general facts as to the distribution of temperature during the

FIG. 11.—HISSAR PLANT.

autumn months, for which period the isotherms are not shown. It is during this period that the crop ripens. Sukkur still remains an area of high temperature (87° F. approx.); but throughout the remaining districts the temperature is practically uniform (Multan 77° F., Delhi 76° F., Gorakhpur 77° F.).

If the normal annual maximum isotherms are considered, the same points are emphasised with perhaps still greater clearness. Sukkur forms a central area with a normal maximum temperature of over 95° F. The Punjaub districts and Hissar lie within the 90° F. isotherm, while the Ganges-valley districts lie between the 90° F. and 85° F. isotherms.

Sukkur, therefore, stands forward prominently as the area in which


MAP OF INDIA
SHOWING THE
METEOROLOGICAL OBSERVATORIES
AND
RAIN-GAUGE STATIONS.
ARABIAN SEA
BAY OF

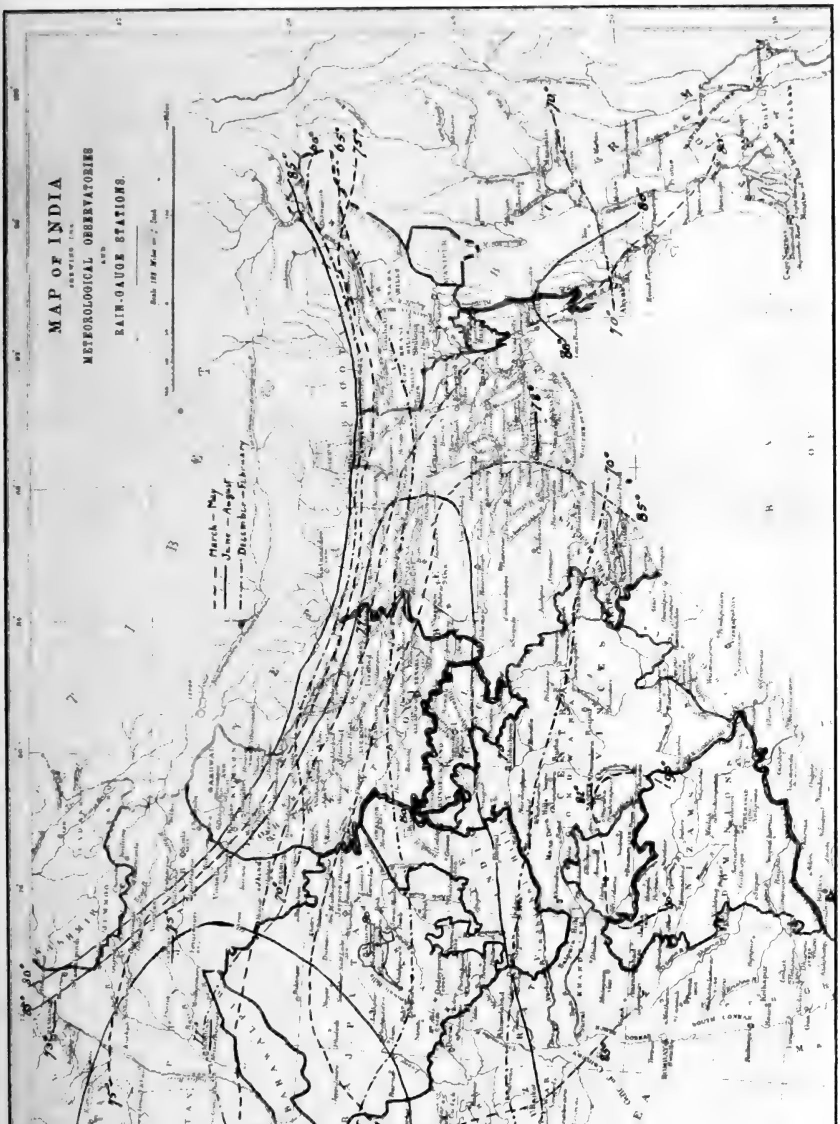
Map III.

extreme heat is associated with the minimum amount of rain, the intensity of both of which conditions is reduced in the case of the Punjaub districts, the reduction being more noticeable in the case of Hissar. The Ganges area, again, shows a still further reduction, both in the intensity of the temperature and in the scarcity of the rainfall.

The Jhind and Hissar areas require a somewhat closer examination. Geograpically these two areas lie but a short distance from each other, and both lie considerably nearer the Ganges than the Punjaub area; yet, as has been shown above, the Hissar plant conforms in all respects with the Punjaub type, while the Jhind plant combines the characters of the plant from both areas. Reference to Maps I. and III., in which the desired

Fig. 12.—Jhind Plant.

points are best indicated, shows that both the line indicating the 20-inch normal annual rainfall and that indicating the 90° F. normal annual maximum temperature bend in a northerly direction, thus passing through Jhind and placing Hissar within the region of intense temperature and low rainfall; the Ganges area falls within the region of less intense temperature and higher rainfall. The necessary conclusion is that a normal annual rainfall of 20 inches combined with a normal annual maximum temperature of 90° F. forms the limiting climatic condition of the two main types. On these lines—which, where they pass through the districts in which indigo is cultivated, happen to be practically coincident—an intermediate type of plant (the Jhind type) is found. Any increase on


MAP OF INDIA
SHOWING THE
METEOROLOGICAL OBSERVATORIES
AND
RAIN-GAUGE STATIONS.
March – May
June – August
December – February
ARABIAN SEA

MAP IV.

this normal temperature, with a simultaneous diminution in the normal annual rainfall, produces a plant in which the xerophytic characters predominate. Similarly any diminution of the normal temperature, combined with an increase of the normal rainfall, induces in the plant a robust and luxuriant growth.

A further comparison has been effected between the various types, namely, as regards their leaf percentages.* Here, again, the same gradation, from the Sukkur type at one extreme to the Ganges-valley type at the other, is observable.

FIG. 13.—DELHI PLANT.

The figures are as follows :—

	Leaf percentage.
(1) Sukkur area :	
Sukkur	70·6
(2) Punjaub area :	
Bahwalpur	68·1
Hansi (= Hissar)	67·6
Dera Gazi Khan	66·7
Multan	62·5
Mozuffergarh	62·1
	Average 65·4

* A comparison primarily undertaken on account of the economic value of the point under consideration.

	Leaf percentage.
(3) Intermediate area :	
Jhind	62·5
(4) Ganges area :	
Kasganj	59·2
Delhi	58·8
Rhotak	57·9
Chaubepur (= Cawnpur)	56·3
	Average 58·0

At first sight it may possibly be thought that these figures do not agree with the statement, previously made, that the plant of the Sukkur

FIG. 14.—RHOTAK PLANT.

and Punjaub areas bears the impress of a xerophytic tendency. Further consideration, however, will show that this is not so. The robust and vigorous growth of the plant from the Ganges area necessitates a considerable length of bare stem, which may be as much as 1 inch in diameter. The low and spreading habit of the plant from the former area, on the contrary, admits of a thin stem (rarely 0·5 inch in diameter) clothed almost to the ground with leaf.

In dealing with a cultivated plant, in the seed of which a large trade is conducted, it seemed quite possible that a considerable check to the establishment of local varieties would be encountered in the importation of seed for cultivation. Considerable pains, therefore, were taken to discover if such importation does take place, and, if so, to what extent. No really reliable information was obtainable, but the following data, gleaned from a mass of conflicting evidence, gathered during the course of a tour through these parts, seem to represent the truth as nearly as it is obtainable.

Sukkur is dependent on its own seed; the excess is exported to Delhi,* and, possibly, a little finds its way to Multan and Dera Gazi Khan. This latter amount, however, is insignificant.

Dera Gazi Khan and Mozuffergarh neither import nor export seed, except on the rarest occasions. Multan is also, as a rule, self-sufficient,

FIG. 15.—KASGANJ PLANT.

but exports to Delhi.* Bahwalpur claims to import from Delhi and Multan on rare occasions, and in insignificant amounts.

Hissar exports only, and in considerable quantity, to both Delhi and Cawnpur.*

The remaining districts export only, and in large quantities.

As far, then, as it is possible to obtain information, no, or only an inappreciable amount of, imported seed is cultivated in the seed-producing areas, and it seems probable from this that the types above described

* As markets, and not for cultivation in these districts.

indicate the limit of variation which the various climatic conditions are capable of inducing.

In connection with this subject it would have been interesting to establish the degree of stability of these various types. Unfortunately the period of observation has not been sufficiently prolonged. There are, however, indications that the plant of the Punjaub type, when cultivated under conditions approximating to those of the Ganges valley, completely loses its characteristics, so that it cannot be separated from the plant long cultivated in the latter area. The period during which this change can

FIG. 16.—CAWNPUR PLANT.

be effected is, as far as has been ascertained, five or six years. It will not be advisable, however, to accept this statement without reservation, since the facts are not the result of personal observation.

EXPLANATION OF FIGURES.

(4) Plant from Chaubepur (= Cawnpur).
(5) European is standing among plants from Sukkur.
Native is standing among plants from Multan.
(6) Plant from Sukkur.
(7) Plant from Dera Gazi Khan (same scale as 10).
(8) Plant from Multan (same scale as 10).
(9) Plant from Mozuffergarh (same scale as 10).
(10) Plant from Bahwalpur.

(11) Plant from Hissar.
(12) Plant from Jhind.
(13) Plant from Delhi.
(14) Plant from Rhotak.
(15) Plant from Kasganj.
(16) Plant from Chaubepur (= Cawnpur).

Map I.—Normal annual rainfall of N. India.
Map II.—Normal rainfall during wet and dry seasons.
Map III.—Normal annual maximum temperature.
Map IV.—Normal seasonal mean temperature.

ON THE OCCURRENCE OF "HARD SEED" IN *INDIGOFERA ARRECTA* HOCHST.*

By H. M. Leake, M.A., F.L.S.

The introduction, in the form of a commercial rival, of the German synthetic product has caused an abrupt awakening to those interested in the natural indigo industry of Northern India. Their long-standing monopoly has broken down, and the rapid fall in prices which this competition

Fig. 17.—Indigofera arrecta.
From untreated seed. From treated seed.

has brought about has created an urgent demand for a means by which the expenditure, relative to the outturn, might be reduced.

Our method for the accomplishment of this desideratum has formed the basis of considerable hopes; it is the introduction of the so-called 'Natal-Java' plant, *Indigofera arrecta* Hochst.†

The popular name of this plant is derived from the two localities from which seed has been imported to Behar. One of these localities is Natal—near, though not in, which it is found wild; the second is Java,‡ where it is extensively cultivated at the present day, and where it has already

* Prain and Baker in *Journal of Botany*, April 1902, p. 143.

† The confusion existing in the terminology of the cultivated species of the genus *Indigofera* is well summed up in a letter from Major D. Prain, I.M.S., Supdt. Roy. Bot. Gard., Calcutta, to Mr. C. A. Barber, Govt. Botanist, Madras, published in *Indian Planting and Gardening*, xi. No. 25, Dec. 18, 1902, p. 453.

‡ Where it passes under the name of *Indigofera leptostachya* DC.

displaced the species now cultivated in Northern India (*Indigofera sumatrana* Gaertn.).

During the first few years all attempts made to grow this plant in Behar were signally unsuccessful. Even when the seed was sown on the abundant moisture, and during the high temperatures, prevalent during the rains, germination was poor and gave rise to a scattered irregular crop.

It soon became evident that *Indigofera arrecta* affords yet another example of a leguminous plant, the seed of which is characterised by the possession of a "hard coat." The recognition of this fact has removed all those doubts as to the possibility of growing this plant in Behar which the previous failures had excited. The only remaining problem is to obtain a cheap and efficient method of "treating" (slightly scratching the seed-coat) seed in bulk. It is hoped that the remedy has been found in the Svalof machine,* devised more especially for treating clover-seed, in which the same defect occurs.

The extent to which germination is injuriously affected is shown by the following figures :—

I. arrecta (Natal),	Per cent. germination.
Seed from plant grown in Behar (1902)	8
" " " " " (1903)	6
Seed from plant grown in North-West Provinces (1902) .	10
Seed imported from Natal	5

No opportunity has, so far, occurred for examining seed from Java, where, as far as information goes, no difficulty is experienced with the germination. The seed of "Java" plant, grown for one season in Behar, showed a germination percentage of seven in a test lasting seven days.

With the exception of the last, the above figures represent the percentage number of seeds which have germinated in five days. This number will, of course, be slightly increased by continuing the experiment for a further period. Five days, however, are sufficient to cover the period of germination of seed which has been treated in an efficient manner. Thus :

Day	2	3	4	5	6	Total		Per cent. Germination
						Germinated	Hard	
Untreated seed . .	1	1	2	3	1	8	150	5
Treated seed . .	16	38	16	9	0	79	30	72

That the above figures for treated seed are not a true measure of the "good" seed in the sample is shown by the following table, the figures in which are obtained from a second sample of the same seed :

Sample of 230 *seeds.*

	Germinated	Swollen	Bad			
Second day	95	—	—	unswollen 54		
Third day	65	12	0	again treated and tested.		
				Germinated	Swollen	Bad
Fourth day	7	5	—	25	29	—
Fifth day	—	—	5	25	—	4

* A short account of this machine occurs in a Report on the Scandinavian seed-control stations, in the Experiment Station Record, U.S. Dept. of Agr., vol. x., 1898.

From this table it is clear that the true percentage of "good" seed is 96 (221 seeds in 230), and the percentage of "bad" seed is 4. It is also clear that the failure to obtain germination in 39 cases (see previous table) was due to ineffective treatment. In the latter table a similar failure occurred in 59 cases, making the apparent germination percentage 74.

No serious effort has been made to ascertain definitely the cause of this phenomenon. An ash determination alone has been made and the figures for *I. arrecta* compared with those for *I. sumatrana*, the seed of both of which species was obtained from plant growing in the same locality.

	I. arrecta	*I. sumatrana*
Testa taken	1·617 *g*	1·334 *g*
Weight of ash after ignition . .	0·022 *g*	0·027 *g*
Percentage ash . . .	1·36	2·02
	Ash not deliquescent	Ash markedly deliquescent.

These figures seem to indicate that the phenomenon is not the result of the occurrence of a large amount of mineral matter in the testa,* and the second explanation, which traces the resistance to the organic, and not the inorganic, substances composing the testa, seems more probable. In the outer layers of this, a body or bodies exhibiting a strong repulsive attitude to water are supposed to be present.

FIGURE.

In left foreground.—Crop of *I. arrecta* ('Natal' var.) seed, untreated, and sown 6 seers (12 lbs.) per bigha ($\frac{7}{8}$ acre).

In right foreground.—Crop of *I. arrecta* ('Natal' var.) seed, treated and sown 4 seers (8 lbs.) per bigha.

Seed was broad-casted, and hence the line of demarcation is neither straight nor very definite.

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* Vide *Agricultural Botany*, J. Perciv l, p. 623.

DESIGN IN THE SUBURBAN GARDEN.

By Hugh P. G. Maule.

It is with the greatest diffidence that I venture to put forward a few thoughts on the subject of design in the suburban garden. In the first place, I fear I have little or no claim to a hearing; and secondly, the subject of "gardens" has of late been treated almost *ad nauseam* by writers of indisputable authority and ability. It is, therefore, only because so many of the *small* gardens that one sees fail in so many particulars to fulfil their function in a proper and adequate manner that I propose to enter a plea for a few definite principles which should be carried out in any garden, no matter how small or how modest, if it is to be worthy of its name. Let me then frankly tell you that as a practical gardener or horticulturist I make no pretence whatever, and that it is from the architect's or designer's point of view that I venture to address you; although I will yield to no one in the love, sympathy, and delight, in all and everything that pertains to growing nature, whether flower, fruit, or tree; and that I hold, and hold most strongly, that no plot of ground is too small, but with love and care it can be made a true garden in the best sense of the word.

At the risk of treading on dangerous ground, I should like to call attention to one point upon which I think ardent gardeners often hold erroneous views. In a recently published and charming little book, "Villa Gardens,"* the author considers that "the flower must be a complete autocrat," and I quote this passage because it is an opinion very generally held without any qualifications. It is, I think, a wrong and rather superficial view. The garden is something more and deeper than a mere emporium for flowers. It is, with the house, a complete entity, and must be treated as such, though we need never forget that the flowers and their disposition are its chiefest glory, and in spite of the above quotation this feeling is very clearly held and expressed by the author of "Villa Gardens."

Before dealing with the suburban garden in particular, it will be well to call attention to the intimate relation between house and garden, whether large or small, and to refer briefly to those general principles which were undoubtedly the foundation and keynote to all that was fine in the old English garden before its days of degeneracy. That these important relations are almost entirely overlooked or unknown by the general public is, I think, a truism, and perhaps it is not too much to say that the average householder looks only upon his garden as a space that must perforce be kept tidy; and even if he himself takes some pleasure and interest in it, it is with no idea that house and garden have anything in common, or that there are any definite principles upon which he should set to work in order to link them together, to obtain a full value in pleasure and effect from even the smallest enclosure.

* *Villa Gardens*, by W. S. Rogers. London: Grant Richards.

That there is no hard and fast rule upon which any particular garden should be laid out is, I hope, obvious, and I should even dare to paraphrase Kipling's ballad "In the Neolithic Age," and say, "there are nine and sixty ways of constructing garden lays, and every single one of them is right," so long as we keep before us the spirit of the old English garden, and understand the principles which underlie its formation and development, and realise the reason why design, educated organised design, should control the garden as much as the house and all that is therein.

Perhaps here, at the outset, I had better say what I personally conceive these underlying principles to be.

First of all then I shall say *seclusion*, for if this was not *the* great aim of the old gardeners, it is an end which has certainly been attained; and it is at least interesting to find that the original meaning of the word *garden* in almost every language was "an enclosed space," and in the Greek word "chortos" a secondary meaning was "a feeding-place." The brick wall, with its green-crusted coping; the close-clipped hedge, defying the prying eyes of the curious; high trellis-work, with its entwining creepers, all point to this end, and, while serving the useful purpose of giving shelter to fruit and flower, wrap the whole garden with a tranquil air of seclusion, security, and mystery. This was well understood in the seventeenth century, and is, I think, clearly the reason why Georgian houses were so often placed close to the road, in order to give more space and seclusion in the gardens lying behind them.

After seclusion comes *use*. Gardens were made, not merely for pleasure, but to provide the home with necessaries and delicacies elsewhere unattainable. Fruit-growing was a fine art. The bakehouse, brewhouse, game larder, fishpond, dovecot, herb garden, walled fruit garden, orchard, quincunx, and stillroom were necessities, and not merely evolved out of playful fancy.

For instance there is, I think, no doubt that the fishpond or tank owed its origin in mediæval Catholic England to the demand for fish, and hence the development and charming treatment of these ponds in later times. The ladies of the household were experts in all that pertained to garden produce, and the recipes of our great-great-grandmothers would probably considerably astonish their twentieth-century descendants. The old-fashioned herb garden must not be forgotten. The culture and curing of "simples" was formerly part of a lady's education, and gardens were ofttimes renowned for this feature alone. Evelyn says, "We walked into a large garden, esteemed for its furniture one of the fairest, especially for simples and exotics." Then also the necessity for good dry paths and terraces, for it was in the garden that exercise was largely taken. Roads were few and bad, and ladies no doubt disliked mud as much then as they do now.

The garden was therefore an integral part of the home—indeed an absolute necessity—for modern conditions were unknown, and if the household was not self-supporting it could barely exist; so garden and house grew up and were designed together, for each was the complement of the other. Thus, I think that the keynote may be said to have been necessity, to which was doubtless added a real love of beauty for its own sake, prompting those quaint fancies which help to enhance the charm and discount the utilitarianism which really lay at the root of all. Necessity and pleasure thus walked hand in hand, the former, by its "directfulness," giving the cue to the sturdy formality and strength of purpose which so appeal to us now. The natural result was a happy blending of pleasure and use, until, by the simple process of evolution, the original uses were no longer required, and therefore not understood and were misapplied, and the way then stood open for the chaos and futility of Capability Brown and his evil school.

Some slight consideration of the original cause of the development of the garden leads us clearly to the fact that the garden was necessary for the home life, that fruit, flowers, walks, turf bowling-greens, shelter and seclusion were the natural outcome of the household requirements, and so house and garden became wedded as it were; each dependent on the other, with logical purpose governing both. Each thus gaining from the close and living contact with the other, they finally became that perfect whole which we can doubtless conjure up before our eyes. The grey stone or purple brick weather-beaten house, the trim well-kept walks, the velvet turf, the checkered play of light and shade on grass, yew, and gravel; the quaint old-world flowers, coming and going again and again year after year in their old familiar places beside the stained and lichened wall, with its kindly shelter from the northern winds; the sundial with its happy phrase, perhaps some little sunken garden, secluded and more sacred than the rest, with the plash of its cool fountain; last, but by no means least, the generous fruit garden and orchard, delighting equally in sight and taste. But no words of mine can adequately describe the limitless possibilities which are to be found. The result we know—that happy blending of house and garden which is the outcome not merely of chance and time, but of steadfast purpose and well-trained organised design, born in the days when gardening was a living craft worthy to be followed, loved, and understood by the noblest minds.

In effect, then, these three—seclusion, usefulness, and pleasure—are what I conceive to be the principles underlying the old tradition and examples.

The questions we must next ask ourselves are these: Do these principles still hold good? Are the same necessities still in existence? Can we, after making due allowance for the lapse of centuries and rapid growth of modern requirements, still say that the same factors should form the basis of good garden design in this twentieth century?

At first sight it may appear that as "the old order changeth, yielding place to new," so we must search for new essentials upon which to found the lines of a logically designed modern garden; but a little consideration will, I think, show that in reality almost all the old conditions should apply at the present time.

First, *seclusion*. I should say that in these days of publicity, of interviewers, photographers, cheap magazines, and general social scramble, never was the quiet calm of the garden more desirable. The greater number of houses, and the greater chances of being overlooked by near neighbours, serve to make strongly defined boundaries, which will act as screens, even more imperative than ever; and thus we have ample excuse for "high-walled gardens, green and old," hedges thick and trim, and well-designed trellis as bounding lines.

The usefulness and need of a garden are still the same, though perhaps at first sight not so apparent, and the reasons are more psychological than materialistic. Different kinds of fruit and vegetables can probably be bought from the greengrocer as cheaply as they can be produced in most private gardens, certainly near London, but the demand for them is greater than ever. Jam and pickle factories have done away with the absolute *necessity* for home growing, but I think every one will agree that home-made jams are far superior. I am sure that few people realise how much can be done, and how much pleasure obtained from even a limited number of well-cared-for fruit trees, and what is more beautiful than an Apple or Pear orchard either in early summer or autumn? Then, too, there are many trees, such as Mulberry, Quince, Medlar, Cherry, Plum, Filbert, which are full of delight to the eye and useful as well, and which, planted with discernment, will give pleasure to generations.

Although sociology hardly comes within the scope of this paper, and without going quite as far as Voltaire's "Candide" and saying "Let us cultivate our garden, for that comprises the whole duty of man," I am certain that if nowadays gardening, not merely flower gardening, but honest fruit and vegetable growing with the accompanying culinary knowledge, were better understood and followed, as our forefathers followed it, the modern cry of broken nerves and jaded energies would not be so much in evidence, either for men or women, and the everlasting cry for amusement and excitement might somewhat abate. There is no recreation more healthful than gardening, and health is the ground-plan of all that is worth having in life.

There is one other point I must touch upon in connection with the necessity of the garden, and that is its educational influence, especially upon children. In these days, when so many time-honoured fallacies have had to succumb to modern science, there is no better way of teaching scientific truths and imparting a true system of observation of nature than by means of the well-ordered garden.

Of the *joy* of the "pleasure garden" there can be no doubt. Bowling-greens have given place to tennis and croquet lawns, but that is only in the course of the natural evolution of physical recreation, which has become more imperative and vigorous. The love and desire for sweet-smelling beautiful flowers and dry walks—indeed all the pleasing fancies of the old gardens—are as strong as ever, and surely we moderns of the twentieth century, with all our increased knowledge and vaunted civilisation, should be able to appreciate the pleasure part of the garden, and derive moral and physical good from it as much as our ancestors. Without wearying you further, then, it is my belief that after making allowance for the gradual evolution of certain old forms, such as bowling-greens, to modern ones, such as tennis lawns, speaking broadly, all the old essentials are still in existence. If some are in modified forms, and if some have dropped out, others have made their appearance, and therefore the same factors, or their modified or more highly specialised descendants, still govern garden design. The house and garden still require each other to make the home one perfect whole. Each must fit in with the other, and each must be in most cases subject to some special circumstance of site and locality.

So far these general principles would apply to all gardens, whether town or country, but with the modern country house the main lines of the garden are now more often than not designed by the architect who has designed the house, and who has given the subject special consideration, and plans each to benefit and supplement the other, and who, seizing some happy accident of nature, is often able to take full advantage of the site, thus welding together house and garden, leaving them only to time to blend into one harmonious whole.

But with the design of the suburban house the architect is generally conspicuous by his absence, and if anything at all has been done to the garden, it has been done by the speculative builder, who is responsible for the house, and it is as absolutely devoid of good taste or common sense as the house itself. Here, then, we have an open field for inquiry, and whether the house has 20 or 30 feet frontage the conditions for our consideration are practically the same.

There is the usual suburban road, with its rows of detached or semi-detached houses on either side, set back from the oak fence or cast-iron railing some 15, 20, or 30 feet, giving to the road that little forecourt popularly designated "the front garden," which may become a dreary desert, or, in the hands of a loving master or mistress, a very oasis of beauty and colour. At the back there is often more scope, and generally by sheer force of circumstances the main outline of garden is of pleasing rectangular shape, with boundaries of no uncertain or indeterminate form, which, if of brick and properly used, become a real delight and use to the garden-lover. As with the front garden, it is of small moment whether the depth be 50, 80, or 100 feet, or even more, for, aspect excepted, there is the same set of conditions on either side of the road and throughout its length, the only difference being that perhaps some one garden, more fortunate than its fellows, has in it a relic of former pristine glory in the shape of a gnarled Elm or sturdy old Apple, the solitary survivor of a jerry-builder's wiles.

These, then, are our conditions:

In front—the forecourt, open to the raking fire of inquisitiveness from passers-by. In summer the constant cloud of dust between the long-spaced intervals of the water-cart's round, with nothing to break the dreary prospective of turgid architecture, save the cast-iron railing.

At the back—the view is probably limited, from the ground floor at least, by the three walls, which with the house confine the plot, leaving no ambiguity as to size, and forcing its limits upon us with a steady insistence and monotony. If we stir from the shelter of the house we are at once exposed to a cross-fire from our neighbour's upper windows, and though these conditions weigh less heavily upon us as the size of our plot increases, they are in effect the conditions of almost every suburban house, unless it stands in at least half an acre of ground, or forms the solitary vanguard which will soon be but one of battalions of its fellows.

How, then, do our underlying principles of seclusion, usefulness, and pleasure affect us here? Can we apply them to these novel modern conditions, and if so, how will they help us to the evolution of a satisfactory scheme? Before attempting to answer these questions I may say I take it for granted that all are agreed that in small gardens, such as those under our consideration, some kind of formal treatment will be considered imperative. Whatever may be said of the rival merits of a so-called "natural" or landscape garden and the set lines of the so-called "formal garden" when applied to a country house or cottage, it is surely an impossibility, indeed a crime, to attempt any naturalistic methods within the narrow limits of the suburban brother.

I have already said that seclusion is still desirable in the ordinary garden of the twentieth century, and it seems to me that it is even more desirable in that little forecourt of the suburban house which lies so open to the passer-by. But by "seclusion" I do not for one moment mean the seclusion of the nunnery or the gaol—rather the friendly shelter of a trim hedge which will serve many a useful purpose. In the first place, if 5 or 6 feet high, it will afford shelter from inquisitive gaze to the ground-floor rooms looking on the street, and therefore do away with the objectionable necessity of lace curtains, which, if they effectually block out the view from without, still more effectually block out the view from within, together with light and air. It will also act to some extent as a screen from the road dust—that bane of town-dwellers, and probably, so scientists would have us believe, the most fruitful source of all contagion. Nor is it necessary for the hedge to be of great thickness and thus encroach on our scanty space. We can take a lesson in this from the hop-growing counties of the South-east of England, where hedge-growing has become a fine art, and where, for the sake of the shelter they give, hedges are grown tall and thin, thoroughly efficient for their purpose and withal most pleasing in appearance.* Within its friendly shelter may be a square of turf, a trim gravel walk, and, according to aspect, such flowers as can best be grown. Against the house itself might be tall-growing plants such as Hollyhocks, Honeysuckle, Roses, and Creepers, which through the narrow cleft for the gate would give a glimpse of cheerful colour.

Now the chief charm of a real garden is, I think, shown, not only in its arrangement, but in the care which is taken of it. If the latter is wanting and turf verges &c. are shaggy and ill-kept, the charm of line is gone, and the feeling of love and care, which should be induced, is lost.

I know a garden, and I say "garden" advisedly, which is only some 14 feet by 16 feet 6 inches, and yet, year in year out, it is the pride of the village, and that solely by reason of its arrangement and the love and care bestowed on it by its cottage owners. Some idea of its size may be gained by comparing it with an ordinary suburban garden, as shown on the accompanying illustration of a garden at Ealing (fig. 19). I know also gardens which are gardens in name only, because either there is no logical arrangement or they are too ambitious for the staff, and therefore paths become weedy and turf gets dull for want of sufficient attention.

These may sound great platitudes, and be well known, but it is so easy to attempt too much—to draw on plans gravel walks, grass borders, or sunken lawns, forgetting all the while that walks want constant attention, and

* It is interesting to note that these hedges are called locally *lew* or *lea*, said to be derived from the Saxon word "hleow," meaning shelter.

that grass borders, and slopes especially, require plenty of labour in summer if their true value is to be maintained. Therefore, above all else, first ascertain how much labour will be expended, and plan your garden accordingly. I have here a plan of the small garden already referred to in the village of Turville, Bucks (fig. 19). It could scarcely be smaller or simpler in design, but its character can, I think, easily be seen even from the drawing. The little straight path with its quaint alternate rows of cobble and brick, kept scrupulously clean, approached through a screen, which, slight though it is, just gives the desired touch of aloofness from the village world without. On either side, the weather-beaten brick wall and the old-fashioned flowers, all in scale and keeping with the cottage and its inmates. Conceive this same garden with a spiral path and a Rhododendron or Laurel clump! No matter what care it had, its homely character, and above all its *scale*, would be entirely lost, and it would sink into insignificance.

So also with our small forecourt; if the arrangement is bad, and the relative scale between house, garden, and flowers be not kept, half its restful charm is gone. Therefore I would avoid at all costs big-scaled shrubs such as Laurels or Rhododendrons, well enough perhaps in a mile-long drive, but quite overpowering the little plot which stands between the house and road; though, if space allowed, I would certainly suggest the inclusion of some pretty flowering tree, May, Laburnum, Lilac, Almond, or the like. If one could imagine a whole street with a perspective of trim-kept hedges broken with masses of flowers and with succeeding glimpses of bright gravel or simple brick-paved path, surely there would be an enhanced pleasure for all the inhabitants and for every passer-by.

On coming to the back garden, one is perhaps confronted by more difficulties. Seclusion is still wanted, but it must not be at the expense of sun and air to the plants, and the skilful gardener will make his arrangements according to aspect, and dispose his plants so that sun is secured to those that most need it, and shade to those that thrive in it. Doubtless there are scores of different ways of treating each plot, but the essentials to be aimed at seem to me to be a certain amount of seclusion, a distinct formality of treatment, infinite care in the garden-craft, and careful preservation of scale between flowers, garden, and house. In small gardens such as those under consideration we are not hampered by more than the desire to make the best use of limited ground-space, to provide efficient shelter, and to make the garden as secluded as possible, not forgetting also the modern importance of the garden as the playground, and what should be almost the chief educational influence of young minds.

If the front garden is planned more with the idea of being seen from the road, the lay-out at the back should undoubtedly be schemed from the point of view from the house. I would therefore suggest that our first object should be to design our garden, as it were, in compartments, to lend an air of uncertainty and mystery to its otherwise unmistakable openness. It is well, too, to remember that the portion most secluded from our neighbours is that nearest the house, and therefore this should, I think, be treated with especial care and thought, so as to contrive a small space within which comparative seclusion is obtained, and *through* which the rest of the garden is seen. This feature is exemplified in the plan of "The Orchard," Harrow-on-the-Hill (fig. 21), and in the garden at Ealing (fig. 19). The general arrangement must of course be governed by the surroundings, but if possible it should be centralised from the principal sitting-room window looking on to it, so that standing in the window the garden would as it were unfold itself to us from that point.

That this enclosure can be contrived in a variety of ways is obvious, but elaboration is *not* essential, for it is surprising how slight a screen will convey the idea of seclusion. A simple arrangement of upright posts, joined at the top by a rail and covered by some sturdy climber, is really almost all that is wanted, forming as it does the frame through which we look.

In any garden, no matter how small, I would strongly advocate the growing of fruit trees, whether standards or espaliers, the latter perhaps especially lending themselves to a confined space and systematic handling. In all probability there will be no room for a kitchen garden, but if, at the end, some portion of the space is reserved for fruit trees there cannot fail to be found in them a continual interest and delight, and if separated from the rest by a well-designed trellis screen, their half-veiled charm is still further enhanced. I would rather like to emphasise this growing of fruit trees, as it seems to me that, beautiful though flowers are, they are more ephemeral than the productive and permanent fruit tree, which by its presence gives us in some measure a return to the primitive condition which made the garden a vital necessity. In effect, then, it seems to me that for the back garden we can take the three essentials, seclusion, usefulness, and pleasure ; and, bearing them in mind, can so arrange the plan that it will exemplify these principles, though the actual design may be varied in a thousand pleasing ways to suit the individual taste and requirement of each owner. While there should be nothing in the way of theatrical effect, there should certainly be some effort to differentiate the several parts and if possible to screen each from the other, thus assisting to gain that air of seclusion and peace which should above all others obtain.

These are, therefore, the main principles upon which I think we may work, and there are here illustrated a few plans which will serve to explain their embodiment better.

The first is the plan of a garden designed by Mr. John Belcher, A.R.A. It is typical of the long narrow plot of ground, with the house set back a little from the road; surely, in its original nakedness, sufficiently uninviting to daunt the most optimistic garden enthusiast. The house is clearly too much to one side of the plot to allow of a satisfactory "central" scheme from it, but notice the seat set in a thoroughly secluded position from which the garden unfolds itself on a central line, and how an added sense of mystery is given by the subdivision and well-ordered balance of each part. I think this plan is so full of thought and character that it forms a far more potent argument in its favour than any words of mine could do. (Fig. 18.)

Here is another plan which, though it cannot be compared with Mr. Belcher's, illustrates the idea that some especial care may with advantage be given to that portion of the garden nearest the house, to induce the idea of seclusion; a public park at the end making an additional reason for this. Consequently the part nearest the house is terraced and separated from the rest by a bank and low privet hedge, through which rise a series of arches covered with clustering ramblers and honeysuckle, while the opening to the garden beyond is central with the drawing-room window. (Fig. 19.)

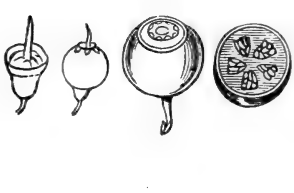
A third plan of a small garden in Sussex shows again a simple treatment by which, in spite of an irregular-shaped piece of ground, full advantage of the plot is taken from the living-room windows, while the garden itself is subdivided to maintain a smallness of scale in keeping with the size of the cottage. (Fig. 20.)

The fourth plan, designed by my friend Mr. Arnold Mitchell for his own house, speaks for itself, and surely proves what an infinity of delight can be obtained from less than one-third of an acre if house and garden are treated together and designed with real understanding. (Fig. 21.)

In conclusion, let us consider for one moment how the usefulness and necessity of the modern garden apply to the busy life of a city worker. If, as is so often the case, the garden is merely handed over to the odd man, while the nurseryman's flowers are its chief adornment, its use or necessity is indeed slight. But if, on the other hand, there is a true appreciation of even some of the many possibilities attaching to its design and care, there is within its narrow limits an educational influence beyond all price. Unfortunately this is the point perhaps the least appreciated, for the very reason that few realise how much can be done in a comparatively short time when some definite scheme is designed, and the work is systematically carried out by the master himself, who, on his return from town, gets into his oldest clothes and puts in an hour or so of honest spade-work.

To obtain the true balance of each part, the thought and care given to each must take its share in elevating the mind, bringing it more in tune with the perfect harmony of living nature, while the effort to produce the unification of house and garden should surely assist in making them the complete entity and centre from which our lives should radiate and expand.

And is there any moral shut
Within the bosom of the rose?
But any man that walks the mead,
In bud, or blade, or bloom may find,
According as his humours lead,
A meaning suited to his mind.




A Suburban Garden.
By John Belcher. A.R.A.
1 House
2 Asphalte
3 Privet Hedge
4 Tool House
5 Seat with Trellis 6 or 7 ft high
6 Lawn
7 Trees
8 Beds treated like Old English Garden
Sun-flowers Holly-hocks Lavender bushes
9 Trees in boxes
10 Summer-house with brick floor
11 Trellis with Archway banked up with
12 Shrubs on NE or house side and with
Raspberry and Currant bushes on SW side
13 Opening in Trellis to turf. perhaps
screened with trained branches as arch
14 Small Conservatory
15 Posts either rough or sawn for training
roses or creepers on either side of
which small fruit bushes and remainder
for kitchen produce
16 Sundial ring of fruit trees round, and
at corners ground laid out for
vegetables and suchlike
17 Alcove at end
A Position of bedding-out plants
B Position of Ferns
Kitchen
Garden
Lawn
House
Scale of feet
John Belcher A.R.A.

Fig. 18.

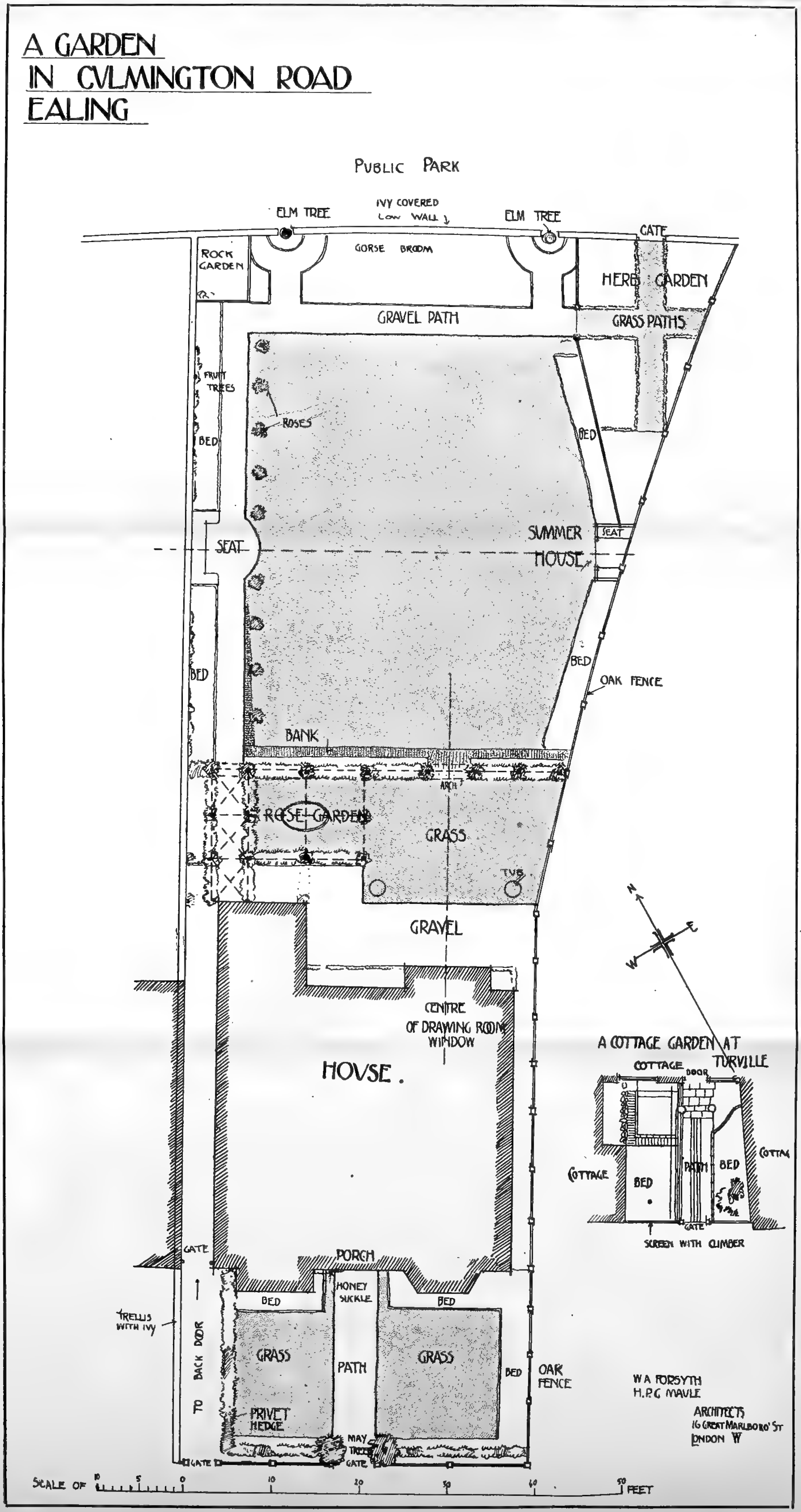

A GARDEN
IN CVLMINGTON ROAD
EALING
PUBLIC PARK
IVY COVERED
LOW WALL
ELM TREE
ELM TREE
GATE
GORSE BROOM
ROCK GARDEN
HERB GARDEN
GRAVEL PATH
GRASS PATHS
FRUIT TREES
ROSES
BED
BED
SEAT
SUMMER HOUSE
SEAT
BED
BED
OAK FENCE
BANK
ARCH
ROSE GARDEN
GRASS
TUB
GRAVEL
N
E
W
CENTRE
OF DRAWING ROOM
WINDOW
HOVSE.
A COTTAGE GARDEN AT TURVILLE
COTTAGE
DOOR
COTTAGE
COTTAGE
PATH
BED
BED
GATE
SCREEN WITH CLIMBER
GATE
PORCH
HONEY SUCKLE
BED
BED
TRELLIS WITH IVY
TO BACK DOOR
GRASS
PATH
GRASS
BED
OAK FENCE
PRIVET HEDGE
MAY TREE
GATE
GATE
W A FORSYTH
H.P.G MAVLE
ARCHITECTS
16 GREAT MARLBORO' ST
LONDON W
SCALE OF 10 5 0 10 20 30 40 50 FEET

FIG. 19.


A SMALL PLEASVRE GARDEN.
WORTHING SVSSEX
THIS GROUND TO BE LAID OUT AS ORCHARD
PRIVET HEDGE
SUNDIAL
RAISED 18" ABOVE THE LEVEL OF ROSE GARDEN
STEPS
SEAT
LOW BRICK WALL
BRICK STEPS
TREES IN TUBS
SEAT
FLOWER
BEDS
GRAVEL PATH
WALL FRUIT TREE
ESPALIER
ESPALIER FRUIT TREES
BRICK AND FLINT WALL
ROSE GARDEN
LAWN
FENCE
FLOWER BED
ESPALIER FRUIT TREE
STANDARD ROSES
ROOT PLANTS
GRAVEL PATH
WALL FRUIT TREE
SUMMER HOUSE
SEAT
STEP
ROSE ARCH
PRIVET HEDGE
CENTRE LINE OF COTTAGE
WALL
TRELLIS AND HEDGE
HERBACEOUS BORDER
PATH
SUNKEN LAWN
40'0"
30'0"
LOW BOX HEDGE
FLOWER BED
ROSE ARCH
BRICK PAVING
ROSES
GATE
BED
BACK PARLOUR
FRONT PARLOUR
KITCHEN
LOBBY
PORCH
PAVED BRICK PATH
WALL
LOBBY
GRASS
RAISED BED
PUBLIC PASSAGE
TRELLIS 6FT HIGH
W.A. FORSYTH
H.D.G. MAULE
ARCHITECTS

Fig. 20.

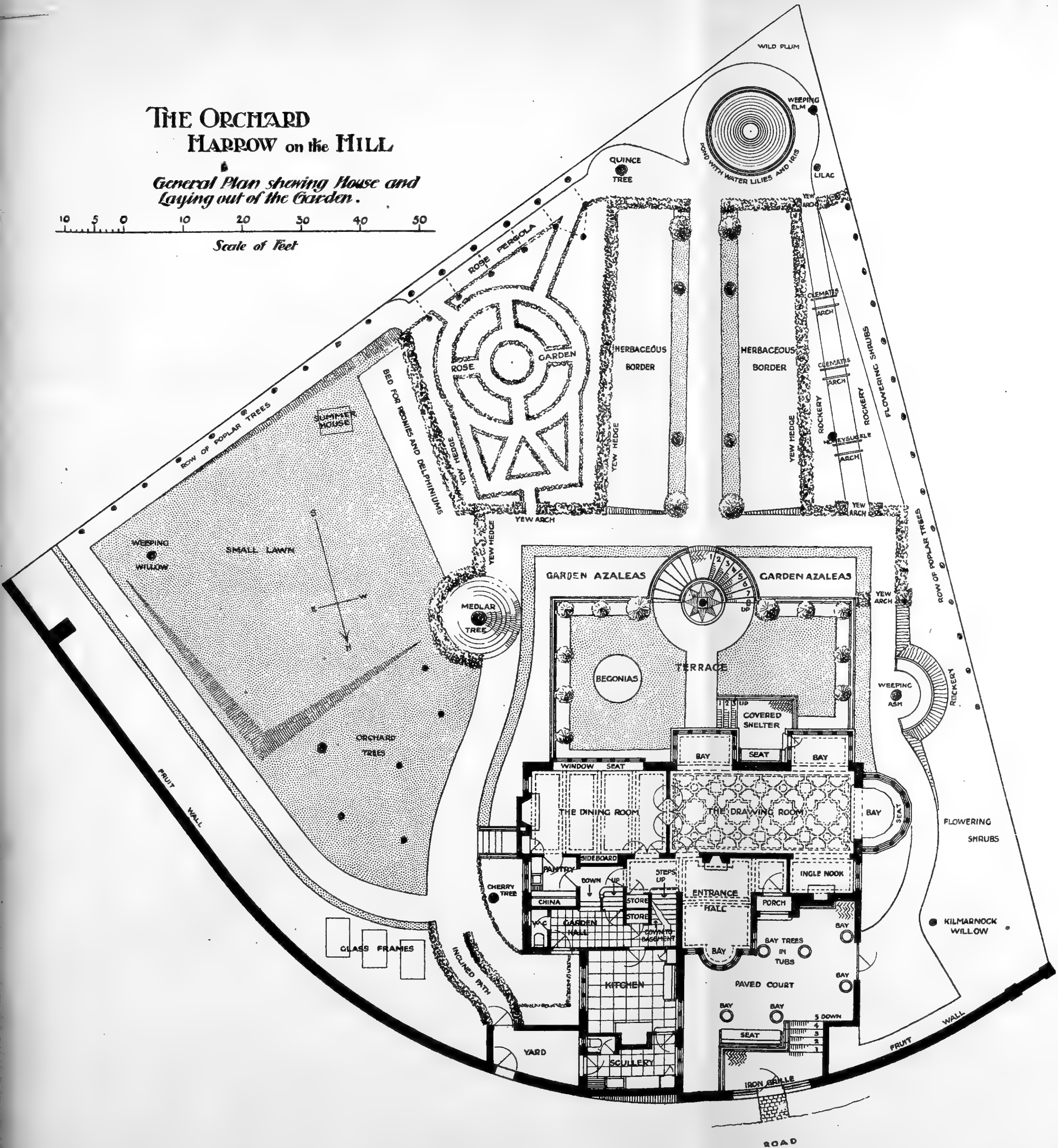

THE ORCHARD
HARROW on the HILL
General Plan shewing House and Laying out of the Garden.
10 5 0 10 20 30 40 50
Scale of Feet
WILD PLUM
WEEPING ELM
POND WITH WATER LILIES AND IRIS
QUINCE TREE
LILAC
ROSE PERGOLA
ROSE GARDEN
HERBACEOUS BORDER
HERBACEOUS BORDER
YEW HEDGE
CLEMATIS ARCH
HONEYSUCKLE ARCH
ROCKERY
FLOWERING SHRUBS
YEW ARCH
ROW OF POPLAR TREES
SUMMER HOUSE
BED FOR PAEONIES AND DELPHINIUMS
WEEPING WILLOW
SMALL LAWN
MEDLAR TREE
GARDEN AZALEAS
GARDEN AZALEAS
BEGONIAS
TERRACE
COVERED SHELTER
WEEPING ASH
ORCHARD TREES
BAY
SEAT
WINDOW SEAT
THE DINING ROOM
THE DRAWING ROOM
FLOWERING SHRUBS
FRUIT WALL
SIDEBOARD
PANTRY
INGLE NOOK
CHERRY TREE
CHINA
STORE
ENTRANCE HALL
PORCH
GARDEN HALL
DOWN TO BASEMENT
KILMARNOCK WILLOW
BAY TREES IN TUBS
GLASS FRAMES
INCLINED PATH
KITCHEN
PAVED COURT
YARD
SCULLERY
IRON GRILLE
ROAD

Fig. 21.

THE HEREDITY OF ACQUIRED CHARACTERS IN PLANTS.

By Rev. Professor G. Henslow, M.A., V.M.H., &c.

When Darwin propounded his theory of Evolution, or "the origin of species by means of natural selection," he assumed two things as axioms, viz. variability, *i.e.* the power in plants and animals to vary, and the heredity of acquired variations.

He was not so much concerned with the causes of variations in animals and plants; but, given the variations, natural selection would, he maintained, decide which was the best fitted to survive in the struggle for life. That changed external conditions of life are somehow the primary cause of variations is admitted by all; and we must look to the living Protoplasm, together with its nucleus, as the instruments in organisms, which can be affected and excited by external influences, to set up new variations in their structure, such being acquired characters.

These consist of any changes in the outward form or internal anatomy of structures, as well as the "habit" * of a plant induced by external agencies.

With regard to heredity Darwin's words are: "The correct way of viewing the whole subject would be to look at the inheritance of any character whatever as the rule, and non-inheritance as the anomaly." † Elsewhere he says: "Natural selection will be enabled to act on and modify organic beings at any age, by the accumulation of variations profitable at that age, and by their inheritance at a corresponding age." ‡

Dr. Weismann, however, introduced the word *soma* (*i.e.* "body") for the vegetative organs of plants, viz. roots, stems, leaves, and the external organs of the flower would be included; but, on the other hand, he distinguished an imaginary "germ-plasm" § in the reproductive organs, such as the embryo-sac, as distinct from the general protoplasm or living substance everywhere else within all living cells of the plant's soma.

It was this hypothetical substance to which alone he attributed, by means of its continuity, the power of carrying on all hereditary characteristics in the offspring.

When his attention was called by botanists to the fact that certain plants, such as Begonias and Mosses, are very generally propagated by means of fragments of their leaves &c., *i.e.* his "soma," he supposed that some portions of the germ-plasm must have been diffused with the protoplasm in such cases.

Since, however, the propagation of plants by their vegetative organs of any kind is possible and frequently done, both in nature and artificially,

* By "habit," it is usually meant that the duration of life, *e.g.* whether annual, biennial, or perennial, or a dwarf size, a procumbent position, &c., is characteristic.

† *Origin of Species*, 6th ed. p. 10. ‡ Ibid. p. 67.

§ I am not here concerned with Weismann's theory of its immortality.

the probability of germ-plasm being *always* associated with protoplasm would seem to form a necessary part of the theory.

But, then, the converse becomes at once more probably true, viz. that there is no such substance at all as germ-plasm, the protoplasm itself being quite able to do all the work that is required.

Microscopic investigations of the germ-cells, which give rise to embryos, exhibit definite structures called "chromosomes," which enter into the first cell of the offspring, and as there must be *something* to carry on hereditary tendencies, these are most probably the agents ; but their chemical constitution is unknown.

Dr. Weismann contends that if the deep-seated germ-plasm could be influenced by external agencies, then their effects might be retained and hereditary ; but as a rule the soma intervenes and would prevent any such influences from affecting the germ-plasm, the existence of which, however, has never been optically proved.

The question, then, which Weismann and his followers give to be answered is : Can any change of form and structure induced by external causes in the soma of a plant be transmitted to the next generation irrespective of conditions ?

The only reply is to see what nature does, and to test it by experiments. These supply two lines of proof, *inductive evidence* and *experimental verification.*

It has long been noticed that the floras of countries with pronounced climatal conditions are characterised by having a more or less general or common *facies*. Hence we are familiar with the terms arctic and alpine plants, remarkable, for example, by their dwarf character and the brilliant colours of many of the flowers. Then there are moist tropical floras, hot desert plants, and so on.

Now all the plants growing under such several conditions reproduce the features characteristic of the genus, species, &c., by seed ; so that they are obviously hereditary, *as long as they live under the same conditions.*

Do they change if taken away from their natural surroundings and are, say, cultivated ? As a rule they do not at first show, to any great extent, any alteration in strongly marked features. Thus seedling Opuntias, Cactuses, &c., retain their characters if raised artificially.

On the other hand, many plants begin to change at once. Thus naturally hairy plants may become hairless, fleshy maritime plants may acquire ordinary thin leaves away from the coast.

Similarly, aquatic plants if crowded will often thrust up branches into the air, the anatomy of which at once changes at the water-level in adaptation to an aerial existence.

The next question is, what are the causes which give rise to any peculiar *facies* ? Why are so many plants fleshy in dry countries, like the *Cactaceæ* of Mexico and the Euphorbias, Stapelias, and Mesembryanthemums of South Africa ?

Or, on the other hand, why have so many dicotyledonous plants finely dissected leaf-blades when growing under water ? Is it drought in the first case, and water in the second case, that are the causes ?

Inductive evidence means that there exists a vast accumulation of independent cases, among plants of no affinity, and situated in diverse parts of the world, whether on land or in water; so that there arises a "moral conviction" that there *are* to be seen distinct causes and effects. This line of argument leads one to the conclusion that it is infinitely probable that drought and water *are* the respective causes. It is the argument accepted by physicists who believe they know the elements in the sun, but they cannot experiment upon the sun itself to corroborate their inductive evidence, supplied by the spectroscope. Astronomers believe that the earth rotates on its axis to produce day and night; but they cannot *prove* that the sun does not go round the earth in twenty-four hours. It is solely that it is infinitely more probable that the earth should rotate than that the sun should go round it. The result is not a mathematical demonstration, but a moral conviction.

If now the peculiarities of plant-structures were acquired in response to the action of the environment, then it is obvious that they are hereditary.

Although inductive evidence is really ample to substantiate the belief, it has been thoroughly corroborated by experimental verification. Indeed, we need not go beyond the kitchen garden, for if we compare our Carrots, Radishes, Parsnips, all the Cabbage tribe, &c., with the wild plants from which they have been derived, we see at once that their peculiarities, confined as they are to the vegetative system or *soma*, are all acquired characters, and arose by the stimulating action of a rich and artificially prepared garden soil.

There is no question of germ-plasm of the reproductive organs being concerned in it; because the enlarged roots, the altered forms of "greens," Brussels Sprouts, Kales, even Cauliflowers, are all formed long *before* the reproductive organs put in any appearance at all. Yet we know that these garden forms of acquired somatic characters are hereditary, for they all come true by seed.

Turning back to the question, "Will plants transmit any acquired character to the *first* generation?" the answer is, judging by horticultural experience, any new character which the cultivator wishes to preserve must be perpetuated by selection and by using the same external conditions of soil, &c., for five or six years before he can depend upon its fixity. As a rule one year is not enough. Nevertheless, it sometimes happens that variations arise which are permanent from the first year of their appearance, as has occurred with certain strains of Chinese Primrose, species of *Œnothera*, &c. It is not, therefore, a fair question to ask for proof that any character acquired in one year shall be transmitted to the first generation; and that too, wherever the offspring may happen to grow. Nature demands accumulation under the same conditions, till fixity can be trusted and heredity secured.

"Everything tends to become hereditary," * says a writer on garden varieties, but everything must, as a rule, be encouraged for a few years, when Nature responds to the care of the cultivator and fixes the variation.

Though cultivation supplies us with ample evidence to prove the fact

* *Production et Fixation des Variétés dans les Végétaux*, par E. A. Carrière, p. 9, 1865.

of the inheritance of acquired somatic characters, experiments are not wanting to show what are the causes which have brought about the natural peculiarities of wild plants growing in distinct environments. Thus M. Lesage has proved by experiments that the fleshiness of so many maritime plants, as the Samphire, is directly due to salt.

M. Bonnier, by cultivating lowland plants at Paris, &c., upon high altitudes in the Alps, proved that they all more or less acquired the dwarf form and peculiar anatomical structure of the leaves, &c., characteristic of alpine plants, as well as the intensified coloration of their flowers. Conversely, normally high alpine plants cultivated at low levels did not change so rapidly, but required some years to do so.

M. Eberhardt carried out experiments to contrast the effect of an excessively dry air with those of a very moist one. The results were that the external forms and internal anatomy agreed precisely with those of dry alpine desert plants, and other localities noted for drought, on the one hand, and with the anatomical details of plants growing normally in very moist situations on the other, the structure of the latter being in the same direction as the anatomy of aquatic plants. Lastly, to test the question whether the finely dissected type of leaf in submerged dicotyledonous plants was due to the water, Mr. McCallum experimented with *Proserpinaca palustris*, a plant of the United States, which bears fully developed leaves in air, but dissected ones under water.*

Assuming, as a "working hypothesis," that the submerged leaves owed their forms to a surcharged protoplasm, which, by being saturated with water, was too weak, so to say, to produce full-sized leaves, he charged the water with certain nutritive salts. This set up osmotic action in the plant, and withdrew the excess of water from the protoplasm; whereupon the plant forthwith formed full-sized leaves under water.

We have thus now an abundance of proofs, both by induction and experiment, that the form and structure of the organs of plants are due to the immediate response of the living protoplasm to the influences of the environment, and that it, or rather the nucleus, builds up just those cells and tissues which are in adaptation to the conditions of life. Then, after a few years, they become hereditary and so fix the varietal or specific characters by which botanists recognise and distinguish plants in nature.

Whenever these specific characters arise in the vegetative organs, they have been acquired by them, *i.e.* the *soma*, long before any reproductive organs were in existence, and therefore before germ-plasm could be present—at least, presumably in sufficient quantity to receive impressions from without; unless, as already stated, it be as universally distributed through all the vegetative organs as protoplasm itself. But this supposition at once does away with the necessity for it, for protoplasm and the nucleus are quite able to do all the work required.

If it be further asked, "How can any impression be conveyed from the circumference, where it is received from external impulses and irritations, to the embryo-sac ?" the reply seems to be that it may be conveyed thereto by protoplasmic continuity. There is at least a machinery which it is conceivable may be capable of conveying vibrations to the germ-cells when these latter come into existence. But as to the nature of this inherent

* *Botanical Gazette*, xxxiv., Aug. 1902, p. 93.

potency we know nothing, and at present can conceive nothing; though of the *fact* of characters acquired through the soma, *i.e.* by the vegetative organs, being subsequently hereditary, there is universal evidence. It may be added that it is perfectly inconceivable how Evolution could proceed a step if it were not so; and that Darwin was undoubtedly right when he regarded inheritance as a *sine qua non* in the origin of species. Dr. Weismann was right in saying, "My theory rests upon theoretical considerations," but wrong when he added, "and the want of any actual proof of the transmission of acquired characters."

It is sometimes urged that there is no proof that mutilations and injuries, whether to the animal body or to trees &c., are hereditary. Fortunately for man, they are not; but even if they were, they are all beside the question of Evolution. What one is looking for as being hereditary are *useful adaptations* acquired by the soma, which fit the plant or animal to its new environment better than the parental structures; or else they are organs which become degenerate, as boughs turn to spines in drought, supportive tissues tend to disappear in submerged plants, and floral organs become "rudimentary."

Mutilations, injuries, or diseases are not favourable or useful variations of structure, nor are they natural degenerations. Hence all references to such have nothing whatever to do with acquired variations which a systematist regards as characteristic of varieties and species.

THE GARDEN OF ARTIFICIAL HILLS (TSUKIYAMA).

By Kenkichi Okubo.

To give the definitions as precisely as possible, the trees, hills, and rocks are indicated by numbers, as in the illustration. (Fig. 22.)

The stone No. 1, called Shugo-seki, standing in the central part of the garden, keeps all other stones in harmony. Other different names are sometimes applied to it, as Takizoe-ishi, Fudō-seki, and Tachi-ishi. It is called Shugo-seki (a commanding stone) because it is the sovereign master of the garden. The name of Takizoe is also given it because it stands beside a cascade. Or we call it Fudō-seki (an immovable stone), for it is placed steadily, and with much care and attention. It has also the name of Tachi-ishi simply because it is a perpendicular stone. Moreover, as the place where this stone is set is in the front part of the garden, a good-shaped stone should be selected. Look at the illustration, and see that it has to be placed opposite the stone No. 2.

Hai-seki, No. 3, a worshipping stone, so called with veneration, must be kept from defilement. For on it the Emperor in the Royal Court and even people living in private houses have to worship the God of Heaven. Thus, even if any of the other parts in the garden admit omission, this stone must always be set in accordance with unvarying rule. And if to make the garden lovely and picturesque the other rocks and trees are placed in different ways, yet the position of this stone Hai-seki will never be changed. It is to be placed on the middle island in the pond, for the air is purer there than in other places. So, if it is in the abbreviate style, there is excuse for the omission, but in the formal style this stone should be placed strictly to the method.

Shōzō-seki or Taizō-seki, No. 4, whichever we call it, is a stone that serves to balance all other things in the garden, the hills, rocks, trees, &c. So the name of Shōzō-seki (a counterbalancing stone) is applied to it. And, although the number 4 is affixed to this stone, it is really the third of the principal stones in the garden, being next in importance to Hai-seki and Shugo-seki. It is situated on the lower ground, but it balances and harmonises with the whole view of the garden, and without attaching much importance to its form this stone must have a good shape and be massive and strong. And if one plants a tree beside it, as is done in most cases, a tree of peculiar shape is chosen for the spot. (See the tree No. 7.)

The stone No. 5, that stands in the position facing the cascade, hills, and pond, is called Hikaye-ishi (a confronting stone). It must have a hill behind, as in the illustration, and it has another stone near it in the water. This is called Suibon-seki (a stone in the water), which stands one or two inches above the surface, and disappears when the water increases. It is placed only a step's distance from the bank, so as to enable one to pass over easily.

Teidō-seki, No. 6, is a stone looking out over the whole view of hills in the garden to make them harmonious in arrangement. So if the cascade

Fig. 22.—Design for a Japanese Garden.

(To face p. 82.)

cannot be formed conveniently, Shugo-seki, the commanding stone, will be placed here. And in that case this stone Teidō-seki is removed to the place where the tree Sekiyō-boku stands. (See the tree No. 5.) It is also called Jōza-seki (the stone of upper seat), for it is set on the upper part of the hill whence one glances over or surveys the whole view.

Karan-seki (a stone that has a round shape like a snail) is the name applied to the stone No. 7. It is placed in the central part of the stepping-stones in the front ground, and keeps them in good order. For in either case if the stones are arranged in a row like flying wild geese (Karigane-gata) or turning to and fro as the water-fowls on the wave (Chidori-gata) they must have a bigger stone in the middle in order to keep the smaller ones in harmony. It looks like a captain who leads some soldiers in the field and puts them in arrangement. Or it is also called Garan-seki, for a master of athletics named Sōami once used a stone pedestal of a temple (Garan) in this place. The principal use of this stone is for the corner-stone where the two lines of stepping-stones meet, or for the stone from which we look down into the pond. But in the latter case the stone is placed near the water at the end of the line.

Getsuin-seki, No. 8, is a stone placed on the furthest hill. The name signifies a moon in the cloud, for the stone is partly concealed from sight. Or it is also called Mikoshi-ishi, a stone that is looked over, for it is scarcely seen behind the rocks and trees that stand in front of it. Here the place must have a gloomy appearance and solitary to the view.

Yūgyo-seki (the stones under which fishes take shelter), Nos. 9 and 10, are so placed as to have a space underneath them. They stand in two positions, the upper and the lower, as in the illustration, so giving a peculiar appearance to the water's edge. From the stones by the cascade to the stone No. 9, and from the stones that are placed by the end of the bridge (Hashi-basami) to the stone No. 10, and downwards to the outlet of water, the position of the stones is most important. Such is the distribution of the principal stones, which are arranged in formal style on the artificial hills or by the pond. Many other stones are used, but they are only supplementary to add to the beauty of the garden. Those of them, however, which are worth mentioning are as follows: Hashibasami (the stones that are placed by the ends of the bridge), Ishi-dōro (a stone lantern), Hiage-ishi (a step-stone for lighting the lantern), Chōzubachi (a stone basin in which one washes his hands), Mizutalaki (the small stones in the hollow space in front upon which the water falls while washing), Tsukubai-ishi (a round flat stone, where one stoops to wash his hands), Mizuage-ishi (a step-stone for filling the basin with water), &c.

Shōshin-boku, No. 1, is a big tree standing on the hill in the central part of the garden. All other trees are planted so as to harmonise with this one, and as this tree is the object or centre by which the other trees are arranged, it is called Shōshin-boku (a middle tree). It may be an Oak or Pine, but the latter is said to be better; and it must be a big one, too, for it is the tree of trees in the garden.

Keiyō-boku, No. 2 (a tree that gives an attractive aspect to the garden), is generally a Pine tree on the island in the pond. Another smaller tree is also planted beside; but it is only for supplement, whereas the Pine tree standing in the middle gives a special beauty to the garden. So a tree nicely branched and of an elegantly crooked trunk should be selected. And it is planted in relation to the cascade, stone-basin, and the tree No. 1 (Shōshin-boku). Thus, if a Pine is used for Shōshin-boku, a leafy tree must be used for Keiyō-boku; and if the former is a leafy tree, the latter should be a Pine tree.

Sekizen-boku, No. 3, is a big shady tree, and is used to give shade in the garden. And as the whole aspect seems lonely and silent by the shade of this tree it is called Sekizen-boku (a tree in the silent quarter). Behind this some other trees are closely set on both sides, but this is the first tree in the thicket by which the other trees are planted.

The tree No. 4 is called Taki-gakoi simply because it stands by the cascade, as in the illustration.

Sekiyō-boku is a tree that stands in the spot No. 5. Here a flowering tree such as a Plum or Cherry, or a tree that changes its colour in autumn, will be planted. For the name Sekiyō represents the brilliant tint of the evening sky, and so this tree has to vie in its glory with the luminous cloud. Or as this tree is planted apart by itself on the western side of the garden, as in the illustration, it is called Sekiyō-boku (a tree that stands towards the evening sun). So if a green tree is used in this place a flowering tree or a tree of crimsoning leaves must be added to it.

Mikoshino-matsu, No. 6 (a Pine tree that is looked over), is planted further behind the hills; and so, if the area of the garden is not wide enough, the tree is planted even outside the fence, but so as to stand up over the fence or wall. If a Pine tree is not used some other tree of a different kind from Shōshin-boku or Seikizen-boku is used instead.

Nagashi-matsu, Nageshi-matsu, or Enkō-matsu, No. 7, whichever we call it, is a dwarf Pine tree only one or two feet in height, but with the branches stretching horizontally over the ground. If a Pine is not used another tree of widely stretching boughs is used, always near the water and projecting over the pond. Nagashi means "flowing branches" and Nageshi "throwing," and the name Enkō, meaning "a monkey," came from the long arms of an ape.

Besides these there are other small trees closely planted by the stones, as in the illustration. They have rounded shapes produced by pruning. Such trees are used for decoration when the stones do not seem nice by themselves.

The first hill, No. 1, is a big hill in the front part of the garden. So, if the artificial hills are to be constructed, the position of this hill should be settled at first. Then the other hills, dales, streams, and cascade are arranged in order. Here the stones Shugoseki, No. 1, and Teido-seki, No. 6, are set to command the whole system of the garden, or if it is necessary an open summer-house with paths leading to it is built. The hill does not represent a secluded mountain, but a large and extensive one with long slopes.

The second hill, No. 2, does not stand side by side to the first hill, but extending in continuation from the one behind it; the cascade falls down between this and the first hill.

The third hill, No. 3, is rather a tableland, and if a shrine or a village scene with a thatched hut is required it will be placed between this and the first hill. And under the shade or shelter of Sekiyō-boku, a tree-mentioned above, the village scene is formed, while the paths running along should be laid in a long way, as in illustration. But if a brook or a stream is formed to come down at this part it is more delightful to the view.

The fourth hill, No. 4, is small in size, and standing near the water it must have a remote and distant view.

The fifth hill, No. 5, is a further or behind hill, and, having a steep or perpendicular form, is in imitation of a recess in the mountains.

SOMETHING ABOUT HIPPEASTRUMS.

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

When I took up the cultivation of Hippeastrums in this country some six or seven years ago, I procured a number of bulbs from Lucknow, Holland, France, and England. When they flowered I gave them names, and crossed them promiscuously in order to get quantity. They were all more or less of the varieties we see at shows, but of course not so select.

The object of getting bulbs from these different countries was the hope of some new variation turning up from these different strains, but so far those that have flowered have been somewhat disappointing, as nothing startling has yet appeared, though some have been very fine. I have over two thousand seedlings of all ages. A number of the first crosses have flowered. I kept a record of their parentage, and of their form and colour, &c., but many of the tickets, being of wood, have been lost.

However, I have up to date a record of 114 of my own seedlings, and I give herewith a list of them. As I knew the names of their parents I could easily note the likeness to either parent, or to both, or otherwise, and also wrote a short description of each as it came into flower. Those of which I had lost the tickets are of course left out of the reckoning.

For the sake of brevity, I shall call the seed parent the "mother," and the pollen parent the "father." Thus:

55 took after the mother;
19 took after the father;
13 rather after the mother;
5 rather after the father;
5 took after both parents;
3 after neither parent;
3 after mother, but with modification;
1 mostly after the mother, but the father influenced;
5 had the colour of the mother, but the form of the father;
4 had the colour of the father, but the form of the mother;
1 had the form of the father, but the colour was different from both parents.

Total 114

It will be seen that the preponderance of the mother's or seed-bearer's influence is great; for

55 gave flowers much like their mother's;
13 gave them rather like the mother's;
3 were like the mother's, though with some modification.

71

That is, in 71 out of 114 the influence of the mother was conspicuous.

It should be noted that the results I am recording were of crosses between Hippeastrums of the same species that we see at shows. But many of the attempted crosses had no result; that is, the ovules were not fertilised, and the ovary perished. They behaved very much as if the attempt had been made between two different genera, or as if no fertilisation had been attempted.

It is not easy to decide whether these 71 results were crosses at all, for they did not show any sign of inheritance from the father's side. The father's pollen may have simply stimulated the ovary and ovules into action, without entering into composition with the materials of the ovules. The ovules may in these cases have been mere bulbils, or carpel buds.

Hyacinth growers, it is said, scoop out the bottom of the mother bulb, which process gives rise to the growth of small bulbils from the edges of the cut scales. The bulbils when grown to the flowering stage usually inherit the characteristics of the mother bulb. We have never been told, however, whether any sports occur among these offspring bulbils of Hyacinths.

Orchid hybridisers have noted that in their crossings the result is not infrequently identical with the mother flower. So not impossibly the *Hippeastrum* crosses, which have resulted in the repetition of the mother's characteristics, may, after all, have been what are called "false crosses."

Of course, in those cases where any inheritance of the father's characteristics has occurred, we must infer that the father's part has been duly performed. In nineteen of my recorded cases the mother's influence appeared to have been wiped out, as the flowers resembled the pollen-bearer.

I have never seen an ovary whose pistil had not been pollinated grow into activity; it always perishes, and in many cases it perishes in spite of the pollination.

When any variation occurs which does not suggest any influence of the father, although the flower may not be identical with that of the mother, the variation may possibly be the result of sport, such as might occur from cuttings or seeds of any plant. So that it is next to impossible to determine whether the variation resulted from the father's influence or from some other cause unknown.

In a comparatively few cases the cross has inherited the colour only of the mother, while the form came from the father, or *vice versa*.

I have obtained some bulbs of *Hippeastrum equestre*, which I believe originally came from Barbados.

The pollen of those that I have, which are rather difficult to flower, I have often tried on the stigma of ordinary Hippeastrums, but without result. This year, however, I succeeded in obtaining from this cross seven apparently good seeds in an imperfectly developed pod, five of which have germinated.

In India I obtained some fine results from crosses with *H. equestre*, and bulbs obtained from these, when flowered, showed unmistakable signs of features derived from that species. Their petals were not striped or feathered, but of one colour with a central equestrian star.

The stigmas of *H. equestre* and of *Sprekelia* are identical to look at, and quite different from the stigmas of the Hippeastrums we see at shows. I tried experiments between these two, but without result.

I have a strong plant which originally came with the name of *Amaryllis robusta.* I have been informed that it is only an inferior form of *Hippeastrum aulicum,* and that *H. robustum* is one of its synonyms.

I have often tried to cross this *H. robustum* with my ordinary Hippeastrums, and reversed the cross, but without success.

Last year, however, I obtained thirteen apparently plump seeds from this cross, eleven of which have germinated, and are thriving plants in their second year.

I succeeded in effecting five different crosses between the ordinary *Hippeastrum* pollinated with *H. pardinum.* The pollen of this spotted *Hippeastrum* took very readily the first time I tried it in 1903, resulting in five full pods with numerous plump seeds. Now I have a large number of this cross thriving in their second year.

In 1901 I thought I would try other pollens of Amaryllids on the *Hippeastrum* stigma. I obtained several full pods from different plants of *Hippeastrum* with the pollen of *Clivia miniata.* Many attempts with this pollen failed; but I obtained three pods, one of which contained sixty plump seeds; the other two had less. A very large proportion germinated, and now of that year's *Clivia* crossings I have a batch of strong healthy bulbs going into their fourth year.

Then, in 1902, I obtained three more full pods of this cross. My difficulty is to find accommodation for them all, a large number having germinated, which are going into their third year.

In the *Gardeners' Chronicle* of April 5, 1902, p. 230, it was stated that Mr. Chapman (Captain Holford's gardener), Westonbirt, near Tetbury, had effected a cross between these two genera, and that some were about to flower. I was much interested in this, as I had already effected a similar cross. We have not heard, however, what the result has been of Mr. Chapman's cross.

The cross between the *Hippeastrum* and *Clivia* was surprising enough, but I have to relate two more crosses between genera, which are still more astonishing.

In 1902 I obtained two full pods of *Hippeastrum* crossed with the pollen of *Ixiolirion tataricum*; a large majority of the plump seeds germinated, and are thriving and strong plants, going into their third year.

The next cross sounds ridiculous, for in 1902 I obtained a full pod of *Hippeastrum* crossed with the pollen of the 'Emperor' Daffodil! The seeds germinated well, and have made strong bulbs, going into their third year.

Now I have to record a curious result of crossing the *Hippeastrum.*

Year after year I tried to fertilise the Hippeastrum with the pollen of *Sprekelia formosissima.* I failed, the fertilised ovary invariably perished; so did the ovary of the *Sprekelia* crossed with the pollen of the Hippeastrum.

But in 1903 I repeated the trial, and two ovaries of Hippeastrum so fertilised began to grow, and I began to fill my mind with the hope that at last I had succeeded in effecting this difficult cross. Finally the pod ripened and burst, showing the interior full of the usual black seeds. I took out the seeds and spread them on a sheet of paper, and lo and behold, not one of them had any embryo in it! They were all chaff. Now what was the fun of this trick on the part of the Hippeastrum and *Sprekelia*?—the ovary, on the application of the pollen, swelling, and making believe that it is going to be full of seed, and when it bursts it is full of nothing but chaff. Such make-believes must often occur in nature, when insects visit one flower after another of different genera, and dust the stigmas with different pollens; but there is nobody to record such interesting tricks.

Of course none of these chaffy seeds germinated.

Then, in 1904, I repeated the attempt to cross these two Amaryllids. Many failed outright; two resulted in the same phenomenon of ripening their pods and containing nothing but chaff; another had apparently five good seeds among its chaff, none of which germinated; yet another seemed to have three good seeds, which failed to germinate.

Finally a Hippeastrum bore two pods which had also been fertilised with the Sprekelia pollen; and I am glad to say that this curious make-believe ceased in this case. One of the pods had forty-five apparently good seeds, of which twenty-one germinated; the other had what appeared to be twenty good seeds, of which five have germinated.

They are all in their young first blade, and may not survive their infancy, for this cross is a weak one; but perseverance year after year has at last been crowned with some seeds that have germinated.

If I were asked "What do you expect to get out of these crosses?" I would say "*Nothing* but Hippeastrums!" For my experience has been that, even when *Hippeastrum* is crossed with *Hippeastrum*, if the thing takes, the prepotency of the mother-factor wipes out the pollen-factor, and in bigeneric crosses, when they succeed, the prepotency of the mother-factor is likely to be even greater. All the individuals of these bigeneric crosses have the foliage of the Hippeastrum; and so, I think, will be their flowers.

In "Indian Planting and Gardening" a writer, signing himself "G. C. O.," from Mussoorie on September 20, 1898, declared that he succeeded in crossing the Hippeastrum with the pollen of the Sprekelia. He says, "I have secured the intense colour of the Sprekelia in the form of the Hippeastrum. I may mention that not one plant in the whole collection took the form of the Sprekelia."

Yet, when I was in Florence many years ago, I visited the Giardino Santarelli, famous for its Camellia bushes. The gardener also grew the *Amaryllis*, or *Hippeastrum*, as it is now called. The owner showed me a coloured drawing of one of his Amaryllises. It had exactly the form of the Sprekelia, with broad petals of a white colour, slashed and veined crimson. He kindly gave me a copy of that coloured drawing, which I posted to the "Garden," but I do not think that it was ever reproduced in that journal. Perhaps that drawing may still be among the archives of the "Garden," if it ever reached its editor.

The plant itself was not then in flower. The drawing, however, was very beautiful and unique.

The Hippeastrum very often has on its face the stamp of having been evolved from a Sprekelia-like ancestry.

The flower consists of three outer (often called sepals) and three inner petals. The three upper ones (one outer and two inner) are similarly coloured and striped, and are curved upwards. The lower three (two outer and one inner, usually smaller) are very often differently marked, and they often project forwards like a shovel. The two outer and lower ones, as broad as the upper three, are often only marked in their upper half, while the lower half may be not marked at all. The smaller and lower petal is often only faintly marked.

Of course modern florists have been endeavouring to make a regular flower of the Hippeastrum, with *all* the petals of equal breadth, and *all* equally marked. They would succeed much better, I think, if they could evolve a flower looking upwards, like the modern form of *Gloxinia*; such a form not improbably was the original one from which the modern one, looking sideways, may have resulted by heavy insect agency. The position of the stamens and pistil, resting on the lower and usually smaller petal, with the different markings of the three lower petals, would indicate that our modern Hippeastrum came from a Sprekelia-formed ancestor.

We would have then something like the following life-history of our modern Hippeastrum. First, it was a regular flower looking upwards; second, it was made to look sideways by insect agency, which gave it a somewhat Sprekelia form; and third, the florists are endeavouring to turn it into a regular flower again, with this difference, that they wish to keep it facing sideways, as in a pot on the stage of a glass-house the beauty of its flowers can be more easily seen. But Hippeastrums are not always grown in pots. In Lucknow I grew them in the ground under the shade of trees, and in Ceylon I have seen them grown in the open border.

Taking everything into consideration with regard to these bigeneric crosses, there may be perhaps a faint chance that some of them may inherit the colour, if not the form, of the male plant.

"Nothing can be known without trying," and time will show whether among a lot of perspectively "false hybrids" something new may not turn up.

The crossed plants are all Amaryllids: that is, in Darwinian phraseology, they have descended from a common stock, during the ages through which they have existed.

I believe, according to Mendel's law, crossings, at first, mostly take after the mother. But if these are again *self-fertilised*, their progeny may split up into the two original parent forms. Unfortunately, I have not life enough left to carry on these experiments further.

Mr. C. R. Fielder stated in the "Gardeners' Chronicle" of April 30, 1904, that it took him from 1893 to 1904, that is about eleven years, to evolve a wholly white *Hippeastrum*. In reality it is not a *pure* white one, but a *creamy* white. I have had Hippeastrums of a milk-white ground, feathered crimson. If some one, as indefatigable as Mr. Fielder, were to take these up and endeavour to eliminate the coloured feathering, he might succeed in producing a Hippeastrum of a whiteness as pure as that of the *Lilium candidum.*

A lifetime is scarcely long enough to carry out these experiments to a satisfactory conclusion and with scientific accuracy.

APPLE AND PEAR SCAB.

By M. C. Cooke, M.A., LL.D., A.L.S., F.R.H.S., V.M.H.

This disease is the most universal and destructive of any which hitherto has attacked the Apple and Pear. It may be treated as one disease on both fruits, although the fungus which produces it is slightly different in the two cases, it being known scientifically as *Fusicladium dendriticum* when occurring on Apple, and *Fusicladium pirinum* when attacking the Pear. There are slight differences in the sporules or conidia of the two species, which account for the difference in the name. The habit, external appearance, life-history, development, and remedies are the same in both cases.

The black mould which causes the disease appears sometimes on the young twigs before the leaves have expanded, on the young or mature leaves, and on the fruits, even in their earliest stages and in their more mature condition. It is sometimes called the Apple or Pear Scab, and sometimes Black Spot. Not only is it known throughout Europe, but it is one of the greatest pests in North America and in Australasia, being found wherever these fruits are cultivated.

The Illinois Horticultural Society has estimated the loss of fruit from this disease in each county of the State in Apples alone to be 20,000 bushels, or a value of 400,000 dollars for the entire State. In Missouri the loss is estimated at half the crop, in Kansas one-fourth of the crop, and in Indiana about one-sixth of the crop. In America it is most severe in seasons when damp cold weather prevails at the time the fruit is forming. In dry warm springs there is a marked absence of the disease. It is more prevalent in heavy soils, where drainage is poor, than in light well-drained lands.

In Australia the Department of Agriculture, Victoria, estimated in 1902 that over eight thousand acres the sum of £40,000 may be taken as roughly representative of the annual losses in Victoria on Apples alone. The *Agriculture Gazette* of Tasmania states that "this disease does more damage and occasions more loss than all the other pests combined."

On the leaves there first appear small dark olive patches with a rounded outline. As these increase in size their surface appears velvety, and the margins become more irregular, and sometimes two or more spots are confluent. Although most frequently on the upper surface of the leaves, spots sometimes appear on the under side and upon the petioles, occasionally on the young twigs.

On the fruit the development of the spots is similar. They appear to start from a centre of infection preserving a rounded form. The spots increase in size, the cuticle cracks, and forms a light-coloured ring about their margin, the greatest vigour remaining about the margin where the fruit seems stimulated to the production of a sort of corky layer in its effort to throw off the disease, which results in the formation of a kind of scab. Often the young fruits are attacked as soon as they are formed and the petals have fallen away.

The mycelium of the fungus creeps along beneath the cuticle and soon produces short erect brown threads on the dark spots which cause the velvety appearance of the surface, and ultimately the apex of each thread is capable of producing a single spore, or conidium, which is also coloured and oval, egg-shaped or pear-shaped, or attenuated towards each end, and sometimes divided by a septum into two unequal cells.

These spores, or conidia, germinate rapidly in water or in a moist atmosphere. Spots may sometimes be seen covered with the fallen conidia in various stages of germination. It has been found that they will germinate most readily in pure water of a temperature of about 50° Fahr., and within about eight hours.

Another method of reproduction has been intimated by the United States Department of Agriculture, to the effect that the individual cells of the mould under certain conditions will push out germ tubes, which develop into new individuals; a method "which may be roughly compared to that by root cuttings in some of the higher plants."

Latterly it has been affirmed that the diseased leaves which lie on the ground in winter develop in that condition a higher or more complex form of fruit, in which the sporidia, or reproductive bodies, are produced within asci, as in other sphæriaceous fungi, and are extruded in spring when they are capable of germinating and infecting fresh leaves. The name applied to this final condition is *Venturia inæqualis*.

We have only now to indicate the methods which have been recommended to combat this disease, whether occurring on Apple or Pear trees.

In early spring before the buds have commenced to expand, spray the trees thoroughly with a solution of sulphate of iron, using one pound of the iron sulphate to each gallon of water.

As soon as the fruit has set, apply the Bordeaux mixture (sulphate of copper and lime), or one of the modified preparations of eau céleste (sulphate of copper and ammonia).

If the weather should be such as to favour the development of the "scab," a third application should be made two or three weeks after the second, using the same material.

In storing the fruit for the winter especial care should be taken to separate all the fruits showing any signs of the "scab" from those which are smooth and healthy, and they should all be kept in rooms or cellars free from moisture.

When the spots have been found to develop themselves on the leaves too late to be checked, all diseased leaves should be collected and burnt, so as to prevent the dispersal of the spores.

All dead leaves should be carefully collected when fallen from the trees and burnt at once before the ascigerous fruit is produced and a new element of infection comes into existence.

Badly infected trees are a great source of danger in an orchard, and would be better condemned and removed to save the rest.

For reference the following authorities may be consulted: *Journn. R.H.S.* xxviii. 1903, pp. 6, 14, Pl. X. fig. 3; *Gardeners' Chronicle*, November 28, 1885, figs. 155, 156; Massee's *Plant Diseases*, 302, figs. 80, 81; *U.S.A. Depart. Agr.* 1887, p. 341; *Depart. Agr. Victoria Bull.* 3, 1902.

METAMORPHOSES OF INFLORESCENCES AND FLOWERS.

By Rev. Prof. G. Henslow, M.A., V.M.H.

Introduction.—One of the most inexplicable things in plant-life is what may be called a normally localised energy concerned in making some one organ, taking up the function of another, so that a special structure is evolved, of a different kind, and altogether outside its usually perfectly limited sphere of action.

Hence, assuming that a whole inflorescence contains a peduncle and pedicels, bracts and bracteoles, the flowers being composed of sepals, petals, stamens, and carpels, all sorts of interchanges, very often only imperfectly effected, may occur between them.

If it be asked why any particular metamorphosis takes place, scarcely any satisfactory answer can yet be given at all. The reason is that it is a matter which is concerned with or executed by *life*; and we do not know what life is, nor the laws governing its activities. We see the *effects* of unknown causes in the changes of structures, but we know nothing of the nature of those causes and processes executed by life, which have brought them about. We may, however, always see an *object* in view, whether it be successfully obtained or not; but how it came about, for example, that the peduncle and pedicels of the inflorescence of the Vine could be converted into an excellent climbing organ or tendril, as perfectly adapted to its purpose as the stalk and branchlets are to carry grapes, is a mystery past finding out.

If a Vine be well searched, many examples can be found in which the tendril bears a few abortive buds revealing its true source.

We must, however, distinguish between useful metamorphoses on the one hand, and more or less useless ones on the other. The former have resulted in well-defined and important organs. The latter remain as abortive attempts at changes only.

Metamorphoses in Peduncles and Pedicels.

Useful Changes.—Besides the Vine, there are other plants of which the flowering branch has been changed into tendrils, but of different kinds. *Ampelopsis hederacea* or Virginia Creeper and its ally *A. Veitchii*, the Passion-flower and *Bauhinia*, well illustrate Nature's power of adaptation of floral axes for climbing by tendrils, in different ways and in different families of plants.

Everybody is familiar with the method of climbing by adhesive pads in the two species of *Ampelopsis*, both belonging to the Vine family.

The Virginia Creeper turns its tendrils away from the light so as to reach, if possible, a rough surface. As soon as the hooks at the end of the branchlets catch in any little depression, the irritation causes them to swell into adhesive pads, which are never formed previously to contact.

In the Japanese species, however, the pads are developed *before* any contact takes place, but are not adhesive till such is the case. Hence the former reveals the evolutionary history of the tendrils in the latter species, in which the effects of a mere irritation are hereditary.

The Passion-flower has only the peduncle transformed into a tendril, which behaves precisely like that of our common Bryony; but in this latter plant the tendril appears to be more comparable to a stipule, having, however, a somewhat anomalous origin.

Another form of a climbing organ constructed out of a flowering branch is that of a hook. This is seen in *Uncaria*, *Artabotrys*, &c., which enables the plants to scramble if not to climb.

A very different but useful metamorphosis of a peduncle is seen in the structure of certain inflorescences. Thus, in the Fig the peduncle forms the bag-like edible structure, the inner surface of which is densely covered with flowers. The forerunner of this is seen in the open dish-like form of *Dorstenia*, of the same family. It is comparable to the so-called "general receptacle" of the *Compositæ*, well seen in the large plate-like structure which carries all the florets and fruits of a Sunflower. The same is edible in the Globe Artichoke.

In whole groups of flowers the pedicel forms what is called the "receptacular tube," such as the hep of the Rose and the cup round the pistil in a Cherry blossom. In both, the sepals, petals, and stamens arise from the rim, having been elevated by the growth of the tube. The tube or cup may be *adherent* to the ovary. Such is the case in the Apple, in which the two adjacent skins or epidermides are not developed, so that the two middle tissues become confluent; the core really representing the *inner* epidermis of the carpel only.

The use of the receptacular tube, and explanation of its origin, appears to have been as an organ for secreting honey. Such is well seen in the Raspberry, in which it forms a circular honey-trough round the pistil.

In the remarkable inflorescence of *Marcgravia*, the circlet of pitcher-like structures are abortive flowers, instead of which the peduncle has developed honey-pitchers. In several plants a not uncommon metamorphosis is for the pedicels to change into short thickened axes, and the parts of the flowers to be replaced by bulb-scales, so that veritable and propagative bulbils take the place of flowers, and in course of time fall to the ground. This is a peculiar habit in some Onions. In Alpine grasses little leafy buds often occur instead of flowers, and the panicle being heavily weighted falls to the ground, where each of the tufts may then strike root, and so form a new and independent plant.

Useless Changes.—The peduncle or pedicels which terminate in flowers are sometimes "proliferous," in which case the axis does not cease to grow, but continues through the flower (instead of the pistil), and may either become a perfect leafy shoot, or attempt to form a flower, the parts being more or less foliaceous; then it may proceed further and finally terminate in a perfect flower.

Cultivated Roses and the wild Water Avens (*Geum rivale*) are peculiarly liable to this procedure.

In the Feather Hyacinth (*Muscari comosum* syn. *Bellevallia comosa*) all the flowers are aborted. The upper ones of the raceme are normally so when wild—it is a common field weed in Malta—but under cultivation the peduncle and pedicels elongate, becoming pink or purplish, and assume a large feather-like structure. Of course all functions of a reproductive character are entirely gone.

Fasciation is another common affection among peduncles, but it does not reveal any special use to the plant. The flowers, however, remain perfect, perhaps sometimes increased in number, and their fruits are fertile.*

Bracts and Bracteoles.

Origin of Bracts.—Bracts and their diminutives, bracteoles, are usually abortive or arrested leaves, from the axils of which peduncles, pedicels, and sessile flowers arise. In their origin, they may be homologous with the petiole, or leaf-stalk, alone, or with the lamina, or blade, alone. As an example of the former, perfect transitions can be found between the "pedate" leaf of the Hellebore and the small oval and pointed bract. This is obtained by reducing the blade to nothing and expanding the petiole.

In Buttercups, however, the bract will be seen to consist of rudimentary segments of the lobed blade, the petiole being suppressed.

In some flowers, as the Willowherbs (*Epilobium*), the bracts are normally sessile leaves merely reduced in size.

Useful Changes.—Though bracts are usually rudimentary leaves, they constitute useful bud-scales, and so protect the flowers or florets within them. Thus in Composites they form the "involucre," *i.e.* a "wrapper," but they may retain or re-acquire a foliaceous character. They can thus perform all the assimilative and other functions of leaves. Such is the case with the large "spathe" of most Aroids, as of our *Arum maculatum*, the "Lords and Ladies."

Another use to which they are sometimes put by Nature is to make them attractive by their being white or brightly coloured. Thus in "Everlastings," among Composites, they may be white, yellow, red, purple, &c., while the florets themselves are comparatively inconspicuous. In *Hedaroma* (*Darwinia*) and *Hæmanthus*, the bracts take on a very bright coloration and assume all the appearances of a gorgeous corolla.

In some species of *Cornus* the four bracts are white, so that the head of flowers mimics a four-sepaled *Clematis*.

Useless Changes—Several members of the *Compositæ* growing in dry inhospitable conditions develop spines in place of the bracts of the involucre. This spinescence is a common feature in other organs on desert plants as the result of drought. Such occurs in Thistles, and especially *Centaurea Calcitrapa*, the 'Caltrop,' so called from the resemblance of a head to that instrument of warfare. Such is not, however (any more than spiny shoots and leaves of Thistles and Gorse), intended for a protection against browsing animals, but is simply a common result of a deficiency of water.

In many plants bracts and bracteoles are quite rudimentary and useless, as in *Umbelliferæ*, or wanting altogether, as in *Cruciferæ*.

* For further details on this subject, I would refer the reader to my paper on "Fasciation and Allied Phenomena," *Journ. R.H.S.* vol. xxvi. p. 155.

FLORAL ORGANS.

Calyx.

Useful Changes.—The calyx as a rule is green in the bud and acts as a protection to the internal organs. It is mostly homologous with the petiole only of a leaf, as may be readily seen in a Rose-bud, in which the imperfect leaflets are still present, but as functionless remnants of the compound leaf.

In some few instances the blade is present, as in the Corn-cockle.

Sometimes the blades are restored abnormally as true leaves, when, of course, they re-acquire the functions of normal foliage. Thus, in the cultivated variety of Primrose known as 'Jack-in-the-Green,' the calyx develops the limb, or blade, thereby becoming foliaceous, so that each sepal is equivalent to a perfect leaf.

The calyx may be either normally or abnormally coloured. *Clematis, Anemone, Caltha,* and Hellebore have no corollas, the white or coloured calyx undertaking to be the attractive organ instead.

Abnormally, it is seen in the 'Hose in hose' form of *Mimulus, Azalea, Campanula* ('Cup and Saucer'), and Primrose.

In *Hydrangea,* the calyx is large, white or coloured; but this is secured at the expense of the other organs (corolla, stamen, and pistil) becoming abortive; so that no seed can be set, and the flowers are said to be neuter.

As a rule it is only the outermost flowers of the cluster which thus render the whole attractive, so that the perfect but very inconspicuous little flowers in the middle can be discovered and visited by insects.

Useless Changes.—Degeneracy of the calyx to useless rudiments is by no means uncommon. It may be even entirely suppressed. This is especially the case when flowers of an inflorescence are much crowded. Hence members of the families *Dipsaceæ, Valerianaceæ, Rubiaceæ, Compositæ,* and *Umbelliferæ* are particularly characterised by having rudimentary sepals, or none at all. In the *Compositæ* it is often represented by hairs or the "pappus," when it re-acquires a use for dispersal.

Some other useless changes or conditions of the sepals are seen in malformations when the sepals try to be stamens or carpels. Such are comparatively rare, but have been described in *Philadelphus speciosus,* in which the sepals attempted to become stamens, and in double flowers of the Garden Pea the sepals formed open carpels with rudimentary ovules.

Corolla.

Useful Changes.—The normal use of a corolla is as an attractive organ, being visible to insects. It may, however, become green and foliaceous, in which case its use is changed to that of leaves.

Such occurs in the cultivated Green Rose and Alpine Strawberry, and not infrequently with late flowers of the Wild Honeysuckle, &c.

Useless Changes.—The wild Guelder Rose resembles the Hydrangea in having the flowers on the circumference of the truss or corymb conspicuous but neuter, while the minute central flowers are perfect; this is not the petaloid calyx, but an enlargement of the corolla, which renders the corymb conspicuous. In the garden form all the flowers have enlarged corollas, by the sacrifice of the essential organs. Hence the globular mass of flowers is now of no use to the plant at all.

In some few plants the corolla has been known to bear abortive anthers. Such has occurred in Foxgloves, *Campanula*, and Begonias. There may be even an effort to produce or convert a petal into a carpel with ovules. Begonias not infrequently exhibit various kinds of such malformations, but they are always abortive.

A large number of plants have flowers which show an entomophilous ancestry, but are now in a state of degradation, having become self-fertilising and far more fertile than was their previous condition. Under this changed condition the corolla is greatly reduced or has vanished. Shepherd's Purse is a case of the first; cleistogamous flower-buds of violet, the second. Such degradations may be regarded as metamorphoses into rudimentary organs.

STAMENS.

Useful Changes.—The change from stamens to petals has laid the foundation, as it were, for the whole floral world. The first flowers, as far as we know, had no corolla nor coloured calyx. The Gymnosperms certainly preceded both Dicotyledons and Monocotyledons; and if existing forms of Gymnosperms have retained their primitive and ancestral characters, nothing but *yellow* anthers existed to tell us both what was the primitive colour, other than green, and what was the origin of petals. That stamens of Gymnosperms originated out of green scales appears revealed in such types as Cypress and Juniper; while, turning to ordinary flowering plants of the above-named classes, we seem to see the process of petal-making at work in such plants as Water-lilies and Cannas.

In the former, as the filament broadens, the anther-cells become arrested, till complete petals are formed, in tracing them from within outwards, as may be readily seen in dissecting the flowers of the Water-lily.

In *Canna* all stamens are petaloid with the exception of one.

As another useful change, we find the filaments broadening in *Atragene*, forming quasi petals, but really destined to secrete honey.

In several other members of the *Ranunculaceæ*, it is the anthers which have undergone a change and become converted into honey-secreting nectaries, as may be well seen in the Winter Aconite and Hellebore. In the Buttercup one half of the anther constitutes a petal, the other half remains as a minute flap at the base. Between the two is the honey-secreting surface. Besides the Hellebores, in the Aconite, Larkspur, and Columbine the anthers have become variously spurred nectaries.

Useless Changes.—Double flowers are usually composed of metamorphosed stamens and carpels, coupled with a great multiplication of their number. Thus a Wallflower has normally six stamens and two carpels, but a double flower of this plant may have more than fifty petals.

In such flowers, whenever all sexuality is lost the doubling is of no utility to the plant itself.

This kind of doubling is mostly the result of the formation of petals out of filaments; but a "petaloid" condition often first shows itself in the anthers. In some forms it remains with them as explained in the Buttercup. In the double Larkspur the concentric circles of spurred petals are the result of several series of stamens having their anthers converted into spur-like nectaries, the spurs fitting one into another in radial series.

Double Flowers.

The word "doubling" may be applied to any organ which is multiplied; so that, for convenience, various kinds of metamorphosis, &c., may be gathered together under this head as follows.

Beginning with bracts, it sometimes happens that the flower is totally arrested. The diverted energy is now directed into bracts, which are thus abnormally multiplied to a great extent. Thus arises the "wheat-eared" Carnation, in which the two pairs of opposite bracts of a normal flower are multiplied so as to form a long series, roughly resembling an ear of wheat.

In the 'Green Dahlia' the florets of the heads are suppressed, so that the usual small chaff-like scales become enlarged into a mass of green bracts.

The multiplication of the sepals, with or without any other perceptible change, is not particularly common. An increase has been observed in the Plum, Elder, Fuchsia, and Water Dropwort. It is not uncommon in Tulips, Iris, Narcissus, &c.

The corolla may have its petals multiplied irrespectively of any conversion of stamens into petals. There may be two or three corollas, one within another, as sometimes occurs in Campanulas. Double Stocks will occasionally have many series of petals and yet retain the six stamens and pistil in the centre unchanged and effective for setting seed.

In some flowers both calyx and corolla are repeated together over and over again, being slightly separated by short internodes on the axis which has elongated through the flower. This is the case with the flowers of a cultivated form of *Arabis albida.* It has occurred in *Helianthemum vulgare* and in a remarkable Mignonette issued by Mr. Balchin, called *Reseda odorata prolifera alba.**

Many Composites are said to be "double," but it is really a false name. Thus when the "single" Dahlia was first cultivated it was described as having only five petals, but is said to have soon shown eight; probably thirteen † and twenty-one followed suit until the whole head was a mass of "petals." The interpretation of this is that the "head" consists not of petals but of florets; those of the "ray," on the circumference, having broad-limbed corollas, and those on the "disk" having minute five-toothed corollas. The number of ray-florets became increased by the conversion of tubular disk-florets into broad-petalled ray-florets.

When the tubular corolla with five petals changes to a large ray-floret, two of the petals are suppressed, while the remaining three become greatly enlarged. Simultaneously, the five stamens are arrested,

* I have described and figured this in the *Journal of the Linnean Society*, vol. xix. p. 214, pl. 32.

† These numbers are accounted for by the law of phyllotaxis, which need not be here discussed.

the pistil remaining in a normal condition so that a completely "double" Composite is entirely female, and can only set seed by the aid of pollen from some more or less unchanged flowers.

In Centaureas, however, the trumpet-like ray-florets are so much enlarged that the pistil is now sacrificed as well as the stamens; hence the ray-florets are all neuter and functionless, except so far as they enhance the attractiveness of the head.

PROBABLE CAUSES OF "DOUBLING."—The primary cause of doubling appears to be any check to the vital activities of a plant; the principal one, at least in the wild state, being a very poor dry soil and a dry atmosphere.

Darwin wrote as follows in 1843 to the "Gardeners' Chronicle" about some plants of *Gentiana Amarella*: "The plants grow on a very hard bare chalk bank, where it was surprising that anything could grow at all. I found on an adjoining field of wretchedly sterile clay great numbers of *Ranunculus repens* producing semi-double flowers. The partial or entire sterility of double flowers is generally attributed to their doubleness, but is not this putting the effect before the cause? It is well known that plants when placed out of their natural conditions become sterile. Linnæus has remarked that most Alpine plants, when cultivated in the lowlands, are rendered quite sterile. Is it, then, too bold a theory to suppose that all double flowers are first rendered, by some change in their natural condition, to a certain degree sterile?"

Observations on the conditions associated with doubling seem to corroborate this idea of Darwin's, for several instances have been recorded of wild plants becoming double under impoverished conditions of the sort mentioned.

A drier climate than that of England probably accounts for more double flowers being raised on the Continent than in England, as I learnt from the late Mr. Bull.

The Rev. C. Wolley-Dod and others have pointed out that the wild English Daffodil often becomes double when transferred to gardens, but that in his own cold and wet soil double-flowering plants tend to become single. Similarly, in a garden in Italy the owner could "keep no single Daffodils for more than a year or two, as they all turn double." The change of climate and soil appears to be the cause of doubling in these cases. Another writes saying that "the Tenby Daffodils (*Narcissus obvallaris*) have nearly all become double in this dry sandy soil (near Hitchin). *N.* 'Golden Spur' has also become double this season, 1904." Early double Tulips are best associated with a dry poor soil, as it is conducive to doubling, according to Mr. Houston.

Mr. Douglas's experience with Carnations is that potted plants produce more "doubles" than those grown in the open. "The finest lot of choice varieties was in a hot dry season." "In a German establishment thousands of flower-pots about five or six inches in diameter were arranged on a wooden staging fully exposed to the open air, and I was also informed that it was necessary to grow the plants in this way, to make sure of the seed producing a large percentage of double flowers." Mr. Douglas also observes that "the pink has a greater tendency to produce double flowers than any other plant known to me, and certainly the tendency is greater in rather exhausted soil, as can easily be proved by allowing a bed to sow itself from the previous year's bloom, and the plants to flower on the same ground without manuring, &c." As another illustration, the second and weaker growth of Peas, issuing from the lower part of the stem, bore double flowers. Hence an enfeebled constitution also appears in this case to have been the cause. Similarly, weak plants of *Lapageria* bore double flowers, while stronger plants grown with them bore only single flowers.

Frost affecting early shoots of Roses and early-blossoming Pelargoniums, as well as the reduced temperature of autumn, causes flowers of Apples and Pears to be more or less liable to doubling.

A check received by repotting Pelargoniums and weakly Cinerarias was noted to produce double flowers. Even too cold water, grubs of insects and minute fungi attacking flowers, thereby checking their development, have been credited with the same result.

Crossing and hybridising are said to encourage the appearance of double flowers. This is attributed to a slight want of harmony between the sexual organs of the parents, the consequence being deformed seeds. Such occurring in *Leucojum*, without any crossing, produced plants with double flowers. The well-nourished seeds of *Leucojum* developed only single flowers.

Stocks bearing defective sexual organs, due to drought, bore seeds which developed into double-flowering plants. Similarly, Camellia seeds raised in dry conditions gave the same result.

Hence it will appear that Darwin's acute surmise in 1843 is fully borne out by subsequent experiences. Doubling having been acquired, it may become congenital. Thus Lemoine crossed a semi-double Lilac with pollen from a single, and thirty out of forty seedlings were double or semi-double. Similarly, a hybrid between East Indian Rhododendrons showed a slightly petaloid anther. Mr. Heal pollinated it with its own pollen. The whole of the Balsamæfloral section is the result of that single impregnation.

As any influence which may affect the reproductive organs may cause them to attempt a metamorphosis, it is not surprising to find exactly the reverse conditions to drought may induce doubling where plants have been long habituated to conditions of dryness. Thus *Kerria japonica* has become double in Europe, including England, but is single in Japan. I have seen the single-flowered form in Sir T. Hanbury's garden at La Mortola, Italy, and in Tunbridge Wells (on sandstone).

Cardamine pratensis has been found to produce double flowers at two very wet places.

Reversions from doubles to singles occur when the conditions are changed. Thus double Daffodils become single in poor, cold and wet, or shaded soils.

Double Balsams when "starved" became single-flowered; but with a liberal treatment bore double flowers, &c. This shows that when "doubling" has been acquired it becomes constitutional, and is greatly improved by high nourishment. But this latter *alone* does not seem to be capable of bringing about the metamorphosis at first.

Carpels.

Useful Changes.—Wherever carpels change into any other organ they of course lose their function of setting seed as in completely double flowers, but if they become foliaceous they acquire all the functions of the leaves, as in the Green Rose, Double Cherry, &c.

Useless Changes.—Besides the carpels being replaced by petals, it sometimes happens that petaloid structures take the place of ovules. Such occurs occasionally in *Cardamine pratensis* and betrays itself by the fruit being globular instead of a long siliqua or pod. Again, stamens have been known to replace ovules, but these metamorphoses are by no means of common occurrence and are always abortive and useless structures.

Sexual Changes.

Useful Changes.—In plants with distinct sexes in different flowers, whether they be both on the same plant (monœcious) or on separate plants (diœcious), female flowers may appear mixed with or in place of male ones, and *vice versa*. Thus ripe grains of maize may be found intermixed with the staminate flowers of a male panicle. So too female flowers sometimes occur on the male catkins of the Spanish Chestnut. Conversely, anthers may occur in the female cones of Pines.

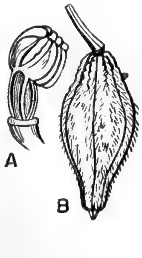
In unisexual plants external conditions may bring about a change of sex. Thus the males are usually borne by *weaker* shoots of trees, and a greater preponderance of males among herbs appears when there is a less amount of nourishment for all the seedlings growing thickly together.

Useless Changes.—The last kind of changes attempted by stamens is into carpels. This is not at all uncommon in certain plants. Thus in all large growings of Wallflowers, as for market purposes, there will generally be found "rogues"; they do not open their flowers, the petals being dwarfed and imperfect, while the six stamens are changed into abortive carpels, often partially open or more or less coherent with the pistil in the middle. They bear rudimentary but useless ovules.

Oranges grown in conservatories often bear small rudimentary carpels more or less coherent to the ovary at the base, and when this swells into the fruit the "pistilloid" stamens form small orange-coloured projections on the fruit.

Poppies, again, not infrequently have a circle of little abortive carpels round the base of the pistil They have arisen by metamorphosis of the stamens.*

* Other abnormalities will be found described in Dr. M. T. Masters's *Vegetable Teratology.*



ON THE PRESENT ASPECT OF THE EPIDEMIC OF THE AMERICAN GOOSEBERRY-MILDEW IN EUROPE.

By Ernest S. Salmon, F.L.S., F.R.H.S.

The American Gooseberry-mildew (*Sphærotheca mors-uvæ* (Schwein.) Berk. & Curt.) was recorded from Ballymena, County Antrim, Ireland, in 1900. This was the first appearance of the disease in Europe (1).* I have described in two recent accounts in this Journal (Bibliogr. 2, 3) the gradual spread of the disease in Ireland in the succeeding seasons of 1901 and 1902, and also its appearance in Russia. I have now to record the continued increase of the disease in both Ireland and Russia. From the reports and specimens sent to me during the last season by numerous correspondents, I can state that in Ireland the American Gooseberry-mildew now occurs in nine localities in six counties. From Russia it is reported from ten widely separated districts.

At the risk of repetition I cannot refrain from urging here that vigorous steps should be taken at once by the authorities to stamp out this disease in Ireland.

The historic case of the outbreak in Europe of the Vine-mildew—a fungus closely allied to the Gooseberry-mildew—affords an example of the immense and wide-spread economic loss such a disease as the present one can cause.

The Vine-mildew—a fungus native to America—appeared in Europe for the first time on hothouse vines at Margate in 1845. The next year it spread in the hothouses of that neighbourhood. In 1847 it was reported from one locality in France. In 1848 it occurred in several localities in France, and in Belgium. In 1850 the vineyards round Paris were devastated, and the disease was reported from Spain and Italy. In 1851 the disease was general in all the vineyards of France, and in those of the Mediterranean basin; and it was reported from Hungary, Greece, Switzerland, Syria, Asia Minor, and Algeria. Except in the neighbourhood of Paris and in the province of Piedmont, where it wrought wholesale devastation, the damage caused by it as yet was not serious, except in a few isolated localities. In 1852, 1853, and 1854, however, all the French vineyards, without exception, were invaded to such an extent that their yield was reduced to a tenth or twentieth, and the effect of the epidemic on the economic conditions of the country was such that in certain districts the population emigrated. In all the countries affected Government Commissions were appointed to investigate the matter, and Consular Reports were also issued.† The disease had now reached its climax, and in 1855 it was less devastating, and the harvest of the vine-

* See Bibliography at end of article.

† Some idea of the consternation caused among viticulturists and the agricultural authorities in these years, and the enormous loss to the revenues of the countries, may be gathered from contemporary articles; see H. von. Mohl in *Botan. Zeitung*, 1852, 1853, and 1854; Montagne, in *Journ. Hort. Soc.* ix. (1855). See also Viala, *Maladies de la Vigne*, 1893.

yards was estimated at one-third to one-fourth of the normal yield. The disease, however, up to the present day still occasions a great annual loss, and is now almost certain to appear wherever vines are grown, It is, indeed, only kept in check at the cost of repeated sulphurings; and almost every week the viticultural journals contain accounts of local outbreaks of mildew, and proposals of fresh means of combating its persistent attacks.

FIG. 23.—OUTLINE MAP OF IRELAND AND RUSSIA, SHOWING THE AREAS (BLACK SQUARES) AFFECTED BY THE AMERICAN GOOSEBERRY-MILDEW.

IRELAND:—1, Ballymena; 2, Coleraine; 3, Antrim; 4, Killagan; 5, Castledawson; 6, Newtownards; 7, Athlone; 8, Foxrock; 9, Abbeyleix. (Also reported from Lissanoure, Co. Antrim, and Aghadoey, Co. Londonderry.)
RUSSIA:—1, Michailowskoje, Podolsk, government of Moscow; 2, Port Kunda, Esthonia; 3, Riga; 4, Pskov; 5, Novgorod; 6, Kaluga; 7, Simbirsk; 8, Poltava; 9, Pinsk; 10, Lomza. (Also reported from Reval, Esthonia.)

The circumstances attending the first outbreak of the American Gooseberry-mildew and the course the disease has since followed are entirely similar to those of the early stages of the epidemic of the Vine-mildew. From the evidence given below it would appear that the American Gooseberry-mildew was introduced (about the year 1900) into Europe from America. The American origin of the disease is almost certain with regard to the outbreaks in Russia, and it is at least probable that it is the same as regards Ireland.

I have on previous occasions (see Bibliogr. 1, 2, 3) quoted extracts from articles by several American mycologists treating of the present disease, which show how much this fungus is feared in the United States, and how it constitutes the most serious obstacle to the cultivation there of the European Gooseberry. Prof. S. A. Beach, of the New York Agricultural Experiment Station, who has issued a handbook (see Bibliogr. 2) giving a full and well-illustrated account of the cultivation of Gooseberries in the United States, has kindly supplied me with the following information in response to my inquiry:—"I do not think any one has collected data from which any satisfactory estimate might be made of the economic loss occasioned by the Gooseberry-mildew in the United States. In general it may be said that because of the ravages of this disease, varieties of *Ribes Grossularia* are not grown to any considerable extent in commercial plantations in this country. Those who have tried them have generally abandoned the attempt. The experiments conducted by this Station have demonstrated that the disease may generally be kept under control by thorough spraying, but this spraying entails an expense which is liable to consume a large share of the profits of the business, if not all of them. You will appreciate this when I tell you that one of the largest canning factories in this State paid in 1902 but three cents per pound for Gooseberries for canning purposes. It costs at least one half-cent for picking, to say nothing of the expense for marketing, cultivating, pruning, interest on investment, &c., which must be met before any profit can be realised. When the fruit is sold in the ordinary markets, higher prices are usually obtained; but when the risks of failure from sun-scald and mildew are taken into consideration, those who grow Gooseberries usually prefer American varieties like 'Downing,' 'Josselyn,' &c. for commercial plantations. It is safe to say that were it not for the danger of loss from attacks of Gooseberry-mildew the European varieties would be largely planted in this country in commercial plantations, but because of the ravages of this disease efforts to grow them on a commercial scale are usually soon abandoned."

Undoubtedly the first step that should be taken with the object of eradicating the disease in Ireland is the examination by an expert of the nurseries in the affected districts, as the existence of any such nursery gardens containing affected stock must serve as permanent and prolific centres of infection. There is no reason why, if the destruction of the infected stock in nurseries and the burning of diseased bushes in private gardens are carried out, the disease should not be entirely extirpated from Ireland. But the possibility of the complete eradication of the disease diminishes as each year passes, bringing with it the establishment of the mildew in fresh localities. Already the list of affected areas has grown dangerously long, and the agricultural authorities will incur a grave responsibility if they neglect to take prompt and energetic measures to stamp out the disease.

I enumerate below the localities in Ireland and Russia where the disease now occurs, together with notes on the circumstances attending the outbreaks.

As regards Ireland, I have received news of the occurrence of the disease in the following counties.

Co. Antrim.—Mr. Nixon writes from Whitehall, Ballymena (whence the disease was first reported for Europe in 1900), with reference to the occurrence of the disease in the season of 1903: "I had a failure in crop this last season as far as berries were concerned, but those which appeared were just as badly affected with mildew as in previous years. I sprayed according to your directions, but could not find time to continue it through the busy season. I have not the least doubt that had I continued the treatment it would have been successful."

At Antrim, also, where the disease was reported in 1902, it has reappeared. The owner of the garden, writing on June 17, reported: "The mildew is spreading amongst my trees here very rapidly. I have seen it in several gardens besides my own, and it has invariably appeared on the berries first. The mildew occurred last year, I understand, at Aghadoey, Co. Derry, and at Lissanoure, Co. Antrim. On thinking over the probable means of its introduction into Ireland from America, I would say that it probably came with Roses to the nursery gardens, for I understand new kinds are introduced from America."

The disease has appeared also in a garden at Killagan, Co. Antrim. The owner of the garden, writing on August 6, sent me the following information: "I have noticed the disease for the past four years. As far as I know there are no American varieties of Gooseberries grown in my garden. I grow about one acre of Gooseberries, and there are signs of the disease on most of the bushes. All varieties suffer, but the 'Yellow Amber' variety suffers most. Most of my bushes are 'Crown Bob' and 'Whinham's Industry.' The damage done to the crop of fruit is considerable. The fungus attacks the berries first, and then spreads to the leaves and tender young shoots. The bushes are from ten to three years old; the disease is quite as bad on the young bushes as on the old ones. The soil of the garden is heavy and damp; the aspect is south-east. I have carefully sprayed the bushes last season and during the present season with potassium sulphide (1 oz. to 2 gallons of water) as you have recommended. Last season the spraying did not appear to do any good. This season I have reason to believe that the disease was slightly checked by the spraying, the number of berries and bushes attacked having been very much less than last year. I have observed, too, that this year the bushes have made strong and large young growths of new wood, whereas last year they did not. I am thinking of spraying the bushes during the winter with Bordeaux mixture, as I believe this might kill the fungus which lives on the young wood through the winter months. I understand the disease is now more or less prevalent throughout Co. Antrim."

Co. Derry.—At Coleraine the disease, noted first in 1902, again appeared. On June 8 green berries invested with the mycelium of the fungus were sent to me. The mycelium was for the most part white, but here and there bore patches of a brownish colour. Young perithecia occurred among the hyphæ at these places.

The mildew has appeared also in a garden at Castledawson, where it was first noticed in 1902. Here the varieties attacked were 'Whinham's Industry,' 'Warrington,' 'Amber,' and 'Golden Lion,' and one half of the crop was destroyed. The disease was noticed to attack the berries most when they were half grown. The gooseberry-bushes in this garden are spur-pruned every winter to about three buds.

Queen's Co.—The disease has appeared in a garden at Abbeyleix. The owner of the garden has supplied me with the following particulars: "The disease was first noticed in 1902, and was very bad then. Almost all the bushes have been attacked, 'Whinham's Industry' *very* badly; 'Heart of Oak' and Berry's 'Early Kent' rather badly; 'Pitmaston Greengage' and 'Early Sulphur,' however, remained nearly free. Many of the old bushes (some probably 'Red Lancashire') and the large smooth-berried kind kept quite free. One border of 'Whinham's Industry' dressed in the spring with about three parts of superphosphate to one of kainit remained almost free from mildew and caterpillar; another border of the same variety of Gooseberry dressed with three parts of kainit to one of superphosphate was very badly attacked, and these bushes are, in fact, quite ruined with mildew and caterpillar. The berries were attacked first; the tops of the shoots are now (July 14) showing the white dust badly. The garden is on light sandy soil, on a deep bed of limestone gravel, and is perfectly flat and walled in."

Co. Dublin.—The disease has been noticed in a garden at Foxrock. The following particulars have been sent to me: "The fungus was first observed in May 1903. The number of bushes attacked was half-a-dozen; these I have treated with sulphide of potassium, and burned all the berries. The disease appears now to be checked. It first appeared on the berries. As far as I know, the varieties attacked are all kitchen varieties, chiefly 'Large Amber.' The bushes are, I should say, eight or nine years old, and were all purchased about five years ago from a florist at Newtownards, Co. Down. I should tell you that for the past three years I have had a great deal of trouble with my gooseberry-bushes owing to caterpillars, which have eaten off the leaves." This correspondent, writing later (July 14), reported: "I am glad to say that there are no fresh cases of the mildew showing in my garden. Some eight or ten bushes became ultimately affected, and nearly all the berries and leaves on these were taken off and burned, and the bushes syringed with sulphide of potassium according to your directions. A few berries on adjacent trees were affected; these were taken off and burned, and for the last fortnight I have seen no sign of the disease. The crop is a very heavy one, and will be ripe in another week or ten days."

Co. Down.—An extensive outbreak of the disease has occurred at Newtownards. The owner of one garden reported (on June 17) as follows: "I have been making a careful inspection of a plot of 250 trees, and cannot find a single tree free from the disease. It was first noticed in 1900. The greater portion of my bushes are 'Amber,' 'Warrington,' and 'Green Gascoigne,' but I cannot say one variety is more severely attacked than another. There has been a little of it observed on the ripe fruit for the last three years, a sort of brown sticky substance being left, making the fruit unmarketable. I have also been examining a quantity of young trees ('Amber') which I intended to use in replanting the ground occupied by the present lot (after taking off the clean fruit and burning the rest), but I find now the fungus on the young shoots of these, as enclosed."

In the specimens sent, the uppermost leaves of the branches and the apex of the young shoots were covered with a white powdery mass of conidia, while the lower part of the young stems bore a skin of matted mycelium, which was at this date (June 17) turning brown and producing many hundreds of young perithecia.

Writing later (June 24) this correspondent added: "On enquiry I find that this disease has appeared in three gardens at Newtownards during the last two years. The mildew appears first on the fruit. My gardener has found to-day two berries affected in an orchard where I have 3,600 gooseberry-bushes, but he can find no others. I will remove and burn this tree at once. I have now begun to clear out and burn the 250 trees in my garden, as you advised. The local nurserymen have a large connection with America for Roses, and I have no doubt that they import plants from that country, as well as from the Continent." In a letter dated March 1904, the following was added: "I have dug up my plot of 250 bushes, and burnt them. I have not been able to make out that the nurserymen in this neighbourhood have imported any gooseberry-bushes from America, and I do not think they have."

From another garden at Newtownards the following report has been sent: "The disease appeared here three or four years ago, and I am of opinion that it was brought into my garden on a few new trees purchased from local nurserymen. The garden is on light soil, and runs north-west and south-east. I have always had hitherto a splendid crop of gooseberries, of the old sorts—Yellow Amber, White Dutch, and Red. The bushes are fairly old, and there was no disease in my garden until I noticed it on the small plot of bushes referred to. I fear that there are now no varieties in my garden untouched; the bushes on which the disease obtained a good hold are valueless. I have burned all the new bushes, and some of the old which were in contact with them, but I know the disease was on some of the bushes last season, which I have still."

Co. Westmeath.—The disease has appeared at Athlone, and the following report has been sent from a private garden: "The disease was first noticed in May, 1903. About thirty bushes, or, roughly speaking, about one-third of my plants, have suffered from it. My varieties are not named, but the 'Sulphur Yellows' have suffered most, and next to them the 'Greens'; while apparently none of the Red Gooseberries have been affected. I have lost on the affected trees about one-third of the crop. The mildew appeared first on the berries, so far as I can discover. I had the mildewed berries all very carefully picked and burned, and my trees have all been sprayed twice. After this had been done the fresh developments of the disease have appeared more on the young green shoots; in these cases all the diseased parts have been cut off and burned. My gardener will now adopt the system of spur-pruning which you suggest. We have had a dry summer, until this week (July 17), when there has been a considerable rainfall; this does not seem to have caused any spread of the disease. My garden is walled in; the soil is limestone loam, about 1 foot deep, with limestone gravel and drift subsoil—this in its natural state; but in the garden from long cultivation and imported soil it is about 18 inches to 2 feet deep. The aspect of the garden is to the west, on a slight slope.*

* In the May 28 (1903) issue of the "Fruit-grower, Fruiterer, Florist, and Market Gardener" (London), p. 347, there is a statement to the effect that a fungus on Gooseberries sent by a correspondent from Lymington, Hants, was probably *S. mors-*

With regard to the occurrence of the disease on the Continent I have obtained the following information.

I have already given (Bibliogr. 3) the general particulars attending the outbreak of the disease in 1901 in some private gardens at Michailowskoje, near Podolsk, in the government of Moscow. In 1902 the disease reappeared with increased severity in these gardens, and was reported also by Prof. Bucholtz from Port Kunda, in Esthonia.

In answer to my enquiries, Prof. Bucholtz has now kindly supplied me with the following additional information. Prof. Bucholtz writes: "Although I am not able at present to give you precise answers to your questions—in consequence of the gardeners here having as yet paid but little attention to this new disease—I can send you the following information. The disease has been noticed here in Riga on almost all the varieties of gooseberries, viz. on smooth, hairy, yellow, and green-berried varieties. The first severe outbreak occurred last year [1902], but the gardeners think that the disease was perhaps present, although not reported, in 1901. With regard to the question of the disease having been imported from America, I have not been able to obtain here any information. The Gooseberries which have become affected have been planted for about ten years in Riga. The gardening establishments here do not obtain Gooseberries direct from America, but, if at all, indirectly through Germany and other countries of Western Europe. In the Custom House returns the kinds of bushes are not specified, so that all imported plants are entered simply as bushes, trees, &c. Mr. E. Hoff, the director of the largest gardening establishment and nurseries in Riga, has told me that he has heard of the disease from other governments (Pinsk, Novgorod, &c.). I send you examples of the fungus from Riga, Port Kunda, and Michailowskoje."

In some specimens sent by Prof. Bucholtz, labelled "Port Kunda, Esthland. Summer, 1902," the young berries were completely invested with the brown densely felted mycelium of the fungus, and had thus been prevented from developing further. Portions of young shoots were also sent; these also were densely covered with brown persistent perithecia-bearing mycelium.

Prof. Bucholtz wrote again, at the beginning of the present year, as follows: "Although I have not had an opportunity of personally observing the disease, I have obtained some information on the subject from other people. I learn from Reval, in Esthonia, that mildew appeared there about five or six years ago on Gooseberries in the fruit-gardens, and no one is able to explain the origin of the outbreak. Unfortunately I have so far been unsuccessful in obtaining specimens, and thus I do not know whether the fungus really is *S. mors-uvæ*. Further, Mr. E. Hoff informs me that he frequently observed the disease (with which he is well acquainted) in his garden in the summer of 1903. Some varieties were more strongly attacked than others, but they were not always the American varieties. He received reports about the disease in 1903 from Pskov (gov. Pskov). In his opinion it is quite impossible to ascertain exactly where the bushes come from, because they have passed through many hands before they

uvæ. I have investigated this case, and can state that the fungus in question was not *S. mors-uvæ.* There is no authenticated record of its occurrence as yet in England reach him. It appears to me that here the disease is gradually spreading. It seems scarcely credible that this disease, which is so striking, could—if it had existed in this country—have been hitherto completely overlooked; yet, on the other hand, the example of the *Pseudoperonospora* of Rostowzew on *Cucumis* proves that such cases may occur. Consequently it is difficult to hold a definite opinion on the subject."

Prof. A. de Jaczewsky, Inspector of Vegetable Pathology to the Russian Minister of Agriculture, has sent me the following information: "With regard to *S. mors-uvæ*, I am now able to give you some more details about the occurrence of this parasite in Russia. During the summer of 1902 I observed it personally at Simbirsk, and I received specimens from the following localities: Kaluga, Poltava, and Lomza, in Poland. In considering the question of the origin of the present outbreak, it seems clear to me that the fungus has been imported, and consequently that my previous opinion that the fungus was endemic to Russia is wrong. In all the localities above named, which are very widely separated, the disease has appeared only within the last two or three years, and has never been observed before. It began in the gardens where gooseberry-bushes (new varieties or new bushes) had been obtained from nurserymen at Riga, Kaluga, Tambov, &c., who import various plants from America, and amongst them gooseberry-bushes. The facts seem to me to prove the American origin of the fungus, and also to account satisfactorily for the sudden appearance of the disease in localities so widely separated. As regards the identity of *S. mors-uvæ* with *S. tomentosa*, I may say that I agree with you (see Bibliogr. 4, p. 72) that *morphologically* both these fungi are identical. It may be that we have to do with two *biological races* of the same species, each with a well-defined area, and I do not suppose that the fungus could now pass from *Euphorbia** to *Ribes*. *S. tomentosa* has been known in Russia since 1870, and in Switzerland I have observed it very frequently in many different localities; but neither in Russia (until the present outbreak) nor in Switzerland has *Ribes* been attacked. Also, *S. mors-uvæ* has now appeared in Russia in localities where *Euphorbia* does not occur."

Since the above was written, an article has appeared by Prof. Rostrup (see Bibliogr. 5) in the July number of the Danish journal "Haven," † recording the appearance of the American Gooseberry-mildew in Denmark. Prof. Rostrup received, at the beginning of last June, branches of Gooseberry bushes bearing berries attacked by *S. mors-uvæ*, from two localities —Tikøb-Egnen in Nordsjælland, and Stavnholt, on the north side of Furesø. Information was obtained that in both localities the Gooseberry bushes which first showed signs of the disease had been obtained, three years ago, from the same nursery. Prof. Rostrup personally inspected, on June 17, the garden at Tikøb in which the outbreak has occurred, and has described in detail the devastation caused by the disease. All the English varieties of Gooseberries which had been

* *S. tomentosa* occurs on *Euphorbia dulcis*, *E. helioscopia*, *E. palustris*, *E. Peplus*, *E. platyphyllos*, *E. stricta*, *E. virgata*, and *E. Cyparissias*, var. *palustris*.

† I am indebted to Mr. L. A. Boodle, F.L.S., for kindly giving me a translation of this article.

planted three years ago, and which even in the year following their planting showed signs of disease, were now so virulently attacked that practically not a single berry was free from the disease. The leaves also on the youngest shoots were white with a powdery covering of conidia, while the young wood and the berries were invested with a brown felt containing the perithecia. From these English varieties the disease had spread to the surrounding bushes, which were older and which had been cultivated in the garden for several years. Of the 300 bushes in the plantation more than half were attacked. The introduced varieties which have become attacked so virulently are the following:—'Careless,' 'Columbus,' 'Keepsake,' 'Mount Pleasant,' 'Speedwell,' 'Whinham's Industry,' 'Admiral Reuter,' 'Früheste von Neuwied,' and 'Whitesmith.' The neighbouring Gooseberry gardens appear so far to be free from the disease.

Information as to the best fungicide to use against the present disease, and the method of applying it, will be found in my previous papers in this Journal. It may be pointed out here that the mildew exists through the winter months exclusively in the form of ascospores within the perithecia, lying more or less hidden in patches of the persistent brown matted mycelium on branches, and especially on the young wood. Every effort, therefore, should be made during the autumn or winter months to cut off, *and burn*, the affected parts of the young wood.

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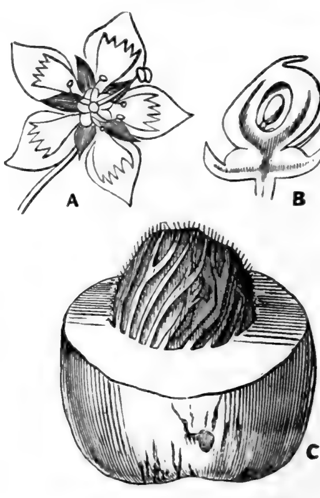


THE HORTICULTURAL PHASE OF "NATURE-STUDY."

By R. Hedger Wallace, F.R.H.S.,
Chairman of the School Nature-Study Union.

Nature-study is a pedagogical term of American origin, and usage there has determined for it a special office, namely, to indicate the movement which endeavours to open the minds of young school children, by direct observation, to a love and appreciation of the common things of their environment. This movement began to take shape in the United States about 1884, but the compounded or hyphenated term as now used, and in the limited sense noted, was first employed in 1889 by Mr. F. Owen Payne in his contributions to the "New York School Journal."

The keynote of the movement, that is its ideal—whatever be the methods employed—is to develop in children a keen personal interest in every observable object and phenomenon. It is an attempt to get Nature-love or Nature-sympathy into the school atmosphere, to lead children natureward. This idea is now widespread and thoroughly established.

Although Nature-study is an American pedagogical term and the present movement first started in the United States, still we can claim that the germ of the Nature-study idea is to be found in Mr. Herbert Spencer's work on "Education." In it he says: "Teachers are eager to give second hand facts in place of first-hand facts. Not perceiving the enormous value of that spontaneous education which goes on in early years—not perceiving that a child's restless observation, instead of being ignored or checked, should be diligently ministered to and made as accurate and complete as possible, they insist on occupying its eyes and thoughts with things that are, for the time being, incomprehensible and repugnant. Possessed by a superstition which worships the symbols of knowledge instead of knowledge itself, they do not see that only when his acquaintance with the object and processes of the household, the streets, and the fields is becoming tolerably exhaustive, only then should a child be introduced to the new sources of information which books supply."

In another chapter Mr. Spencer writes: "After long ages of blindness, men are at last seeing that the spontaneous activity of the observing faculties in children has a meaning and a use. What was once thought mere purposeless action, or play, or mischief, as the case might be, is now recognised as the process of acquiring a knowledge on which all after-knowledge is based. . . . Children should be led to make their own investigations and to draw their own inferences. They should be *told* as little as possible, and induced to *discover* as much as possible. . . . Those who have been brought up under the ordinary school-drill, and have carried away with them the idea that education is practicable only in that style, will think it hopeless to make children their own teachers. If, however, they will consider that the all-important knowledge of surrounding objects which a child gets in its early years is got without help—if they will remember that the child is self-taught in the use of its mother-tongue—if they will estimate the amount of that experience of life, that out-of-school wisdom which every boy gathers for himself . . . they will find it a not unreasonable conclusion that, if the subjects be put before him in the right order and right form, any pupil of ordinary capacity will surmount his successive difficulties with but little assistance. . . . Passing on to object-lessons, which manifestly form a natural continuation of this primary culture of the senses, it is to be remarked that the system commonly pursued is wholly at variance with the method of Nature as exhibited alike in infancy, in adult life, and in the course of civilisation. . . . To *tell* a child this, and to *show* it the other, is not to teach it how to observe, but to make it a mere recipient of another's observations. . . . Object-lessons should not only be carried on after quite a different fashion from that commonly pursued, but should be extended to a range of things far wider and continued to a period far later than now. They should not be limited to the contents of the house, but should include those of the fields and the hedges, the quarry and the seashore. They should not cease with early childhood, but should be so kept up during youth as insensibly to merge into the investigations of the naturalist and the man of science."

In these extracts from Herbert Spencer are to be found the guiding principles of the Nature-study movement, the object of which can even be defined in Herbert Spencer's own words as being the encouragement of that "instinctive inclination which every child shows to observe natural beauties and investigate natural phenomena."

The first eulogy on things is expressed in the words, "He saw that they were good." How many of us to-day, either young or old, really do see the things that are around us? Do we not pass by without study, even unnoticed, those things which we daily proclaim with our lips to be so wonderful? Yet, though undeveloped, the nature-instinct is strong within us all.

Nature-study, not being a science-teaching movement, has many phases or aspects. It must vary with one's outlook on the world, and to it there can never be attached codified methods or systems of teaching. Every method, therefore, that is employed in the teaching of Nature-study must be accepted as correct if the final result is the development of a keen personal interest in natural objects and phenomena. Two factors, however, determine the value of these Nature-study methods: first, the subject must be common, easily seen by the pupil, preferably out of doors, and somewhat associated with his daily life; and, secondly, the range and nature of the subjects or objects "studied" must be limited to those in which the teacher is interested and regarding which he has some knowledge, although it be not extensive. The best "Nature-study" work seems to be done where the teacher, in relation to his pupils, takes the position of a senior student only.

One of the many Nature-study methods that are practised is mainly concerned with plants and plant life—the horticultural phase, to which I desire to direct attention. In the teaching of plant subjects in schools four distinct stages or epochs can be traced. First it took the form of making named inventories of the plant kingdom, and the school method was herbarium collecting. The second stage was learning the names of the parts of plants by a rigid codified and defined system, through text-books that blended together the morphology, physiology, and histology of plants. The third epoch, under which the present generation has suffered, may be termed the German laboratory method. The pupil in this epoch actually handles and studies plants, but, instead of ranging gardens and fields, is tied down to the tables of the laboratory and the outlook provided by the microscope. The fourth epoch, in the beginning of which we are now living, is marked by the effort to know the actual life, habits, and associations of plants under natural conditions: that is, living its own life in a natural way. In this epoch our attention is chiefly directed to plant ecology, which investigates the physical conditions under which plants in a given area live; notes the adaptation of their organs to these external conditions, *i.e.* the response of plants to their surroundings; and, lastly, determines what plants grow together, or rather the relationship of plants to each other. The dominant note of this last epoch is "field-work."

There are many methods for carrying out Nature-study with plants, and their efficiency depends on their elasticity; but, broadly speaking, they fall into three groups. First, those that take the form of an outdoor study of plant societies and associations; secondly, those which combine an outdoor and indoor study of the attributes or forms of plants; and thirdly, those that encourage the actual growing of plants (*a*) in the schoolhouse, and (*b*) in the school grounds.

The best Nature-study observation is that which is done out of doors, the next that done in the schoolroom from material brought in by the pupils and obtained by them through out-of-door field work. The nature of this teaching, or leading, or study, whether outdoor or indoor, will depend (1) on the time of year and the opportunities it offers; (2) on the situation of the school—rural or urban, its altitude and latitude, and its environment, such as mountain or moorland, woodland or farmland; (3) on the desires of the pupils, as on them rests the onus of observing and recording data; (4) on the desires and capabilities of the teacher, for the personality of the teacher must always stand out strongly—the best for Nature-study work being those who are Nature-lovers, have the greatest personal enthusiasm, and are least bound by the traditions of the schoolroom.

The type of Nature-study undertaken in the first group may be that some common plant like the Dandelion is taken, and the inquiry takes the form of comparing the relative abundance and "look" of these plants in the playground and the meadow, the garden and the roadside, on the borders of woodlands and on lawns, and so on. Another inquiry might be as to the common dominant plants generally to be found in an open field, a woodland and a dripping rock-cliff; by a roadside, a hard-tramped path, and in a meadow; by a hedgerow or a rubbish heap, and many other situations. Certain plant forms come to mind when one thinks of an Apple orchard or a Beech forest. A moor, a dry hillside, a brook-side, a weedy yard, a dusty roadway, a river-bank, a pasture, a railway cutting, a tangled fence, and a swamp—each has its characteristic common plants. Nature-study of the type we are discussing endeavours to answer the question, What are they?

The second group of Nature-study methods is mainly concerned with the special attributes or forms of plants. Observations are made on the forms of stems, varieties of bark, ways of branching, position, and size of leaves, and the variety of root forms, leaf forms, and flower forms. Other observations may be concerned with the forms of trees, seed sowing, and germination, preparations for spring, leaf buds and fruit buds, seed dispersal, falling of the leaves, evergreens and how they shed their leaves, how the different kinds of trees hold the snow, and other suggestive inquiries about the common things of our environment. The indoor work that may be done in school in Nature-study of this type must, of course, depend on the out-of-door observations of the pupils.

The third group of Nature-study methods is chiefly concerned with the growing of plants. It must be admitted that "actually to grow a plant is to come into intimate contact with a specific bit of nature." Three distinct merits can be attributed to Nature-study of this type. First, the plant is practically under the control of the observer and can be subjected to continuous observation; secondly, it teaches pupils how to grow plants—the purely technical aspect; thirdly, it teaches the child the care of things, for if the needs of a plant are not attended to its life ends. The growing of plants by children, either in the schoolhouse or at their homes, has its own influence towards Nature-love. The plants, of course, are grown in boxes, pots, or glasses, under natural conditions as to soil, light, warmth, and moisture, for if grown in water solutions or under other unnatural conditions, then the dividing line between "Nature-study" and "science" will have been crossed.

Nature-study is often associated with the growing of plants in the school grounds. School-gardening may have many objects or purposes in view, and school gardens may be established (1) for ornamenting the grounds; (2) for providing material for object-lessons and class-work; (3) for affording an opportunity to teach a phase of Nature-study; (4) for affording instruction in plant-growing; (5) for teaching technical agriculture and horticulture; and (6) for affording manual training.

Although Emerson wrote that "manual labour is the study of the external world," manual training is outside our province, so also is the teaching of agriculture and horticulture. The ornamentation of school grounds, though a valuable factor in arousing Nature-instincts, can also be passed over. The chief value of school-gardening to us is, that it provides an opportunity for some form of "Nature-study," to be introduced and practised in rural schools.

School gardens, especially in England and the United States, are at present just feeling their way. We have unfortunately lost in the late Mr. Rooper, of the Education Department, their most enthusiastic supporter and advocate. The United States, on the other hand, have happily still with them Professor Bailey, of Cornell University, the leader of the Nature-study movement in America, and perhaps the strongest supporter the school garden movement possesses among the English-speaking peoples. A real school garden should be regarded as an outdoor laboratory in the equipment of a school, but such a school garden is not adapted to all schools even if they be rural, any more than, as will be admitted, schools are not all adapted to possess a complete equipment in chemistry or physics.

To find the school garden movement best developed we have to turn to the Continent. Comenius in the seventeenth century maintained that "a garden should be connected with every school, where children at times can leisurely gaze on trees, flowers, and herbs, and be taught to enjoy them." In the eighteenth century Rousseau advanced the school garden idea in his "Émile," while the idea was further advanced in the nineteenth century by Pestalozzi and Froebel, the latter founding the first "kindergarten" in 1840, in which the larger children did light gardening in connection with the play of the younger ones. The classical land of school gardens is Austria-Hungary, where they are established and required by law—a regulation issued in 1870 furthermore requiring that instruction in natural history shall always be given in an appropriately arranged school garden. In Sweden the interest in school gardens was manifested nearly as early as in Austria, and national schools there must have a garden in which the children work, and from which they obtain trees and shrubs to plant at their own homes. In Belgium, the study of horticulture being compulsory, all public elementary schools have gardens, and they are used in connection with instruction given in botany, horticulture, and agriculture. Since 1882 school gardens have played a very important part in the French rural school system of education, and the school garden question has also been alive in Switzerland for over twenty years. In Germany the school-garden idea took root about twenty years ago. In many cases these German school gardens are meant to serve for the maintenance of the teacher. The gardens connected with many elementary schools are, however, of a different type and are known as partial school gardens, in which only certain kinds of plants are cultivated, as they are only established to furnish the plants required for instruction. In many of the large cities of Germany there exist large central school gardens to furnish plant material to schools. The first of these was established in Berlin and covers nearly ten acres. Magdeburg has a central school garden in the Herrenkrug park, and other cities, such as Leipzig, Mannheim, Cologne, &c., have central gardens which vary in extent from two to five acres. In the Berlin central school garden the plants are arranged according to geographical zones; usually they are arranged according to families. Besides these, smaller gardens have been established in connection with high schools, normal schools, and agricultural winter schools. School gardens are specially numerous in Bavaria and fairly so in Saxony, where most of the elementary schools are provided with gardens even in the large cities. Würtemberg proportionately has few school gardens, and similar conditions prevail in the Grand Duchy of Baden.

"No instruction without observation" is the educational watchword of our times that is thoroughly appreciated in Germany, and school gardens are there considered to meet this demand. From an article on school gardens in Rein's "Pedagogical Cyclopædia" we learn that "in many cases they furnish numerous specimens for object-lessons, or are themselves excellent means for observation; in others they give many points for comparison that have the value of direct observation. . . . Instruction in gardens appears partly as occasional lectures, partly as defined lessons, partly as practical work, and partly as constant Nature-study. . . . Besides the occasional instruction the teacher should conduct some of the regular lessons in the garden when the weather permits it. The greater number of lessons in Nature-study must be given during the summer out of doors, as the garden furnishes the best subjects for direct observation."

German educators warmly advocate instruction outdoors, and at a conference of teachers held at the instance of the Emperor it was recommended in these words: "Outdoor instruction shall be furthered in every way for the study of the natural sciences as well as for the study of the home geography and home history."

Based on his own experience, a noted German natural-history or Nature-knowledge teacher has indicated the many uses to which a school garden may be put, and we think it will prove serviceable if, in an abbreviated form, we reproduce his points, more especially as in England we are rather apt to limit the value of school gardens to instruction in gardening. According to Jung of Kiel, "lessons and reviews may include the plants and animals found in the garden; the most beautiful trees in the garden; the useful shrubs; flowers and their forms; the most beautiful field flowers; the useful garden insects; the destroyers of fruit; plants injurious to man; plants raised for food, &c. . . . Besides, natural history, geometry, physics, and mathematics in part, may be taught in the garden. Thus a class of pupils under the teacher's directions can measure off the garden and beds and calculate areas. The pitch of the ground can be calculated by means of a levelling instrument or a water-level; the height of a tree can be ascertained by the length of its shadow; and the area of variously shaped beds and subdivisions can be found; finally the calculation of surface and volume may be combined with the classification of all kinds of geometrical figures. . . . Countless specimens for other studies are furnished by the school garden; as, for instance, for drawing leaves for the study of their outline, parts of flowers and foliage; furthermore, objects for perspective study. . . . Many physical laws studied in the classroom can be exemplified, as, for instance, the construction of a fountain; the well, as an example of the suction-pump; ripe fruit's fall in consequence of the law of gravitation; water poured into the saucers under flower-pots will rise in obedience to capillary attraction; the temperature is higher beneath the snow than in the open air; the air is colder after rain; the greater the angle of incidence, the stronger the influence of the sun's rays on slanting hot-bed frames; dark objects get warmer more quickly than light, &c. Abundant material for compositions and language lessons is likewise furnished—such subjects as the garden in summer and in winter; my flower-bed; the life of the honey-bee; why are fruit trees planted? how is a nesting-box made? the uses of singing-birds; how to fight the enemies of fruit; the gardener's friends among animals; why is the goat of no use to the gardener? The garden also furnishes much material for the study of home geography and singing. . . . Finally, instruction in gardens suggests constant observation of natural phenomena which the children can make under the teacher's direction. They refer to weather conditions, sunrise and sunset at different seasons, winds and clouds, development of plants from germination to fruit formation, the actions of useful and harmful animals, and other things. . . . These observations are a preparation for instruction; they render the senses more acute, exercise thought and judgment, and arouse interest."

The outline I have been able to present of that phase of the Nature study movement that may be termed horticultural will, it is hoped—though it be a bare bold outline—direct the attention of horticulturists to the movement. English men of science of the past generation recognised the need for Nature-study teaching. Professor Forbes in 1853, in a lecture before the Royal School of Mines, said that "the great defect of our systems of education is the neglect of the educating of the observing powers—a very distinct matter, be it noted, from scientific instruction." Again, Dr. Carpenter, in his evidence before the English Public Schools Commission, said: "Any right system of education will take up the faculties in the order of their development, and it is quite certain that the observing faculties are developed before the reasoning powers. . . . The training of the observing faculties by attention to the phenomena of nature, both in physical and in natural science, seems to me to be the natural application of time at the age of, say, from eight to twelve," These views are also embodied in the testimony of such men as Lyell, Faraday, Hooker, and Owen.

Our present educational code recognises gardening as a subject of instruction, yet it is quite possible to learn how to grow an economic plant without really observing it. Professor Bailey relates that he went into a potato-growing community and asked the farmers where the roots of the potato plant were—whether above or below the tuber; and that in an apple-growing district he asked the growers how many apple flowers are borne in a cluster, with the result in each case that "every man guessed, but no man knew." It is undoubtedly not the province of Nature-study to teach where the potato roots are. Its function is to make one observant, and if this be accomplished, then the observant details introduce themselves.

The old idea of the study of Nature was to make an inventory of things, and many still believe in this natural history bookkeeping. It is to be hoped it will soon pass away. No doubt at present much confusion exists as to what Nature-study is, because of the different attitudes of its various exponents. This is a healthy sign, for it represents the reflections of different personalities and is the expression of their outlook on the world. Should any definition of Nature-study ever meet general acceptance, it will be found to be based on the terms of its purpose and not in terms of its methods.

Whatever be the aspect of Nature-study we support—the horticultural for example—it will be an acceptable one if it stimulates and exercises the powers of observation, paying little heed to information-giving or the teaching of classified knowledge. Through it our science teaching must become more fruitful, for it will have developed those qualities most desirable in a student of science.

Nature-study of the desirable type—free from the incubus of mental discipline, science teaching, &c., yet in its own way an excellent training for such teaching and discipline—will in due course, it is to be hoped, free our educational methods from the caustic criticism passed on them by Agassiz when he remarked that under the ordinary conditions "the pupil studies Nature in the schoolroom, and when he goes out of doors he cannot find her."

ORANGE CULTURE UNDER GLASS.

By H. Somers Rivers, F.R.H.S.

"Kennst du das Land wo die Citronen blühn?"

Every Englishman does, even he who has never left his native shore. He is not always conscious of this, as Orange culture is neglected in this country, perhaps because the imported fruits are so plentiful and so cheap. Those which come here in cases from abroad, however, are not to be compared with the home-grown fruit. Anyone whose acquaintance is only with the former does not know what an Orange is. To use Dr. Bonavia's simile, the difference is as great as that between the night and day.

The many varieties are most interesting, their flavours distinct and attractive; it is something to be able to pick fruit from the trees for dessert during the Christmas festivities, and a dish of fresh Oranges, picked each with a short stalk and a leaf or two attached, is an earnest of a more genial climate to come, even at this dead season.

Than the orangery itself, what can be brighter and pleasanter as a winter garden? Not the dreary orangery of former days, pretentious in architecture and yet not beautiful, wanting in light and air, more like a mausoleum than a home for the trees condemned to a miserable existence within it, the modern orangery is a span-roofed orchard-house, entrapping and enhancing whatever sunlight is vouchsafed to us during the winter months.

To give the greatest return, trees should be planted along either side, six feet apart, and trees in pots arranged in the body of the house. These pot trees may be stood four feet apart, angled thus . ˙ . ˙ . if there is room for more than one row, but not so close to the planted trees as to be shaded by them. The shoots of the latter are tied out to wires, arranged as in a house for trained Peach-trees, namely about a foot apart and nine inches from the glass. The roof should be wired only halfway up to the ridge, and the trees not allowed to extend much beyond, or the thick evergreen leaves will shut out too much light. Studded with golden fruit against this dark leafy background, the house seems filled with sunshine even on the most dreary December day.

In order that the trees may attain their maximum of juice and sweetness, the temperature must not range below 50° in the winter; it may be allowed to go up to 65° in the daytime, higher with sun heat; ventilation being given very carefully in stormy weather with cold winds.

After the fruit is gathered, a temperature of about 45°–50° is sufficient for a time. Then, when the trees start growing, about the middle or end of February, 60° at night, 75° in the day, or higher with the sun's help, is necessary, and the house should be closed early, at about 2 o'clock in the afternoon.

While the trees are in flower they must not be syringed; plenty of air should be given, and the house damped down occasionally. After the flowers have fallen and the fruit is swelling, the syringe may again be used, except in dull or wet weather, in addition to damping down. Syringing should be done early, and then air put on to evaporate the water on the leaves before the sun gets on the house, thus preventing scorch. As the fruit colours, syringing must again be stopped and the earth kept drier by watering less freely. In summer plenty of ventilation during the day, and some at night, may be given.

Water so as to keep the earth moist; it must not be allowed to become overdry at any time, or the leaves will lose their healthy glossy green, turn yellow, and fall. Overwatering and a sodden soil will have the same effect.

To grow and thrive, the Orange requires a firm sweet soil, made up of some good light turfy loam, one half, and leaf-mould one half, to which it is a good plan to add a little twig-charcoal as a purifier. The planted trees may be top-dressed with this mixture every other year, removing some of the old surface soil and replacing with fresh; the pot trees repotted either bi- or triennially, top-dressed in the intermediate years if necessary. When the tree has been taken out of its old pot, the ball of earth must be reduced somewhat, but not too severely. In repotting the tree must not be moved into too large a pot or tub, under the mistaken idea that it will thrive the better the more soil it has to grow in. A pot allowing about an inch space for fresh soil between the ball of earth and its sides is quite large enough. The tree should have its collar well above the surface of the soil after it has been repotted; if the roots are buried too deep they will not grow freely. An Orange tree growing naturally has the bases of the larger roots, where they join the stem, uncovered by the soil. Water two or three days after repotting, and syringe with tepid water. With fruiting trees the best time for repotting or top-dressing is just before the flowers appear.

Manures must be avoided; the Orange dislikes them. When the fruit is beginning to colour, in order to help it to swell and attain its greatest development, soot water or soapy water should be given the trees about twice a week.

I had an interesting confirmation of the efficacy of soapy water in this respect a few days ago. A lady was telling me of the splendid Lemons she saw in a garden at Grahamstown, Cape Colony. Lemons are common in the district, but these were so particularly fine that they were frequently sent round as presents to friends in the neighbourhood. She added that the trees seemed to enjoy plenty of water, as they grew along the banks of a "sloet" at the bottom of the garden. On enquiry, I found that all the soapy water from the house went into this ditch.

Soot water is made by putting a bag of soot into a tank and leaving it there to soak. It is useful to syringe with soot water occasionally, and used thus it seems to maintain a healthy colour in the leaves.

If at any time the leaves look pale and unhealthy, watering with either soot or soapy water will restore their deep green. Fallen leaves may conveniently be picked up by means of a stick with a nail in the end; they must not be allowed to lie about in the house and harbour insects.

The pruning is simple, all that is necessary being to pinch out the tip of the stronger shoots when they have made about six inches of growth and to keep the heads thinned. Pot trees naturally form half standards, and the aim of pinching is to maintain an evenly balanced and fairly compact head. Trellis trees should have their branches laid in about a foot apart. With Oranges growth can be obtained anywhere from the old wood by cutting back hard.

In the fruiting-house at Sawbridgeworth two 4-inch pipes, a flow and return, one above the other, run along each side, just inside the ventilators, to warm the air as it comes in; two others down the middle of either border, let into the ground their own depth, give bottom heat without drying out the soil. The path is down the centre, three feet wide, with a border four feet wide on each side of it. This house, sixty feet long, contains eighteen trees planted out and trained to the roof, and two dozen pot trees.

A crop of about five hundred or more excellent fruit may be expected, although most of the pot trees are young and only carry very few. This sounds rather paltry compared with what one hears of in South Africa: single trees, about thirty feet high, from one of which you may gather a thousand fruit and scarcely know that any have been picked; nevertheless it means a very good supply.

The Oranges, being heavy, and usually borne at the tip of a slender branch, require support; this may easily be given by slinging the branch to the wires in the case of trained trees, or to the main stem with pot trees.

The house should run east and west to get the full benefit of the winter sun.

Oranges and Lemons need not necessarily be grown in a house by themselves; they may be put on the back wall of a plant-house and give excellent results, provided the conditions described above are complied with. One must be careful, however, to exclude all plants which, like the *Eucharis*, are very susceptible to mealy bug. Conversely the Orange-house may be used for plants; the climate is very congenial to Ferns.

Oranges have a bad name for being dirty trees and difficult to keep clean. If allowed to get thoroughly dirty, no doubt it requires some labour and patience to bring them round again; this should never be the case with a skilful cultivator.

The sooty black layer, so often seen on the leaves of unclean trees, is a fungus growing in the honeydew dropped on them by the various scale insects which the trees harbour in quantity if allowed.

Without insects the trees will keep clean automatically.

Before the invention of fumigation by the evaporation of nicotine compounds the process was not so easy. Tobacco paper was difficult to regulate; frequently it flared, and even without this, the hot smoke often scorched the tips of the leaves if it did no worse. There is no excuse for insects now one can fumigate all the year round, whenever necessary, with no fear of bad results.

If the trees are practically clean, but scale makes its appearance upon a few isolated shoots, these should be washed or sprayed and the insects destroyed thus without recourse to the fumigation of the whole house.

The glass and woodwork should be thoroughly washed once a year.

Three scale insects are the chief enemies of the Orange: the mealy bug (*Dactylopius destructor*), the brown Orange scale (*Lecanium hesperidum*), and a mussel scale (*Mytilaspis*), a large aphis, pale-yellowish with dark markings, sucks the juice of the young shoots, but does not seem very abundant and is easily dealt with. Ants climb up the trees when they are in bloom and bite off the stamens; they also encourage the scale insects, being very fond of the honeydew they distil, as too are wasps. Ants are destroyed by pouring weed-killer into their nests if no tree-roots are near enough to be affected; if there is any chance of this, boiling water should be used instead. They may be prevented from climbing up pot trees by chalking the stems.

The species of *Citrus* are so divergent in form and quality of fruit that varieties in each group are well worthy of cultivation on this account. The choice will naturally be chiefly confined to those having the greatest value for dessert, the different sorts of the true Orange (*C. Aurantium*). The 'St. Michael's' is a free cropper and bears large juicy fruits, as do several closely allied sorts: 'Sustain,' 'Bittencourt,' 'Egg,' 'Dom Louise,' 'Excelsior,' 'Brown's Orange,' and others, more or less distinct in flavour and giving the charm of variety to a collection. 'Egg' is the earliest; the two last named ripen late.

The 'White Orange,' which derives its name from its pale-coloured pulp, is excellent; the rind is of the ordinary orange colour, usually with a narrow longitudinal stripe or stripes of lemon hue. 'Silver' or 'Plata,' one of the sweetest and best pale-coloured with a curious weal-like orange stripe and somewhat small, is a very heavy fruit, the thin and close-textured skin of which does not peel very readily; the tree is a compact grower. 'Embiguo,' or the 'Washington Navel Orange,' so well known and popular, produces its splendid fruit in quantity under glass and does not belie its reputation. The 'Jaffa,' with large curved and crinkled leaves and big oblong fruit, seems rather shy-bearing, making up for this in the size of the individual Oranges. Two Malta Oranges, the 'Blood' and the 'Oval,' are similar in growth and outward appearance of the fruit; the pulp of the Maltese 'Oval' is, however, devoid of the blood-stains which characterise that of the former. These stains are not constant; occasionally they are wanting altogether in a fruit, when others on the same tree have deep-crimson pulp.

In the aromatic little Tangerine (*C. nobilis*), we have a totally different fruit, as distinct as is the slender graceful little tree itself, with its willow-like foliage and its small flowers borne singly along the shoots.

'Seville' (*C. Bigaradia*), though bitter and used only for preserving and marmalade, merits a place in the orangery on account of its handsome round polished fruit and shiny leaves. Its flowers are borne in profusion.

Citrus corniculata, the 'Horned Orange,' so called from the pointed projections of the rind near the apex of the fruit, and the dwarf 'Myrtle-leaved Orange' are curiosities only. The 'Myrtle-leaved' is very slow-growing; its little very dark leaves are closely clustered along the shoots. It bears miniature Oranges about an inch in diameter. We have not yet fruited the 'Sún-tára,' a variety from India, said to be most excellent.

Of Lemons (*C. Limonum*) the best are the 'Imperial,' in shape oval, and, like the common Lemon and the 'White,' roundish-flattened, with a very large boss on the crown of the fruit. The numerous large oil-glands in the leaves of Lemons are very noticeable when they are held up to the light.

Several Limes (*C. Limetta*) are useful in making cooling drinks, and are of delicate flavour. The largest is the Persian, not unlike a diminutive Lemon in appearance; the Common Lime is an abundant bearer.

The Citron (*C. Medica*) is a strong-growing, rather straggly tree, with handsome lemon-coloured fruits of great size. Most singular is the Fingered Citron, or Buddha's Hand, described as 'Siang-han' or 'Fragrance-container,' a fruit which legend says is made of the moon's dew congealed as gold around the hands of the sage of the west.

A very large and showy fruit is that of the Shaddock (*C. decumana*), more ornamental than useful, surpassed in size by that giant of its class the Red-fleshed Pummelo of Bombay, the round fruit of which weighs 6 lbs. and measures 8 inches in diameter. Its pulp is composed of numerous little sacs which separate freely from each other, rather coarse in texture, but agreeable when eaten with sugar.

The Grape-fruit (*C. Paradisi*) obtains its name, I imagine, from the fruit being borne in bunches ("grappes") at the end of the shoots. The young growths and flower-buds are coated with silvery hairs. It is in great demand in America, where the fruits command high prices; the pulp is most pleasant and refreshing, and is valued on account of its tonic properties. Experiments are now being carried on in America with the view of obtaining Orange trees which will withstand frost and thrive in a temperate climate. It is sought to effect this by hybridising the hardy deciduous Japanese Orange (*C. trifoliata*), sometimes used as a hedge-plant there, with varieties of the Sweet Orange. *C. trifoliata* flowers later than the common Orange, the flowers appearing before the leaves, and ripens its fruit earlier. At some future time we shall perhaps be able to grow Oranges in our gardens with as much success as we do Pears now.

I am indebted to Miss Gayton, of Much Hadham, for the excellent recipes for liqueurs, preserved oranges, and marmalade given below. By using citrons, pummelos, &c. in place of or in conjunction with Sevilles and sweet oranges, sundry most palatable marmalades may be made.

Orange Brandy.

Three quarts of best pale brandy put into an earthen jar with $1\frac{3}{4}$ lb. of sugar candy; the rind of six Seville oranges and the juice of twelve. One quart of boiling new milk to be poured on all the ingredients. Let the mixture stand eight days in the covered jar, stirring it occasionally; then strain through a jelly-bag till very fine and bottle it.

Orange Gin.

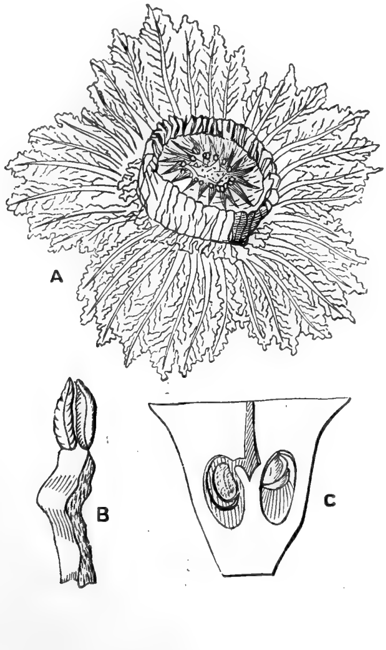
To one gallon of gin take eight lemons and eight Seville oranges, pare the rinds very thin and put them in the gin with 3 lbs. of lump sugar. Let it stand forty-eight hours, stirring occasionally, then bottle and cork very tight. Both the gin and the brandy improve with keeping.

For preserving Seville Oranges whole.

Wash the oranges and core them with an apple corer (if this is not done they do not keep their shape when cooked), put 1 lb. of fruit to soak in 3 pints of cold water for twenty-four hours, then boil till the fruit is quite tender, remembering that the addition of sugar during the second boiling will harden the peel if it is not thoroughly softened first. Lift the fruit carefully out of the preserving pan into an earthenware pan, pour the liquor over it and leave till next day. Then add the sugar (1 lb. of pure cane to 1 lb. of boiled fruit and liquor) and boil till the fruit looks clear and transparent. Lift each out very carefully into bottles or jars, reduce the syrup by fast boiling for a short time and pour it over the oranges to quite cover them. A piece of dried ginger, in a muslin bag, put into the water and syrup during the process of preserving, is an improvement.

Orange Marmalade.

Wash the Seville oranges and weigh them. To every pound of fruit take 3 pints of cold water. Slice the oranges into the water in an earthenware pan and let them stand twenty-four hours. Then boil in a preserving pan till the slices are quite tender, which will be in about two hours; the liquor will then be reduced about one-third. Pour all back into the earthenware pan and allow it to stand until the next day; then to every pound of boiled fruit and liquid add 1 lb. of pure cane sugar and boil till the syrup jellies (about forty or fifty minutes). The oranges should be cut up very thin and only the pips taken away; these should be put in a muslin bag to soak and boil with the sliced fruit, as they yield a great deal of jelly.



DISEASE OF THE LEAVES OF CALANTHES.

By John Bidgood, B.Sc., F.L.S.

During recent years there have been complaints from all parts that the leaves of Calanthe plants grown in our Orchid houses have almost universally been disfigured by broad areas and smaller patches of black and dead tissue. This local death is not confined to the leaves, for the flower-stems and bracts as well as the pseudo-bulbs show similar areas. The consequence is that, long before their period of usefulness should be over, the leaves are useless to the plant, while the flower-spikes and pseudo-bulbs are small, and, like the leaves, unsightly. This more particularly applies to the various hybrid Calanthes, the worst of all being those which are most inbred.

Except where otherwise stated, what follows here is more particularly applicable to the hybrid section, to which my observations have been almost entirely confined.

The cause of the spotting is not easy to find, and is even now, after three years' inquiry, observation, and experiment, mainly conjectural. It is certainly not always produced by a fall of temperature in the gorged leaf, as described by Massee in the "Annals of Botany," September 1895. He there shows that dead spots are produced on the leaves of certain Orchids by the simultaneous operation of the three following conditions: (1) too high a temperature; (2) too much water and not enough air in contact with the roots; (3) watering or spraying with a falling instead of a rising temperature. By experiment it was shown that drops of water on the leaves always caused "spot" when the temperature fell exceptionally low and the roots at the same time were well supplied with water.

In the case of Calanthes, I am able to say that over and over again I have known plants to have become badly spotted when and where drops of water could not have reached the leaves under any circumstances. The "spot" in question is certainly of non-parasitic origin. Numerous examinations and experiments have been made, but no fungoid or bacterial parasite has ever been detected. Injuries by animals are also not in question.

The leaf of Calanthe shows an extreme type of hygrophilous structure. It is large and broad, and its broadest part is well spread out horizontally. It is very thin, consisting rarely of more than three layers of spongy parenchymatous cells, with abundant and large intercellular spaces, covered by an upper and lower epidermis. The epidermal cells are small and furnished with a very thin cuticle on each exposed surface. The stomata are flush with the surface of the leaf. They are numerous on the upper surface, but according to my observations on *C. vestita*, *C.* × *Veitchii*, *C. v. Regnierii*, and many others, there are none on the lower surface. There is a scanty supply of simple hairs on the upper surface of the young leaf, but they are not persistent. The bundle system is fairly well developed, although the transverse branches between the parallel bundles are very rudimentary, consisting mainly of a single row of imperfectly formed tracheides.

Regarding its structure, therefore, it is a leaf which is calculated to perform its vital functions most efficiently in a well-shaded position and a moist atmosphere.

The deciduous section lose their leaves shortly after the completion of growth of the pseudo-bulbs. This, and the presence of a large pseudo-bulb and a well-developed root-system, show that the plant should be classed as a tropophyte—one of those which pass through a dry (or cold) season of no growth, and a wet (or warm) season of exuberant growth.

It would appear, therefore, from the consideration of the plant's structure, that the most favourable conditions of cultivation would be an easily rooting medium such as is now generally used for Orchids; plenty of water at the roots when root-action is vigorous ; a well-shaded position at all times; and a moist atmosphere during the whole period of leaf-growth and leaf-action. Orchid manuals recommend that manure should be mixed with the potting soil, and that liquid manure should be given when the bulbs are swelling. I regard manure for these plants as not only not necessary, but distinctly harmful. It is also recommended that the plants should be close to the glass on the lightest side of the stove, and the general practice is to give Calanthes too much light. It is well known that the intensity of the chemically active solar rays in this country during a bright summer is nearly equal to that in the tropics. But Calanthes cannot endure such insolation without injury. Ewart showed* that the effects of excessive insolation are the inhibition of carbon assimilation and, in many cases, the complete destruction of the chlorophyll.

It is certain that very slight injury to the leaves is invariably followed by the death of the injured parts, and that death is not confined to the portions injured. For example, a slight puncture with a needle causes in a few days the destruction of a portion of the leaf several millimetres in diameter. An injury to the leaf-point or edge is followed by a progressive death of the leaf, which continues as long as the leaf remains on the plant. This increasing effect of slight injury is not confined to the leaves, but is evident also in the roots, flower-stems, and bracts, and in the floral segments. In this respect it is interesting to note that the various Phaius species and hybrids behave in a similar manner.

Schunck, in 1901, noticed that the leaves of *Calanthe veratrifolia* and *Phaius grandifolius* contained indican, a glucoside, which under the influence of oxygen—always present in the intercellular spaces of the plant—decomposes spontaneously, with the production of insoluble indigo, as soon as the vitality of the cell is destroyed. I find that indican is present in all the parts, including the flowers, of the Calanthes in question, as well as in *Phaius tuberculosus*, *P. Warpuri*, varieties of *P. grandifolius* and their hybrids. So unstable is the glucoside that a slight rub with the finger along the labellum of a Phaius flower causes in a very short time the appearance of a dark-coloured blotch in consequence of

* *Annals of Botany*, 1897, p. 439.

the liberation of indigo in the solid form. So easily is the effect produced that it may well be that a *lowering* of the cell's vitality is sufficient to bring about the decomposition of the glucoside, and this supposition is supported by other evidence. The precipitation of indigo in the cells furnishes a very convenient index of the progress of local death in any part; it is evident even in some cells which are still green and not yet plasmolysed, whereas in others the decomposition of the indican takes place after plasmolysis. This is not the time to discuss the use and destiny of such a glucoside as indican. If it is made use of by the plant in metabolism, its decomposition must be of a different character from that noted here, for indigo is not found in the vitally active cell. It is not unreasonable to suppose, therefore, that the decomposition of indican with the production of indigo, however brought about, may be a cause as well as an effect of the death of the cell. Indigo is certainly never found in cells which continue to live.

The majority of the Calanthe plants which have been under my observation, in consequence, as I believe, of previous wrong methods of cultivation, develop their leaves irregularly. The outer protecting leaves of the bud develop and open out so slowly and imperfectly that the inner leaves are crowded and cannot emerge properly. This causes much injury to them, so that tips and edges are frequently damaged before they see the light. Young hairs are also torn away in consequence of imperfect plaiting, and wherever a hair is torn a dead spot appears and extends.

But, beyond this mechanical injury, the young leaves before emergence show a multitude of pale spots, more transparent than the surrounding tissue, and manifesting a deficiency of chlorophyll. Although the cells of these spots grow for a time, they grow more slowly than the healthy cells around them, and in consequence strains are produced which destroy the parallelism of the fibro-vascular bundles on each side of them. Yet the transverse branches which pass through the unhealthy tissue and connect the parallel bundles appear to grow to their full length, and in order to be accommodated in the narrowed space they pursue a tortuous course with many angles, approaching in places near the surface of the leaf. At an early stage the unhealthy cells become plasmolysed, their indican—which is not present in so large a quantity in them as in the healthy cells—is decomposed, the cells die and the tissue is frequently ruptured. As the leaf grows other pale spots appear, and the whole of the spots, extending into each other, form large or long black dead blotches. By steeping the leaf in alcohol, or by boiling it in alcohol for a few minutes, the dead cells can be seen to be full of indigo.

In the progressive death of the leaf from the tip or edge, or from a dead spot, the first visible difference beyond the obvious dead margin is the deposition of indigo-blue in the cells. This is first seen in elongated cells about the fibro-vascular bundles, and in the guard-cells of the stomata on the still green side of the margin. Plasmolysis of the cells and the disappearance of air from the intercellular spaces extend also some little distance into the still green tissue.

The imperfect development of the leaf-bud, and the appearance of diseased places in the very young leaf, are certainly determined by an abnormal condition of the pseudo-bulb produced in the previous year. The fact that the most inbred hybrids are the worst sufferers seems to indicate that hybridisation has produced Calanthes more delicate than the species from which they were bred. The best prospect of bringing these hybrid plants into a more healthy condition appears to lie in more rational methods of cultivation for a few years.

ALLOTMENT AND COTTAGE GARDENING.

By Alexander Dean, F.R.H.S., V.M.H.

A grave mistake would be made were it assumed that the only practical gardening found in Great Britain was the work of professional gardeners or of those engaged in commercial horticulture. There is even amongst the section of gardeners described generally as "amateurs," evidence of great gardening knowledge and capacity. These, however, may well on some future occasion speak for themselves, for they are legion. The section of the community to whose garden practice I refer in this paper lies quite outside any of the garden divisions referred to. They come exclusively from the great mass of workers, whose many and varied occupations are diverse from horticulture altogether, men whose labour usually is arduous, and such that in doing it little of direction whatever is given to them in the performance of successful gardening. Doubtless their chief instigation to the laborious work which the cultivation of an allotment or cottage garden impels is the need of providing some sort of addition to their weekly incomes in the form of good healthy food, such as garden or allotment culture produces. Many, however, have native or inherent tastes for garden work, and find in it the best and purest of recreation. These men are all truly born gardeners and evidence the fact that had they been trained as professionals they would have been in such vocation eminently at home, and successful. There are, however, men cultivating gardens and plots who entered upon them without having any defined tastes or desires whatever: these naturally made faulty starts and numerous mistakes, yet has the love for gardening grown upon them so strongly that they have become good cultivators in spite of their original ignorance or comparative repugnance to such labour. Cottage gardeners and allotment holders may now, under the improved conditions which exist to-day, be counted by hundreds of thousands. Still there is room for many more, and myriads shut up in towns or populous localities, where land is devoted to the worship of the Great Brick God, sigh in vain for the day when they may have their house or cottage embowered in flowers, and enough land attached which may be to them a little garden-heaven, or even but an allotment plot, where, under God's glorious sky and in His free air, they may toil in leisure moments with a delightful sense of freedom, and of doing work that is healthful, profitable, and enjoyable.

With the growth of a love for small gardening have come also very many local societies, some promoted by the workers themselves, some, perhaps rather too patronisingly, whose objects are the encouragement of cottage and allotment gardening in their respective parishes and districts through competitions and exhibitions, and these societies, when efficiently utilised, have done great good and have rendered to small gardening active encouragement and assistance. Beyond these, county councils, through the agency of the technical side of their educational work, have now done real good, by placing their garden experts at the disposal of local societies for judging purposes, by lectures, visits, and demonstrations. In many ways they have rendered singularly valuable help, and it is greatly to be hoped that this form of co-operation may in time be widely extended. It is, on the part of county authorities, a recognition of the importance of gardening as a home industry, of its value in training a great industrial population, and of its tendency wherever practised to create sobriety morality, and material social contentment.

Garden Sites and Areas.—It rarely happens, except it be in the formation of a garden city, such as Bournville or Port Sunlight, that sites for cottages and gardens will admit of selection; as a rule cottages have to be built promiscuously, where wanted, or where ground can be spared for such purpose. Thus we find them in all sorts of situations, on all descriptions of soils, and the gardens of exceedingly diverse areas and forms. It is useless in the rural districts as a rule to lay down any prescribed aspects, soils, or situations. These have to be determined by their environment. Naturally it is best that a cottage should front to the north, and the garden have a south aspect, but myriads of good cottages and gardens are found oppositely placed. A cottage garden may vary in area from forty rods, a quarter of an acre, down to ten rods only, although some even do not exceed six rods—an area distinctly too small. Much as to area also may be determined by the time the occupier may have at his disposal for cultivating it. We have seen large gardens of forty rods area cropped and kept in the most perfect condition, quite equal in every respect to the cropping and up-keep of small gardens. A cottager who has in him the true garden cult will not rest, even if his garden seem exceptionally large, until he has the whole in perfect condition. However, very large gardens are the exception rather than the rule. In any good garden moderate portions are invariably devoted to flowers, especially those parts near to or surrounding the cottage. Other parts are devoted more or less to ordinary hardy fruits, the major portion being allotted to vegetables, potatos as a rule occupying fully one third of such space. Generally the cropping is well arranged, so that the ground is well utilised and neatness and order strikingly prevail.

Allotments.—While it is usually found that allotments are provided in groups, more or less in area and number, many are found in isolated spots, such as on unused building sites or where ground is not otherwise usable. Any plot that is not a cottage garden, even if thus single, is treated as an allotment, as the worker does not reside upon it. Groups of plots are usually provided by local authorities or by private persons, landowners especially. At Epsom in Surrey, for instance, there are large groups provided by the District Council and by two landowners respectively. At Richmond, Surrey, the group comprises some 250 plots, provided by the Town Council and leased from the Crown. The plots vary in area from 10 to 20 rods. At Surbiton, Surrey, the District Council have two extensive groups, including some 300 plots. These also vary in area from 10 to 20 rods. In many of the rural districts the groups are smaller in area, and are generally provided by local landowners. The plots again run to similar dimensions. The soils vary greatly, some being deep sand, others stiff clay, black sandy loam, or on chalk. Still it seems to matter little what may be the nature of the soil, crops invariably responding well to deep cultivation and liberal manuring. Necessarily distance from the worker's home has much to do with the working. It frequently happens that the worker resides fully a mile from his plot, and is thus materially handicapped. But if he be a real gardener distance rarely serves to damp his enthusiasm, and his work will elicit the warmest admiration. In Surrey, where allotment culture has, in those districts where local societies have been active, been brought by the best workers up to a high degree of perfection, the best 20-rod plot, including fine vegetables, good fruit, and flowers, has for several years been the work of an ex-policeman. This plot is at Carshalton. A remarkably small plot is usually furnished at Merton, Wimbledon. So also is there a fine one situate on a steep slope at Milford, Godalming. Other first-rate 20-rod plots may be seen at Brockham, Dorking, of which place that fine old rosarian the Rev. Alan Cheales was formerly rector. There a splendid plot, finely cropped and cultivated and beautifully kept, was presented for competition last year by a railway signalman.

Of cottage gardens the finest cropped and kept large one in Surrey was that of a carter at Birtley, between Witley and Haslemere. This man, who has been a soldier, rises in the summer months at 3 o'clock and works for an hour in his garden, then goes to his work till 3 P.M., has his dinner, works in his garden, and in that way presents for competition a splendid garden that commands the warmest praise and secures for him the highest number of marks when seen early in July. There are about the county many gardens that run him close, worked by other farm hands, gamekeepers, signalmen, carpenters, garden labourers, artisans, and policemen, all of whom work with a zest in their gardens and with a degree of love and devotion to which even myriads of professional gardeners may be strangers.

Cropping a Cottage Garden.—Vegetables of course occupy by far the greater portion of a garden. These comprise Potatos, Cabbages, Peas, and Beans of diverse kinds (especially Scarlet Runners), Cauliflowers, Vegetable Marrows, Ridge Cucumbers, Tomatos, Parsnips, Onions (spring- and autumn-sown), Carrots (both short and long), Beets (round and tapering), Broccoli and various winter greens, Spinach, Celery, Lettuce, Turnips, Shallots—always a crop, and others in lesser bulk, to which there is invariably added a nice selection of seasoning herbs, and sometimes even of medicinal herbs. As a rule, the various crops named are in bulk proportioned to their value for domestic consumption. In the Surrey judging, every encouragement is given to cropping which shall cover a wide period of time —indeed literally all the year round. It is important that there shall be shown on the part of the cultivator as much consideration for winter products, growing or stored, as for the more attractive summer vegetables. Fruit is always found in any good garden in varying representation. The most favoured are the bush fruits, Gooseberries and Currants, sometimes planted as bushes on either side of a garden walk, but much better when planted in rows across the garden at about 5 feet apart, Gooseberries and Currants being alternated in rows. Some space is usually devoted to a row or two of Raspberries, as these are among the most reliable of fruits, and oftentimes there are a few rows of one or more varieties of Strawberries. Apples, Pears, and Plums are commonly found as low standards planted at intervals down the garden quarters, although sometimes nice well-cared-for bush trees are seen. The cottager, however, is not, as a rule, a capable fruit-grower, and he prefers trees or methods of training that call for only moderate technical skill. Thus we rarely see the walls of a cottage utilised for the training of good Pears, Plums, or Morella Cherries, fruits that well repay good culture. Presumably the occupier does not care to embark on such culture of fruit, remembering the uncertain tenure of his possession, the original cost of trees, and his comparative lack of knowledge as to suitable training, pruning, and attention. But if the utilitarian rule of the cottage walls be neglected, at least some consideration is often shown for their decoration by means of climbing Roses, Clematises, Honeysuckles, and other suitable plants. Windows may be seen dressed with boxes filled with gay flowering plants, or else with plants in pots ; not infrequently beneath the dressed window is a flower stand, with tiers of shelves, on which very effectively grouped are many plants in pots ; and sometimes also a singular beauty is added by plants, especially drooping ones, such as Musks, Creeping Jenny, *Campanula, Isophylla,* trailing Lobelia, drooping Begonias, Ivy-leaf Pelargoniums, and similar plants grown in pots, and secured by wire to wall-fixed brackets, or planted in hanging baskets. In the garden the flowers include Roses, Dahlias, hardy perennials, Carnations, Pinks, hardy and tender annuals, and not infrequently many tender greenhouse plants, especially Begonias, Fuchsias, Petunias, Pelargoniums in variety, all assisting to give much delightful floral beauty. Naturally with all this evidence of garden taste there is found neatness that seems to be almost excessive. Still it is looked for, and when seen bears warm testimony to the tastes of the cottager for cleanliness and order, without which even the best of crops may fail to give satisfaction. How common it is to find the cleanliness of the garden indicating the neatness and domestic comfort found in the cottage !

Cultivation and Manuring.—The picture of beauty and industry thus drawn is yet one that never fails to arrest the attention of the passer-by if near a highway, and presents a striking example to the other cottagers of the locality. But all this, as seen in the summer, is only secured by hard work. The industrious cottager now knows the value of deep cultivation ; hence in the winter months he trenches 2 feet in depth some portion of his garden, and thus serves the whole of it so far as is practicable in such way once every three or four years. The importance of deep cultivation has been made manifest to him in dry hot seasons, and he has been taught that the deeper roots go in search of manure and moisture in dry weather, the more effectually will the crops resist drought. He knows too the value of manure dressings and of having a good portion placed low down in the soil to induce roots to seek low for it. He knows the value of manures for annual summer mulchings as a top dressing also, and, not least, has learnt to understand how valuable a summer cultivator is the hoe, kept in constant use in dry weather, thus keeping weeds from growing and preserving on the surface about crops a fine coating of well-pulverised soil which acts as a mulch also, and greatly assists to retain moisture in the soil when great heat is prevalent.

Cropping an Allotment.—While the areas of allotments differ, so also do the shapes. But as a rule they comprise strips of ground of equal widths but of varying lengths. On all such plots there is no better or more orderly method of cropping than in the form of rows running right across the ground. Where a plot is of extra width it is usually divided by a 2-feet path down the centre. Where fruit is planted, especially of bush kinds, it is common practice to plant in rows across the plot at wide intervals, enabling vegetables of diverse kinds to be intercropped. But where birds prey on the fruit, bushes are best in rows close together to enable the whole to be netted over. But fruit, unless the group of allotments be well protected, is seldom planted on them largely. On the other hand, comparatively open and easy of access as most groups of allotments are, complaints of human depredators are rare. Strawberries may be grown as well on an allotment as in a garden. Wherever allotments abut on to cart roads or broad paths, a portion of the frontages some 6 feet in depth should be appropriated to flowers. Occasionally where this rule is carried out on large groups the effect in the summer is singularly pleasing. In any case during the summer some pretty flowers should never be lacking, while in many cases in relation to vegetables the cropping is regulated by the possession of a home garden ; still for judging purposes an allotment should be very representatively cropped. Probably one third of the area will be devoted to Potatos, not necessarily all in one patch. Then other crops are regulated by the area of ground at disposal and the needs of the cultivator. Not only is the highest evidence of neatness and order looked for, but also deep cultivation and effective manuring. Whilst more points are as a rule looked for in a good cottage garden, yet very often such superb work and cropping are seen on an allotment that even good gardens are quite distanced in the number of marks awarded. Cold indeed must be the man who looks upon a big group of plots some Saturday afternoon in the summer, alive with workers, without feeling deeply touched.

Garden or Allotment Judging is done in Surrey by the Education Committee's horticultural instructor on a numerical basis. The value of each crop or feature or cultural detail has its maximum number of marks, and it is just in proportion to the approach shown to excellence as represented by the maximum numerals that marks are awarded. The system is found to work most admirably. It is easy to grasp and it greatly facilitates judging. It is not only effectual in enabling comparisons to be instituted between gardens and allotments in all parts of the county, but also with regard to the merits of any one garden or plot from year to year. It is worth mention that gardens which have been of exceptional excellence one year, having totalled upwards of 170 marks—a very high position—have the following year still been good on exactly the same method of pointing, given either the same number of marks again, or perhaps one more or less, and yet without the least reference being made to the figures of the previous year. Whether the pointing be done by one judge only or by two—and that number should never be exceeded—the pointing can be got over rapidly, especially when done by those who have to point many hundreds of gardens and allotments each year.

Maximum Marks.—Twenty is the maximum given to superior work, order, good regular cropping, cleanliness, and evidence of high-class culture.

Ten is the maximum given to Potatos, Peas, winter and summer Onions, winter Greens (including Broccoli, Brussels Sprouts, Savoys, Kales, and Coleworts), to hardy fruits, and, where there are no flower-garden classes, to flowers also.

Eight each is the maximum given to Runner, Dwarf Kidney, and Broad Beans; also to Beet, Carrots, Cabbages, Cauliflowers, Parsnips, Turnips, and Vegetable Marrows.

Six is the maximum given to Asparagus, Celery, Leeks, Cucumbers, Lettuce, Rhubarb, Seakale, and Tomatos.

Four is the maximum given to Artichokes, Red Cabbage, Shallots, Spinach, Herbs, small salads, and anything else that may be found unenumerated.

These maximums indicate the value to the grower which the compilers of the schedule attach to the various crops. It is as a rule found that cottagers and allotment holders attach much about the same values to them also.

The total number of marks possible to obtain is 236; but no garden or allotment ever exhibits perfection in every crop, although the maximum is often attained in relation to cleanliness, order, &c. The judges are somewhat exacting, and both look for and demand excellence. The highest pointed garden in Surrey so far—and a splendid garden it was—secured 184 marks, whilst the highest number given as yet to an allotment is 179. The Surrey Education Committee grant county certificates once only to all those whose work for the first time obtains with a garden 120 marks, and for an allotment 110 marks. In future years, when the gardens or plots obtain these numbers of marks and above them, merit cards are given to each competitor. These are exclusive of the various local societies' prizes, as it is only those entered in the local competitions that are judged by the county experts. Their services are placed at the disposal of these local bodies free of charge. Some twelve years' experience has conclusively proved that the awards of these county judges carry more local respect than do those of judges living in the localities.

It is worthy of remark that for the year 1903, in spite of the difficulties the season created to cultivators, there were just 100 certificates or merit cards awarded to cottagers and allotment holders, and thirty-one were awarded for excellence in flower gardening.

With respect to the granting of marks for flower gardens—

Ten is the maximum given to order and neatness, and the same to brightness or general effect.

Eight is the maximum given to hardy flowers and to tender flowers.

Six to Ferns, vases, or hanging plants, and to other unenumerated features.

For window decoration there is a total maximum of thirty-eight marks, divided among cultivation and quality, tasteful arrangement, variety in plants, and any other special features.

Some cottage fronts are very beautifully done, exhibiting great taste, skill, industry, and not infrequently evidencing material expenditure.

NOTE ON ELECTRIC HEATING.

By R. B. Rogers, A.M.Inst.C.E., F.R.H.S.

I find electric power a very useful and not at all expensive way of getting a little extra heat locally in a conservatory. In the corner of my conservatory I have an octagonal hand-light standing on an octagonal wooden frame, 1 ft. 3 in. deep and 1 ft. length of side, in which I have a few Orchids, and it is also useful for bringing on seedling Ferns or anything else which requires a close warm atmosphere. With two 8-candle-power 110-volt lamps working on a 100-volt circuit I can keep the temperature inside 10° to 12° above that outside. Either lamp can be used separately or both together. The bottom is made of two sheets of flat galvanised iron, one above the other, with some small flat stones between: this is to prevent loss of heat downwards. The lower sheet lies on the staging. The lamps lie on the galvanised iron and are covered by flat tins; over these are two slates, one over the other; then a pot can stand on the top without risk of overheating the bottom of the pot. The current is taken to the lamps by twin lead-covered cable taken into the lampholder and the back of the lampholder filled with insulating compound. The insulation is low, due no doubt to leakage from the lampholders; but there is no risk of fire, as they are entirely surrounded by stone and metal.

I have also arranged an electrically heated hotbed. This consists of a round galvanised iron vessel, 7 in. deep and 16 in. diameter, filled with leaf mould in which the pots are plunged. This rests on a cylinder of sheet iron, 7 in. deep, standing on a wooden platform. In this platform there is a square hole, in which a tray fits, carrying the lamp; the bottom of this tray is covered with sand. The sheet-iron cylinder is surrounded with sand, and the hotbed itself is surrounded with wood-wool and sawdust; there is a wooden casing outside to hold the sand, &c. Over the hotbed there is an octagonal hand-light. With one 8-candle-power 110-volt lamp on 100-volt circuit the temperature is about 90° 3 in. below the surface. From these experiments it will be seen that very little power is required to heat a small enclosure provided the heat is properly kept in, and it seems to me a very convenient and cheap way of heating enclosed window boxes, or any small enclosure in a sitting-room. I have three lampholders fixed under the staging in my conservatory in which I can put 32-candle power lamps to get a little extra heat in very cold weather; but to heat a whole house electrically would of course take a good deal more power; and although it would be more easily under control than any other way of heating it might be too expensive.

ENEMIES OF THE APPLE TREE.

By MONSIEUR CHARLES BALTET, of Troyes.

THE Apple tree is one of our most popular of all fruit trees. In France one meets with it nearly everywhere—in gardens, in the open orchard, on uncultivated land, or by the roadside, from the plains of Flanders to the mountains of Auvergne, on the hillsides of Vigan and under the shadow of the Alpine heights, or within the influence of the sea breezes of Normandy or Brittany, to say nothing of the highly cultivated and lucrative espaliers in the neighbourhood of Paris.

And to what an extent its fruit is sought for, either for direct consumption or for industrial uses! Carts, wagons, and ships convey it to the markets, to the cider press, to the manufactory, to the stove of the fruit-drier, to the ovens of the confectioner, to the pan of the jam-maker. In all forms the Apple is wholesome; and its culture and sale form the object of a very considerable and paying enterprise.

However, the watchfulness of the cultivator must be kept constantly on the alert if he means to safeguard his property from the attacks of its numerous enemies, and to fight against the unfavourable influences which frequently beset the conditions under which it has to grow.

The diseases of the Apple are, in fact, often the result of badly made plantations, of unsuitable positions, or of neglected cultivation; above all, one ought to find out what is defective in the nature of the soil and supply the want. For example: endeavour first to provide coolness for the roots of trees that wither in a dry soil; and, secondly, to drain away excess of moisture from soils and subsoils which are always wet. These are conditions which weaken the growth and, in consequence, the bearing of the trees. The leaf, losing its strength, gets spotted or bleaches, withers away, and falls prematurely.

YELLOW LEAF.—In the first place remove the earth round the trunk down to the roots, and to a sufficiently wide radius, replacing it by a mixture of fresh materials, sandy loam, peat, river dredgings, rotted turf, and waste animal or vegetable matter, the whole being watered with manure water, or dirty water from the house. When the hole is filled up, cover it with a layer of rough grass, farmyard litter, or marsh cuttings, which will permit the rain to filter slowly through, being enriched at the same time by passing through them.

SCORCHING.—The blackening and drying up of the young shoots and leaves, caused by excess of moisture in the soil, necessitates the removal or draining away of the water by means of drains made of pipes of alder wood or burnt clay, trenches filled with broken stones or green fagots, the ground round the tree at the same time being repeatedly dug. If the tree is still young it should be dug up, and replanted sufficiently high, or even on a mound, then staked, and moderately pruned. Good may be done also by incorporating with the soil any light sandy substances, such as road-scrapings, cinders, and even clinkers.

Canker.—Canker arises from many causes: too much shade, cold position, pruning the branches too short, without reckoning the invisible bacilli, fungus spores, split bark, &c. As soon as ever it is noticed, the whole of the wound, with all the canker already formed and in the process of formation, should be cut out with a sharp knife and the healthy parts left bare, covered with some greasy substance. Stockholm tar, grafting wax, and suchlike are also effectual, so also is hydrochloric acid. Leave the branches unpruned, and enrich the soil close to the fine roots by introducing phosphates and powdered sulphate of iron. Paint the stem and larger branches with a mixture of clay, cowdung, and glue or milk, which will protect the bark against the action of cold, and also ward off the direct rays of the sun, both of which are causes of canker.

Frost Glaze.—Floods or heavy falls of rain followed by frost, causing ice and frost glaze on the stems of the trees, are liable to cause cracks in the bark at the time of thawing.

Exposed plantations will require the stems of the trees to be surrounded, to the height of from one half to one metre, with straw bands or wisps of hay, which will at the same time preserve them from the attacks of hares and rabbits. These pests should also be kept at a distance by surrounding the trunk with galvanised iron netting. Traps or poisoned baits are used for the destruction of harmful animals such as rabbits, moles, rats, fieldmice, dormice, &c.

Mistletoe.—Mistletoe is a vegetable parasite, harmful when plentiful, and easily removed with a pruning-knife when quite young. It is well known that bunches of Mistletoe meet with a ready sale at the approach of the Christmas holidays. Shiploads of Mistletoe are sent from our ports to England, together with eggs, butter, and fowls for the Christmas festivities, in which our neighbours across the sea so greatly delight.

Mosses and Lichens.—To remove old bark, mosses, and lichens, which, on the stems and branches, prevent the respiratory functions of the tree or serve as a harbour for insects, a scraper, a metallic brush, or a glove made of steel links may be used, and that most effectively immediately after a heavy rain.

Afterwards paint the trunks with a solution of sulphate of copper or of iron. Burn all infected waste. This cleaning of the wood is a health-preserving operation at all times, and should be done at each age of the tree, even from the very beginning of the plantation. This system of scraping, followed by a wash of nicotine or lime, either by itself or with the addition of sulphate of iron, is also adopted against the little *Chermes aspidiotus*, a kind of scale which fixes itself to the bark of Apple trees grown too much in the shade or as espaliers.

American Blight.—Fight without ceasing against this terrible foe to our orchards, which, by its rapid spread, would otherwise soon end by destroying them utterly. Apple-trees with wide-spread branches are most subject to it, because this style of growth allows the pest to grow on the under side of the branches. In the case of quite young trees, in the nursery or orchard, scrub the parts affected with a solution of ammonia, alcohol, urine, manure water, potash water, refuse oil, or a mixture of soft soap and infusion of nicotine. A hard brush which will penetrate into the roughness and cracks where the insects harbour must be used.

Repeat the operation a week or fortnight afterwards, and whenever the pest reappears. Do not forget that it is wise to cut off and burn any young branches that are badly attacked.

Large Apple trees should be submitted to a liming at the roots. As soon as the leaves have fallen, remove the earth around the bole and surface roots and replace it with lime or soot. The colonies of the pest will then not be able to hibernate.

Green or Black Aphis.—Several kinds of aphis attack the young shoots while they are still in a soft state and hinder the flow of the sap. To remove these, either crush them with the hand, or sprinkle them with nicotine or pyrethrum powder, or syringe them with a solution of soft soap, and then wash them with ordinary water. Young nursery trees being particularly liable to these attacks, it is well to thoroughly syringe and moisten with water any buds or leafed branches that may be either strongly or even only moderately attacked, and to repeat it if necessary.

Hyponomeuta Padellus (the Small Ermine Moth).—To destroy this insect, which appears to be becoming commoner every year, the web containing a brood of caterpillars, which is not unlike a mass of cobwebs, should be either crushed or burnt. *Bombyx dispar* (the Gipsy Moth) may be destroyed by scraping off and burning the patches of eggs which resemble small patches of amadou. They are laid on the shoots and branches in places where they will be sheltered from the rain. Any shoots which show by their leaves curling up and withering that they are attacked by the caterpillars of *Bombyx chrysorrhea* (the Brown-tailed Moth) should be cut off, placed in a basket and burnt, and shoots encircled by the rows of eggs laid by *Bombyx neustria* (the Lackey Moth) should be treated in the same manner.

Cockchafers and their Larvæ.—The vigorous killing of cockchafers in all places is the first stage of the struggle.

The preliminary cultivation of the soil of the nursery or orchard, carefully carried out with a fork, will assist in the destruction of the larvæ in their underground haunts. Strawberry plants or salad plants planted here and there in the infested field attract the grubs. As soon as a plant fades, dig it up with a spade, which will remove it from the soil, with the enemy still at its roots. This method is often necessary where the pips of Apples or Pears have been sown in the nursery.

The young seed-beds are equally subject to the attacks of the *Courtilière* or 'Mole-Cricket.' Follow its burrow with a finger; when you have traced the direction of its nest, give it, through a funnel, a few drops of oil mixed with a pint of water. The insect will come out of its hiding-place and die in the open air.

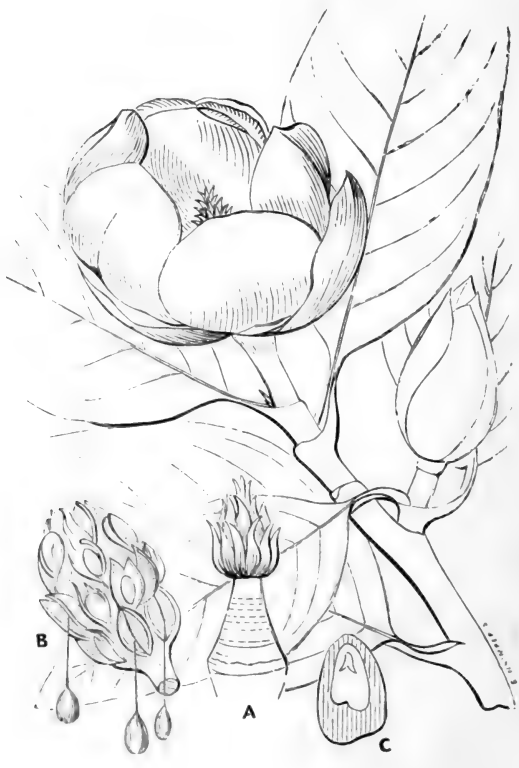
Various weevils belonging to the following genera, *Anthonomus*, *Apion*, *Rhynchites*, &c., form a group of small beetles which are very difficult to capture.

Here, again, the careful dressing of the tree will help much to destroy them. The different transformations undergone by these insects being hindered, they will not be able to stand against the war waged against them in the hiding-places where they take refuge. Remove the dead bark from the tree, sulphur the stems and branches, cleanse not only the infested Apple tree itself, but its surrounding neighbours, no matter what dressing you make use of. Then remove a layer of earth and turf from round the bole of the tree, and make an "auto-da-fé" of it and the debris you have collected. The "Lisette," belonging to the genus *Phyllobius*, which destroys the buds in the spring, should be collected early in the morning, or during rain or watering, and crushed.

The *Agrilus*, a beetle which has no English name, and the caterpillars of the Goat Moth (*Cossus ligniperda*), should be sought for at the end of their burrows. Any greasy matter spread and renewed on the trunk will prevent the female insects from depositing their eggs on the bark or in the sapwood, and will stick to and hold any of the winter moths (*Cheimatobia brumata*), either male or female, that crawl over it.

Luminous traps, well managed, are capable of causing great havoc among winged insects, hardly to be noticed from their minute size and night-flying habits. Moths belonging to the family *Pyralidæ* and flies belonging to the genus *Cecidomyia*, which attack Apples, are among the number. Alas that all fruits cannot be tied up in bags!

As regards the day-moving insects, our charming assistants, the small birds, take upon themselves to free us from them, or at least to make great havoc among them, and to capture them both in the egg state and during their various changes.



SOME DISEASES OF THE POTATO.

By GEORGE MASSEE, F.L.S., V.M.H.

PHYTOPHTHORA INFESTANS, De Bary.

THIS disease is so well known that, unfortunately, little can at present be added to our knowledge of it. Extended experiments, such as might be carried out under the auspices of the Royal Horticultural Society, are still needed to demonstrate clearly the sources of infection. Opinions differ as to whether young Potatos can be infected directly by spores carried into the soil by rain, &c. Some authorities do not admit the usually accepted statement that the mycelium spawn passes up from diseased seed Potatos into the foliage. Experiments conducted at Kew prove that in some instances this does occur, even when the Potatos are only very slightly diseased.

It is, perhaps, not stating too much to say that a very large percentage of disease is due to two specific causes, both of which could be prevented. Unfortunately, the means of prevention do not generally commend themselves to the majority of Potato-growers. I have observed the important fact that, when diseased Potatos are planted, after the crop has been lifted, the remains of the old seed Potatos, when brought to the surface of the ground, will produce a crop of the fungus bearing myriads of spores. If such old seed Potatos are kept buried in soil until the following year, and then exposed to light under favourable conditions, fungus fruit is still produced, and continues to grow so long as a scrap of the old Potato remains. I have now in the laboratory at Kew Gardens scraps of last year's seed Potatos covered with the fungus, and with the spores thus produced have successfully inoculated the leaves of young Potato plants.

It is not rare to see in horticultural periodicals statements to the effect that ten acres of badly diseased Potatos were ploughed in, not being considered worth lifting. Now in face of the above statement as to the copious growth of the fungus on diseased Potatos when exposed to the air, it is not difficult to understand where the germs that first infest a crop come from, and, with the well-known necessary conditions of moisture and warmth, an epidemic breaks out at once. Lacking such necessary conditions, the fungus, although present, cannot attack the Potato-leaves; hence the absence of disease does not necessarily prove the absence of the fungus, but only the absence of those conditions necessary to enable the fungus to attack its host. In all probability the fungus is always present in land where Potatos are grown at short intervals.

I can realise the thoughts of the practical man on being told that it is as important to collect the old "sets," or the whole of a crop of diseased Potatos, as it is to gather the sound ones. Nevertheless such is the fact; and although at first sight such work might appear not to pay, it would eventually do so.

The only known method of preventing an epidemic through infection of the leaves by floating spores is spraying. Dilute Bordeaux mixture should be used; this, however, is of real service only when applied as a preventive. Do not wait until damp warm dull days suggest an epidemic; it is then practically too late. Spray first about midsummer, and again

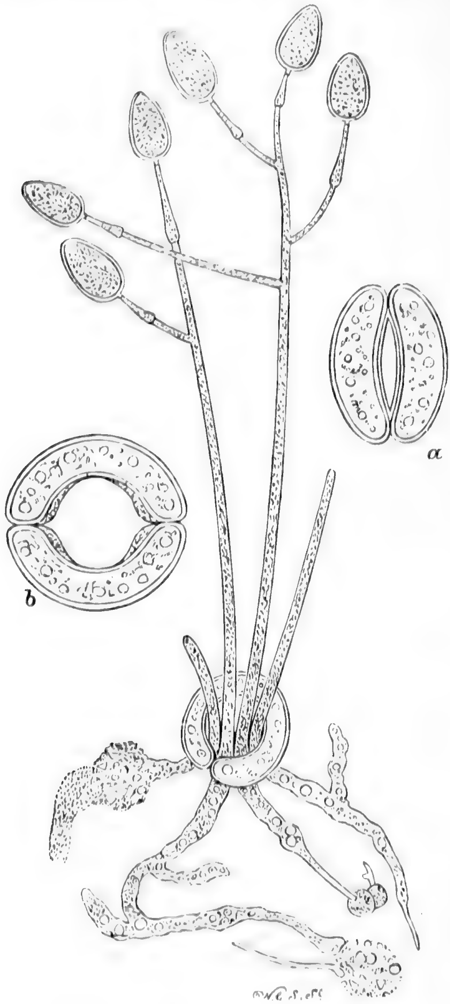


FIG. 24. PHYTOPHTHORA INFESTANS. (*Gardeners' Chronicle.*)
Showing fungal threads bearing conidia passing through a stoma. *a*, stoma in natural state; *b*, stoma distended to allow of passage of the fungal threads. Highly magnified.

after an interval of a month if the disease has not appeared in the meantime. If there are the slightest signs of the disease, spray at once. Unless spraying is properly done, it is absolutely useless. To be well done the under surface of the foliage should be thoroughly covered. Add a pound of soft soap to every five gallons of solution.

A second very fertile source of disease is due to planting infected

Potatos. Perhaps no one would plant obviously diseased "sets"; the danger arises when the Potatos exhibit none of the external signs of disease, but when cut just show indications of the discoloured patches characteristic of the presence of the fungus. The obvious check to this source of danger is to cut all Potatos used for planting, refusing those suspected of being diseased.

Winter-rot (*Nectria solani*, Pers.).

One of the commonest of diseases attacking stored Potatos, but not as a rule manifesting itself for some weeks after the Potatos have been piled

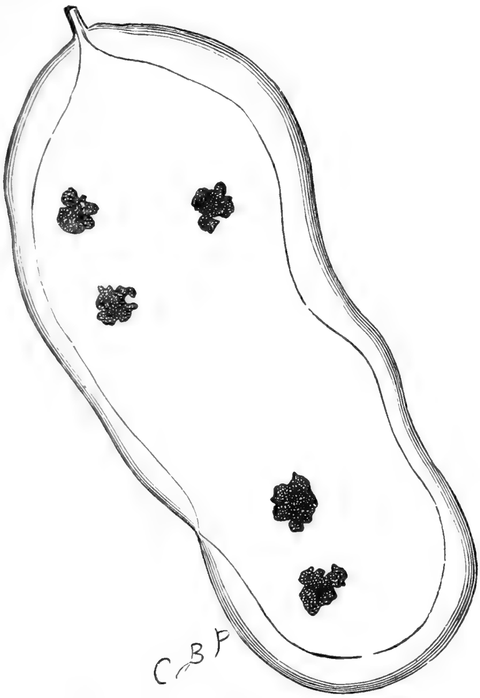


Fig. 25.—Diseased Potato: Internal Spotting. (*Gardeners' Chronicle.*)

in a heap. It is rarely, if ever, met with on Potatos that are kept dry and exposed to the air, whereas, when stored before being perfectly dry, sweating takes place, and in some instances a very large percentage becomes thoroughly rotten before the spring.

The first outward indication of the disease is the appearance of scattered white warts bursting through the skin of the Potato; these, when examined under the microscope, are seen to be covered with a minute mould-like form of fruit once considered as an independent fungus called *Monosporium.* At a later stage the same warts change to a pale rose-pink colour and a second form of fruit appears, the so-called *Fusarium solani.* The spores of the *Fusarium* on germination yield a third type of spore, produced in a ball-like mass of gelatine, which in turn was at one time supposed to be an independent fungus called

Cephalosporium. Each kind of spore in turn is capable of reproducing the fungus, the spores being carried by the numerous mites and other forms of animal life present in heaps of stored Potatos.

The last and most perfect form of fruit produced from the warts are minute blood-red flask-shaped bodies; but these only appear on old dried-up scraps of Potato-skin that are thrown away and lie exposed to

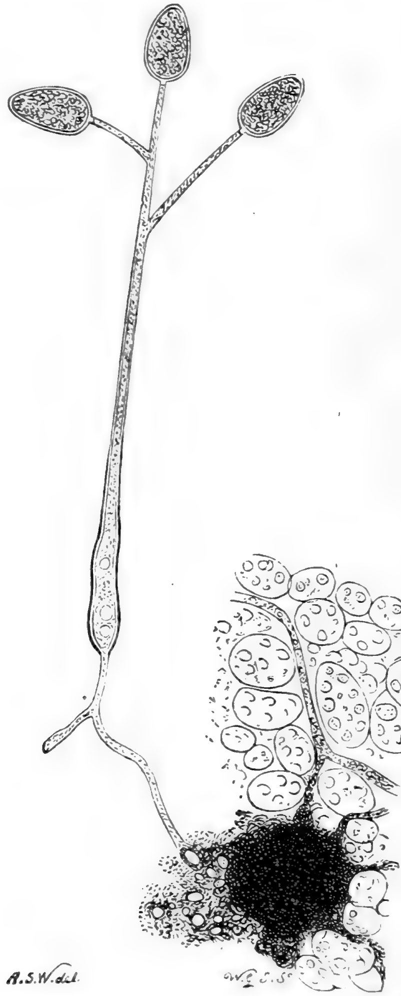


FIG. 26.—PLANT OF PHYTOPHTHORA INFESTANS, SHOWING THE CONIDIAL STAGE. Highly magnified. (*Gardeners' Chronicle.*)

the open air. This is the *Nectria* condition of the fungus, the spores of which on germination produce the *Cephalosporium* forms of fruit. These spores in turn start the first infection in other heaps of stored Potatos.

The best preventive against winter-rot is to have the Potatos thoroughly dry, and then well sprinkled over with powdered sulphur before storing. The sulphur not only destroys the germinating fungus spores, but also checks the development of mites and other minute animals which convey the spores from one Potato to another.

The spawn or mycelium of the fungus extends much beyond the region actually decayed, consequently it is not safe to use even slightly damaged Potatos for sets, even when the decayed portion is cut off.

BLACK SCAB (*Œdomyces leproides*, Trabut).

This serious pest, although only quite recently imported from the Continent, threatens to be quite as destructive to Potatos as the old-established disease. It has also been called *Chrysophlyctis endobiotica* (JOURN. R.H.S. xxviii. p. clxxviii) (fig. 29).

The young "sprouts" are first attacked, presenting a dark brown colour; as these continue to grow they become contorted and much

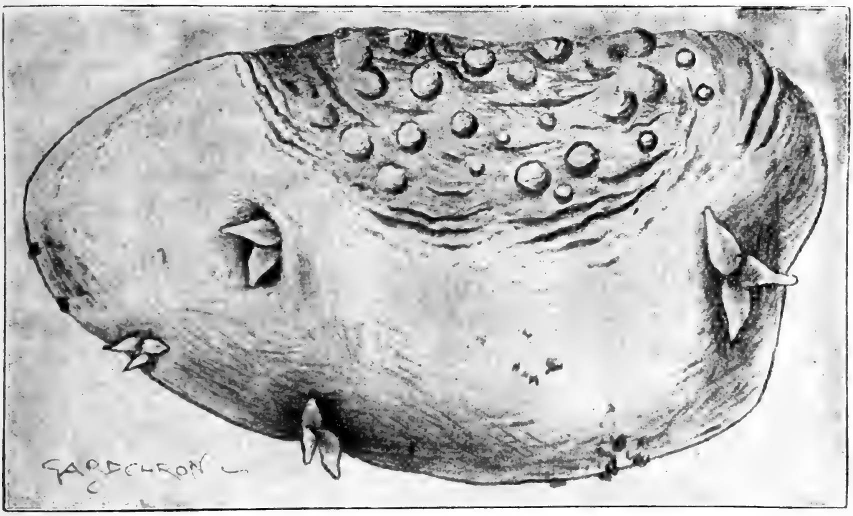


FIG. 27.—WINTER-ROT (*Nectria solani*). (*Gardeners' Chronicle.*) Showing outward appearance. Natural size.

thickened, forming thick crusts of a blackish hue with projecting points, and wrinkled on the surface like a Broccoli flower. After a time the fungus spreads along the surface, and, meeting other diseased sprouts, the greater portion of the surface of the Potato becomes covered with an irregular blackish scab.

When diseased Potatos are allowed to decay on the ground, the liberated spores live in the soil and infect Potatos the following year.

Experiments conducted at Kew prove that, if seed Potatos are thoroughly well covered with powdered sulphur just before planting, they are not attacked when planted in soil known to be infected; but the young Potatos are attacked under such circumstances; whereas if the soil is intimately mixed with sulphur, both "set" and young Potatos are protected.

It may not be practicable to mix sulphur with the soil on a large scale, nevertheless the fact is worth recording. Gas-lime also kills the fungus in the soil if worked in about May or June, when the fungus is in a very susceptible condition. At other seasons of the year gas-lime is of no value in this respect. The only practical means of preventing the spread of this disease is carefully to avoid infecting the soil, and this

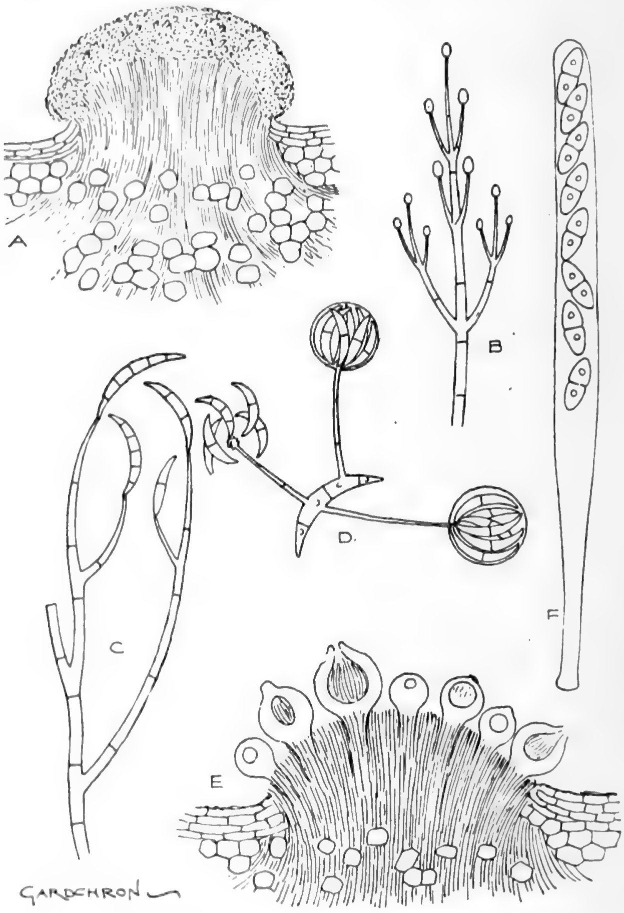


Fig. 28.—Winter-rot (*Nectria solani*). (*Gardeners' Chronicle.*)

A. One of the white pustules or warts in section. The fungus has burst through the "skin" of the Potato and formed fruit on the surface. Slightly magnified. B. First form of conidial fruit (*Monosporium*). Highly magnified. C. Second conidial form of fruit (*Fusarium*). Highly magnified (the conidia are usually only 3-septate instead of 5-septate as shown). D. A *Fusarium* spore, germinating and producing a third form of fruit (*Cephalosporium*). Highly magnified. E. Ascigerous form of fruit (*Nectria*), developing on the pustule that previously bore the conidial forms of fruits. Highly magnified. F. Ascus, containing eight spores, produced by the *Nectria* form of fruit. Highly magnified.

means the removal and burning of all diseased Potatos; at the same time being careful not to plant slightly diseased "sets," known by the blackening at the base of the young sprouts.

This fungus also attacks Beet and Mangold, and may possibly also adapt itself to other root crops; hence such should not be sown on infected ground. Cereals, Peas, and Beans may be sown with safety.

Bacterial Disease (*Bacillus solanacearum*, Smith).

This disease, which has proved very destructive to Potatos in the United States, has occurred once or twice in this country. The leaves wilt and die, the stem changes colour and shows black streaks. When a diseased tuber is cut across, a dark ring, more or less intense, depending on the progress of the disease, is present some little distance from the outside.

The most certain means of checking the spread of this pest is to be assured that the sets are free from disease. This can only be ascertained

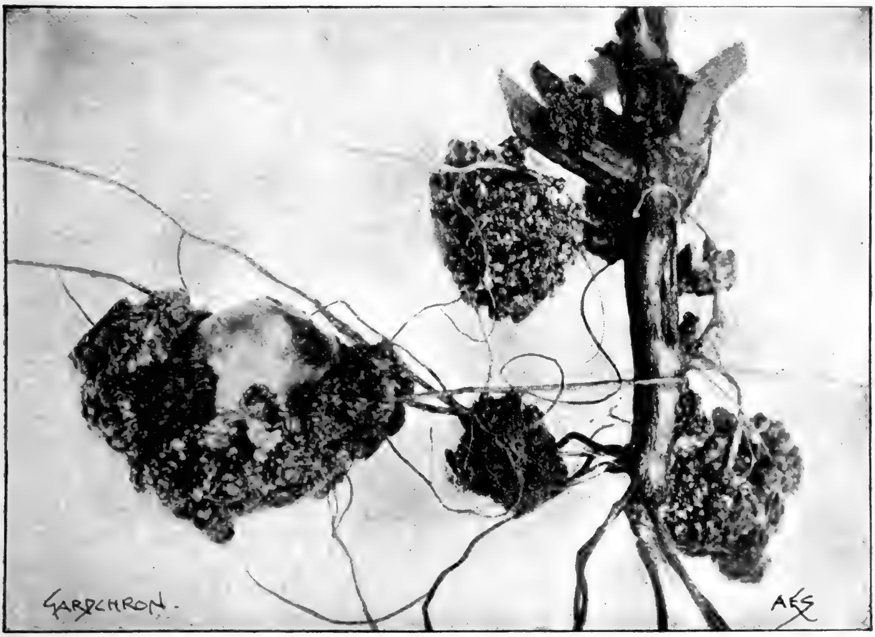


Fig. 29.—Black Scab or Warty Disease of Potatos. (*Gardeners' Chronicle.*)

by cutting, as externally the Potato may appear perfectly sound, whereas the suggestion of a brown ring inside points to disease.

Potato Scab (*Sorosporium scabies*, Fisch.).

This disease, characterised by the presence of scurvy or scab-like patches on the skin of the Potato, is very prevalent during certain seasons, and although the edible property of the tuber is not injured, the market value is much depreciated. A second form of scab, superficially resembling the one described above, caused by an organism called *Oospora scabies*, Thax., also occurs.

The disease is prevented in both cases by steeping seed Potatos for two hours in half a pint of formalin mixed with 15 gallons of water.

POMOLOGY AS A STUDY.

By R. Lewis Castle, F.R.H.S.

Pomology has been too frequently regarded as if it were necessarily narrowed down to a consideration of the mere description and classification of fruits. Interesting and important as these sections undoubtedly are, yet the subject is worthy of being treated upon a much broader basis. One of the leading authorities has defined pomology as the "science of fruits; a treatise on fruit trees; the cultivation of fruits and fruit trees." This offers ample scope, as it practically includes the whole range of subjects in any degree connected with the fruits grown in this country. Especially suitable to the objects of the present notes is that part of the definition which refers to the "science of fruits," meaning a knowledge of fruits acquired by investigation and inquiry conducted upon scientific principles, namely, in a logical, systematic, and accurate manner. Considered in this light pomology constitutes one of the most interesting and important of the departments in scientific and practical horticulture, and one which should command the fullest attention of all who are concerned in the production of the fruit crops of this country. In one section of pomology alone, namely, that dealing with the origin and history of cultivated fruits, there is a wide field for investigation in the geographical distribution of plants and the development of organic forms. Conducted in the same thorough and elaborate manner as Alphonse de Candolle pursued the subject, it becomes almost a science in itself, and certainly is most absorbing to any one who has once entered upon it. To do justice to this would require a treatise, and it is only referred to here because the principal object is to indicate the direction in which both pleasure and advantage can be obtained by an extension of pomological study on a broad foundation. There are many problems concerning the origin of cultivated fruits which have never yet been solved, and perhaps never will be; but numerous matters connected with plant life of less interest and less importance have received a far larger share of attention.

In short the whole phenomena of plant life, growth, and reproduction are involved in a full study of pomology, and it will be the purpose of the following notes to indicate some of the directions in which investigators may find both pleasure and profit. For those of an experimental turn of mind there are abundant subjects worthy of being attacked on the most approved scientific methods, and in addition to confirming or extending what has already been attempted or accomplished fresh experiments could be undertaken in many directions. Well-conducted inquiry of this kind cannot be too widely extended, or treated under too great a variety of conditions; in fact it is only by such means that reliable conclusions can be arrived at and substantial addition made to general knowledge. In the present paper the following divisions are adopted in tracing the development of fruits from the bud stage, pointing out in passing the problems and difficulties which require solution or removal:

1. Flower-bud formation; controlling influences.
2. Problems in fertilisation and sterility.
3. The development of fruits.
4. Fruit characters and description.
5. Systems of classification.

1. *Flower-bud Formation; Controlling Influences.*—We regard the flower-bud as the first chapter in the life-history of a fruit, just as we look upon a seed, a cutting, or a scion as the commencement of the life-history of a plant or tree, though it is obvious that to obtain a complete history it is necessary to go still further back, and to deal with the individual life from which the seed or bud has sprung. As regards the fruit-bearing plants cultivated out of doors in Great Britain, and also with most of those under glass, the first consideration after the plant or tree has attained sufficient size is the production of healthy flower-buds in due proportion, which may be expected, in the absence of climatic or other disasters, to result in fruits that will develop to the fullest their special characters. This is one of the initial stages in successful fruit-growing, as, if flower-buds be few or defective, the cultivator is powerless to remedy the evil by any immediate application or treatment.

But does the formation of flower-buds receive the attention that the subject demands, and are the various influences fully considered in the cultivator's methods and observations?

It is generally recognised that the vegetative and the reproductive forces in plants are to some extent in opposition, and every grower is familiar with the fact that undue luxuriance in a fruit tree is antagonistic to fruit production. But this is not always interpreted in the right way, nor is the requisite attention always given to the observance of the causes that operate in favouring the formation of flower-buds.

The fruit trees grown out of doors in this climate are exposed to many constantly varying conditions that are often entirely beyond the cultivator's control, but the effects can be modified if the influences are carefully observed. Any scientific work in connection with pomology or horticulture generally must be assisted by accurate and detailed meteorological notes, and the interpretation of results in one year can usually be obtained only by reference to the observations of the preceding year, and it may even be to the one before that. The production of healthy perfect flower-buds in fruit trees is mainly dependent upon the storage of elaborated but available substances, and these can only have resulted from preceding healthy growth, with active well-developed leaves fully exposed to the influence of light. A much greater proportionate storage is required to favour the formation of flower-buds than is needed by leaves only, and it can often be observed that buds formed in the axils of partially developed leaves of the current season's growth will commence expanding before the attendant leaves are fully developed. This can be seen in Pears early in a warm moist season. A leaf bud requires but moderate actual storage—less than a seed does—because the first partially expanded leaf commences at once the work of elaboration, and there are sap supplies from the branches to support it. In the case of the flower-bud affairs are quite different, as, though the calyx, when expanded, probably affords some slight assistance, this is small in comparison with the highly specialised demands of the staminate and pistillate elements of a flower.

The first essential, therefore, in flower-bud production is a surplus storage of material, the result of substantial work; and this must be supported by the second essential, the balancing or moderation of the growth. It does not appear that any storage of special substances is made for flower buds; the matters stored are just as available for and as convertible into growth. Pfeffer says: "In perennial plants a large portion of the assimilated material is conveyed to the permanent organs such as the subterranean roots or rhizomes, and to the stems of trees, while in spring a reverse current always conveys food to the developing buds."

In consequence, a continuation or extension of injurious growth will commonly either prevent the formation of flower-buds or effectively weaken them by depriving them of support.

Artificial restriction of this growth either by branch or root pruning, or by diminishing supplies of soil solutions and moisture, are usually resorted to. Advantageous as such methods are in moderation, extreme treatment in either direction frequently results in further evils. Excessive branch pruning commonly results in greatly multiplied growth, leading to the non-development or deformity of flower-buds owing to the excess of material available which the plant cannot dispose of. Excessive root reduction, on the other hand, often causes permanent weakening of the tree, and though flowers may be produced they are frequently lacking in some of the essential organs, resulting in non-fertility.

An interesting example of the effects of excessive root pruning in reference to bud formation and fruit bearing came under my notice a few years ago. Six old espalier Pear trees of one variety at the side of a kitchen garden walk had for some time made a very free growth, but remained unfruitful. Under my direction they were made the subject of an experiment:—(A) two were root-pruned on both sides, (B) two were root-pruned on one side only, and the remaining two (C) were left untouched at the roots. The operation was performed in January or February, and nothing special was noticed in the current year; but in the following year A and B both flowered well; but while in the latter (those half-root-pruned) the flowers were followed by a fair crop of good fruits, those more severely treated had very few fruits. The last two were in their usual condition, but one was subjected to the same treatment as the others in the following season and gave very similar results. This is only stated as an example of the effects which follow extreme treatment in connection with flower-bud production. Many instances could also be furnished of the antagonistic influence of excessive branch pruning against flower-bud production and development; and there is little doubt that undue reduction of growth is quite as much opposed to flower-bud production as excessive growth itself, and much more adverse as regards that point alone than non-pruning. But there are other considerations rendering the latter undesirable which cannot be entered upon here, as I only wished to direct attention to the chief influences controlling bud formation and the difficulties which further experiments might help to elucidate.

Obviously in the case of trees and plants grown entirely out of doors the effects of weather and season will usually be paramount, either helping or counteracting the cultivator's efforts. In the formation of buds on our principal fruit trees, such as Apples, Pears, Plums, Cherries, &c., the weather of May, June, and July has a great influence. For example, in Bedfordshire, in the year 1898, fruit trees flowered and fruited in a remarkable manner; many trees which had not given a sign of fruit before had quite a good crop, and some of the varieties which are always sparse and irregular fruiters were similarly satisfactory. This was in a large measure accounted for by the weather of May to July both in 1897 and in 1896, conditions that favoured leaf production and action followed by an early maturing.

Two questions have repeatedly been asked me in connection with flower-bud formation which are very difficult to answer, and which are worth some definite experimental research to determine. One is:

"Are fruit-tree buds essentially growth and flower-buds from their first formation?"

The other is a somewhat similar inquiry in a different form, viz.:

"Is it possible when buds are forming to cause (by treatment or weather influences) their development as flower-buds?"

The theoretical origin of flowers is of course well understood now, and we often see strange transformations of floral organs into foliaceous productions; but does the reverse take place? Is there a stage up to which a bud is neutral, as it were, and is its development then by some external cause sufficiently influenced to become so greatly differentiated in its parts as takes place in a flower? I confess that this is a question upon which I am not prepared to give a definite reply, though I have been accumulating evidence for some years, much of which points to the conclusion that such changes do occasionally take place. It is invested with considerable interest, however, and is well worthy of investigation.

2. *Problems in Fertilisation and Sterility.*—An important stage in the life-history of a fruit is reached when the two elements of the flower are developed and the period of expansion is approaching. Apart from the fact that adverse weather-influences counteract all the good work which has preceded the production of flowers, there may still be something wanted to complete the fertilisation and ensure the perfection of the fruit.

The majority of fruits in this country are members of the great rosaceous family, which includes so many useful and beautiful garden plants. They are furnished both with the staminate and pistillate elements in an advanced and strongly developed form. Yet a very moderate amount of observation directed to the behaviour of cultivated Apples, Pears, Peaches, Plums, and Strawberries will show that there is often a marked tendency to a unisexual condition in some varieties, due to one or other of the elements being imperfectly developed or entirely suppressed. This has at times an important bearing upon practical success. It may sometimes arise from internal or inherited defects in the individual plants, but more frequently it is due to soil, climatic, or weather influences. Professor George Henslow has given numerous examples of this phenomenon in a chapter on "Sexuality and Environment" in his interesting work on

"Floral Structures," in which he deals with nutrition, temperature, and soil as affecting the two essential elements.

Among fruits these causes all operate to some extent, though not equally, on the same plants. Perhaps the most remarkable is the behaviour of Strawberries under different climatic conditions, as shown by the European varieties introduced into North America, and even by the varieties raised in the United States and grown in widely separated districts. Some of these have become staminate only and others pistillate only; yet in Great Britain we seldom have any prolonged serious trouble in this respect, except with those of the 'Hautbois' type. In all the American lists it is usual to state, in the description, which Strawberries are staminate and which pistillate, and when the latter are planted in beds a line of a variety which produces pollen freely is planted with the others to ensure fertilisation, about one line to ten being found sufficient for the purpose. A typical American variety which will illustrate this is 'Crescent Seedling.' It is distinctly pistillate in the United States, whereas in this country it produces perfect flowers and sets its fruit most readily, cropping heavily in favourable seasons.

A well-known British variety, 'Stirling Castle,' which is also pistillate in America and does not set its fruit without the aid of pollen from another variety, is here quite self-fertile and bears constant crops, being one of the varieties especially favoured by some large fruit preservers for jam making. Whether it is the greater heat of summer or the colder winters of North America which produce this floral unisexuality it is difficult to determine, but in England I have grown the 'Royal Hautbois' in warm soils in Surrey and Kent that has proved quite fertile, while the same variety on cold soils in Bedfordshire and elsewhere has proved continually unfertile owing to the suppression of stamens and pollen.

The evidence varies greatly, and perhaps that recorded is not always strictly reliable, owing to some circumstances being omitted; but it appears generally that the staminate portion of the flower is more readily affected by changes of temperature than the pistil; but this is not the case when the temperature falls below freezing point, as then according to my observations, which have extended to several thousands of flowers of our principal fruit trees, the pistil and stigma are the more quickly injured, though something depends upon the stage the flower has reached. But even in small unopened buds of Apples, Pears, Peaches, Apricots, Plums, Cherries, Gooseberries, Currants, and Strawberries, I have repeatedly found the pistil destroyed, or so injured as to be useless, when the stamen showed no damage and subsequently produced pollen. The greatest damage to the stamens appears to result from low temperatures, with sudden variations and abundant moisture, and this is in accord with the observations of Mr. Meehan and others to the effect that the staminate element is more readily affected by a rise in temperature than the pistillate part, and it is thus rendered liable to injury or check by sudden alterations of temperature. It was noted by that observer that in some years with warm days early in spring the catkins of the Hazel would become fully developed "some weeks before the pistillate flowers," with the result that the latter were then usually unfertilised. In a collection of many varieties of nuts there is some natural difference in the time of flowering, and the evil referred to is avoided; but where large quantities of one variety are grown I have observed a similar occurrence in several forms besides the common Hazel.

The sterility arising from inadequate nutrition can be seen at times in some varieties of Apples and Pears in a very marked degree; but there is a great difference in this respect, as a few forms resist such effects with surprising strength, while others are just as readily influenced. Some varieties of Apples have especially attracted my notice during a long series of years, as under most diverse conditions of soil and situation which have produced marked effects on the growth, yet both elements of the flowers appear to be developed with equal strength, and they are consequently strongly self-fertile. It is generally held that the pistillate portion requires the most nutrition, and where the two elements are in different flowers those producing seed are usually borne upon the strongest branches or the stronger part of the same branch. This is no doubt true as regards the ultimate result, the development of fruit and seed; but up to the time of fertilisation as regards most of our fruit trees, as far as my observations extend, the pollen production is the most serious tax upon the strength of the tree, and in consequence in the case of weakness or soil-poverty the stamens or anthers are the first to suffer. I have noticed this in the Apples 'Stirling Castle,' 'Lord Suffield,' and 'Cox's Orange Pippin,' with others, besides several Plums, Pears, and Peaches. In such cases sterility has been effectually removed by liberal application of complete manurial aids; but where the defect has arisen from some other cause it has been necessary to plant other varieties with the failing sorts in order to provide the requisite pollen.

It is a rather remarkable fact, but it appears, as regards Apples, Pears, Plums, Peaches, Apricots, and Gooseberries, that the pollen of any variety is equally effectual with that of the individual's own flower in causing fertilisation and seed production. Indeed, it has been contended that the use of the pollen from other varieties is more beneficial, resulting in more seeds being formed, and in finer and better keeping fruits developing from the cross-pollination. Mr. M. B. Waite, of the United States Department of Agriculture, has recorded the results of some interesting experiments with Apples and Pears in reference to this matter. He further claims that the pollen has exerted conspicuous effects in certain cases upon the resulting fruits, and he has furnished both illustrations and descriptions of such effects (see Year Book of the Department of Agriculture, U.S.A., 1898, pp. 171–174).

3. *The Development of Fruits.*—Progress of the fruits from the time of the fertilisation until the ripening period is more strictly a purely cultural part of the subject than the preceding, but there are several points which, from their scientific bearing and importance, may be considered as coming within the scope of the subject as we have set it out. The chief questions arising out of these are, 1st, how far fruits are aided in their progress by the previously stored materials in the stems and branches of trees, &c.; 2ndly, to what extent the work of assimilation carried on in the leaves of the current year assists the progress; 3rdly, what manures have the greatest effects, and when they should be applied to produce the best results; and 4thly, will any application after

the fruit is fertilised materially affect the ultimate development? In all these subjects there is much work yet to be done before it will be possible to do more than generalise respecting them. It has been shown by the microscopical examination of large and small fruits of the same varieties, that the actual number of cells in each does not differ in any degree proportionately to the difference in size. The increased development of the larger parts seems in nearly every case to be due mainly to the fact that the individual cells are larger, and that there is a greater proportion of water in the juices or flesh. It has been pointed out that the larger fruits do not contain a greater portion of the sugars or flavouring matters, but rather that these have been diluted and lessened in effect. Much must always depend upon the nature of the soil, and now that the work of the organisms present in soil is becoming more generally understood, there is little doubt that increased light will be thrown upon many of the problems afforded by the diverse results recorded in the manuring of fruit trees. It is to the nature of the soil we must first look, not merely the chemical constitution, but the mechanical or physical state, and the bacteria-favouring conditions. Here again is a wide field for the student and the cultivator.

4. *Fruit Characters and Description.*—To all who are interested in the minute and beautiful variations of organic forms, the principal cultivated fruits afford as diversified objects as could be desired. But this variability is most difficult, if not impossible, to fix in a written description with sufficient character to render a fruit always recognisable under all circumstances. Recognising this, some of the most distinguished pomologists have taken extreme courses in their descriptions of fruits. Some have described individual fruits with the most accurate minuteness of detail, while others have gone to the opposite extreme and reduced their descriptions to a few general characters of the ordinary catalogue type. For purposes of identification both are often useless, the first because instead of taking a type, including the range of chief variations, an individual is selected which might scarcely be recognisable in another district or even in another season. To describe fruits satisfactorily a wide experience with them under diverse conditions is essential, and a quick perception to detect the essential characters. To Mr. George Lindley (the father of the illustrious Dr. John Lindley, who was so long Secretary of the Royal Horticultural Society) we owe the best of the early volumes in the English language devoted to the description of fruits. In the "Guide to the Orchard," published in 1831 under the editorship of Dr. J. Lindley, we have the work of forty years of close observation, and the descriptions are in the majority of cases models of what such word pictures should be—neither too long nor too short, but including all that is essential. The majority of the older varieties can be still readily recognised from these descriptions.

After the lapse of over a quarter of a century Dr. Robert Hogg took up the great task of describing the leading cultivated fruits of the United Kingdom, and in the "Fruit Manual" he embodied the results of his labours, and to this day it remains the most elaborate and accurate book of reference on the characters of all our home-grown fruits known up to the date of the last edition, namely, 1884. More recently Mr. George Bunyard and Mr. Owen Thomas have in the "Fruit Garden" provided more abbreviated but carefully condensed descriptions of the recent fruits.

Monsieur André Leroy, of Angers, contributed to the literature of pomology an important work in the "Dictionnaire de Pomologie." His descriptions of fruit and trees are worked out in the utmost detail, together with a most elaborate synonymy and full historical references. It is of more value with regard to Continental varieties than as concerns those that are more especially British; but as an example of keen study it is interesting in the extreme. In one respect especially it is to be commended, and that is the fact that particulars are included respecting the foliage and habit of the trees, these characters being as a rule too little regarded in ordinary works on pomology.

5. *Systems of Classification.*—An efficient system of classification of organic beings or productions should combine two purposes:

a. To furnish a convenient means of ascertaining the identity of any members of the series.

b. To convey information respecting the natural relationship existing between the different objects and to encourage further study.

Where the known variations have become very numerous, as with many plants under extensive cultivation, the difficulties of such a classification are greatly increased. Broadly defined groups can be formed, but when the subdivisions are reached the limits are not easily fixed, and it is often a matter of arbitrary decision as to the position to be assigned in closely related groups.

Such difficulties must always occur, and as study is extended, though they may be reduced in some directions, they are often increased in others. The utmost that can be done is to minimise the inconvenience caused by these impediments, by continued patient research and keen observation of all characters, which is in itself a pleasant occupation or recreation.

As regards fruits more particularly, the study of the principles upon which classification depends supplies abundant matter of interest, and it might be pursued more generally with advantage.

In these notes it is only attempted to point out the main features of the methods at present adopted, and to offer suggestions for simplification which long experience has indicated as desirable.

The natural orders or families of plants, which include the fruits most generally cultivated in this country, are few, and comprise the following:

Berberidaceæ.—The Barberry.

Ampelidaceæ.—Vines.

Rosaceæ.—Almonds, Peaches, Apricots, Plums, Cherries, Raspberries, Blackberries, Strawberries, Pears, Apples, Medlars, Quinces.

Saxifragaceæ.—Red and Black Currants, Gooseberries.

Cucurbitaceæ.—Melons, Cucumbers.

Vacciniaceæ.—Cranberries, Bilberries.

Solanaceæ.—Tomatos.

Urticaceæ.—Figs, Mulberries.

Juglandaceæ.—Walnuts.

Cupuliferæ.—Hazel Nuts, Filberts, Chestnuts.

Scitamineæ.—Bananas.

Bromeliaceæ.—Pineapples.

Of the fruits named we shall only deal here with a few examples of those which include numerous varieties and present exceptional difficulties in their classification or determination. The late Dr. Hogg's systems are those analysed and explained. They embody all the best observations of the pomologists who preceded him, and nothing more efficient has appeared since. During a period of some years I had ample opportunities for studying the working of the various systems under their author's guidance. He was fully conscious of the imperfections which always to some extent mar the usefulness of such methods, and some of them would no doubt have been modified by further experience. During the past ten years I have had exceptional means for closely investigating the systems detailed in the last edition of the "Fruit Manual"; thousands of fruits have been examined and compared, and upon these observations the following remarks are founded.

GRAPES (European).—*Vitis vinifera.*
(American).—*Vitis Labrusca.*

The characters which are most available in these fruits for classification purposes are the shape of the berries, the colour, and the flavour. For instance, two large groups can be formed:

1. Berries globular.
2. Berries oval.

Each of these is subdivided into three sections, according to the colour of the skin:

A. Black or purple.
B. Red or tawny.
C. White, yellow, or green.

Two groups have been formed in each of these sections, determined by the flavour, namely, "Muscats" and "Non-muscats." This is the weakest part of the system, for there are some varieties which cannot be conveniently classed in that manner. The alternative is to devote a separate classification to all the true Muscats, founded upon the principles set out, and then the final subdivisions would not be required. This appears more simple and preferable. It is practically that followed by Mr. A. F. Barron in his work on "Vines and Vine Culture," as he classed European Grapes in three divisions:

1. Sweetwater Grapes.
2. Muscat Grapes.
3. Vinous Grapes.

The characters of form and colour are then available for the subdivisions, an arrangement which has much in its favour.

ALMONDS. *Prunus Amygdalus.*—There are not many varieties to deal with here, and the characters relied upon have been the constitution of the fruit, as (1) a thin spongy husk, and (2) a thick succulent husk, for the main divisions; the flavour of the kernels, *i.e.* sweet or bitter, being taken for the secondary groups, as well as the consistency of the shell, namely, "hard and woody," or "soft and tender." With regard to the two leading divisions, some modification is advisable. The second was founded upon an interesting fruit, but of little value horticulturally. It is a kind of nondescript, being regarded as a hybrid between the Almond and the Peach, but possessing the best qualities of neither. As it is the only member, the group is not worth maintaining on that account, though the Peach-Almond might well have a place in any garden where curiosities are appreciated. It is either the same or a similar form which is seen in some botanic gardens as *Prunus Amygdalus* var. *persicoides*.

By adopting the flavour of the Almond kernels as the chief distinguishing character, a more consistent arrangement results:

1. Kernels sweet.
2. Kernels bitter.

These then correspond respectively to the botanical varieties, *Prunus Amygdalus* var. *dulcis*, and var. *amara*.

Peaches and Nectarines. *Prunus Persica*. (*Prunus Davidiana*, a Chinese tree which has been also described as a variety of *P. Persica*, is regarded by some as the true source of the cultivated Peach.)

The size of the flowers (large or small) was selected by Dr. Hogg for his two main groups of Peaches and Nectarines. The character is a good one and generally easily distinguished, though there are some intermediate forms. The chief difficulty is that the characters are not available at the time when the fruits have to be determined, namely, when they are ripe. This is a material disadvantage in any system of classification, and especially as regards the leading groups.

The next characters are derived from the leaves, the presence or absence of glands at the base of the leaf-blade, and the shape of the glands, as round or kidney-shaped. Though variable at times, these are fairly reliable as a rule, and they are useful because they are at command at the same time as the fruits. The final divisions rest on the adherence or non-adherence of the stone to the flesh, *i.e.* clingstone and freestone.

In my own work, I have adopted a modification of the "Fruit Manual" system, for the reasons already explained in brief. This is as follows:

A. Leaves with glands.
    1. Glands round.
        ×. Freestone.
            Flowers large.
            Flowers small.
        × ×. Clingstone.
            Flowers large.
            Flowers small.
    2. Glands kidney-shaped.
        (Similar subdivisions.)
B. Leaves without glands.
    ×. Freestone.
        Flowers large.
        Flowers small.
    × ×. Clingstone.
        Flowers large.
        Flowers small.

Apricots. *Prunus Armeniaca.*—The varieties cultivated in Great Britain are not very numerous, and a few characteristics suffice to distinguish them. They have been classed in this way:

A. Kernels bitter.
    ×. Back of stone impervious (= not perforated).
        Freestone.
        Clingstone.
    × ×. Back of stone pervious (= perforated).
        Freestone.
        Clingstone.
B. Kernels sweet.
        Freestone.
        Clingstone.

It is a question whether the perforation of the stone would not be a preferable character for the main divisions. The arrangement would then be:

A. Back of stone perforated.
    1. Kernels bitter.
        Freestone.
        Clingstone.
    2. Kernels sweet.
        Freestone.
        Clingstone.
B. Back of stone not perforated.
        (Similar subdivisions.)

Plums. *Prunus communis.*—Dr. Hogg's arrangement of Plums grown in British gardens has never to my knowledge been surpassed. The characters relied upon are readily available: namely, the smoothness or hairiness of the young shoots, the shape of the fruit, the colour of the skin, and the relation of the flesh to the stone (freestone and clingstone).

The system in detail is as follows:

A. Fruit round.
    1. Summer shoots smooth.
        ×. Skin dark.
            Freestone.
            Clingstone.
        × ×. Skin pale.
            Freestone.
            Clingstone.
    2. Summer shoots downy.
        (Similar subdivisions.)
B. Fruit oval.
    (The same subdivisions as in A.)

Intermediate forms occur in all the sections, but as a general rule the principal characters are easily applied. Perhaps the most difficult is in the smoothness or downy state of the shoots, and it is rather puzzling occasionally to determine to which group a variety should be referred. This may, however, be overcome by examining several shoots in different stages from various branches on the same tree.

Cherries. *Prunus avium, P. Cerasus,* and *P. acida.*—The majority of Cherries are naturally ranked in two series—those with sweet fruits, and those with more or less acid fruits. They are also distinguished by differences of habit, growth, and foliage, which render the groups more clearly defined.

The first group, the 'Gean,' 'Guigné,' or 'Mazzard' Cherries, comprises the varieties with sweet heart-shaped fruits derived from *Prunus avium.* These have generally a spreading habit of growth, long leaves, large flowers, and thin petals, including the Black and Red Geans, the Black Hearts, and the Bigarreau types.

The second main division includes those Cherries to which the term 'Griotte' has been applied: namely, the Black and Red 'Dukes,' and the Black and Red Morellos (Kentish and Flemish). In the 'Duke' type the growth is upright with broad flat leaves, while in the Morello class the growths are more slender or pendulous with small narrow leaves, acidity of juice characterising all the latter varieties in a marked degree.

The Morello is referred to *Prunus Cerasus,* but *Prunus acida* is also concerned in the Griotte group, for the All Saints Cherry is regarded as identical with *P. acida* var. *semperflorens.*

In each of the classes mentioned the subdivisions depend upon the shape of the fruit and the colour of the flesh and juice. Thus under Geans the arrangement is in this form:

A. Fruit obtuse, heart-shaped, flesh tender, melting.
  ×. Flesh dark, juice coloured.
  × ×. Flesh pale, juice uncoloured.
B. Fruit heart-shaped, flesh firm and crackling.
  (The above subdivisions are repeated.)

The Griottes are grouped in this order:
A. Branches upright, leaves large and broad.
  ×. Flesh dark, juice coloured.
  × ×. Flesh pale, juice uncoloured.
B. Branches long, slender and drooping; leaves small and narrow.
  (The same subdivisions are repeated.)

A modification of this system could be made with advantage as regards the Griotte group. The 'Duke' varieties constitute a distinct section, as do the Morellos also. If three main divisions were formed instead of two, we should have (1) Geans, (2) Dukes, and (3) Morellos with the subdivisions as already indicated.

Pears. *Pyrus communis.*—The difficulties of classifying Pears satisfactorily are numerous, and all schemes hitherto prepared are open to various objections in the working. An approximate arrangement only can be secured, and that set out in the last edition of the "Fruit Manual" is the best yet formed, though further study is required. It is founded upon the relative length of the lower (stalk) portion and that of the upper (eye) portion of the fruit for the main divisions, while the relation of the total length to the lateral breadth of the fruit distinguishes the subdivisions.

The three chief groups are thus characterised:

1. Length from the base of the stalk to the base of the seed-cells greater than from the base of the cells to the base of the eye.
2. Length, taken in the same way, less in the lower than the upper portions of the fruit.
3. Length in the two parts equal.

Three sections are formed in each of these groups, as follows:

(*a*) Length from the base of the stalk to the base of the eye greater than the lateral diameter.
(*b*) Length less than the lateral diameter.
(*c*) Length equal to the lateral diameter.

These characters can only be determined by taking cross and longitudinal sections of the fruits to be examined, and only fully developed specimens must be relied upon to show the formation accurately.

The great variability of Pears under different conditions of soil and climate, and the difficulty of obtaining fruits in the same stage for comparison, necessitate much patience and keen observation on the part of the pomologist who undertakes the study of these fruits.

Peculiarities of the skin surface, the colour, the length, thickness and position of the stalk, the form of the eye, flavour, consistency of the flesh, and the season of maturation are all useful for distinguishing varieties, but they are of little value for general classification.

The Apple. *Pyrus Malus.*—More attention has been paid to the systematic classification of this fruit than to any other, partly because it has been so widely cultivated in Europe for so long a period, and partly because the varieties are numerous, and the need for their accurate determination is most frequent. Some of the older writers on fruits propounded very elaborate systems, which possibly served their purpose then, but in these times of much more abundant varieties the old systems have become unworkable and useless.

When the "Apple and its Varieties" was issued (1852), a simple arrangement was adopted, and if it could be made to serve at the present time it would be all that could be desired. The main divisions were three, determined by the season when the varieties were fit for use, namely, summer, autumn, and winter. The secondary groups were founded upon the form of the fruits, *i.e.* round or globular, flat or oblate, and oblong or conical. The next character taken was the colour, and again three divisions were formed, viz. coloured, striped, and pale or green. It might be possible, by excluding intermediate or doubtful forms, to utilise this system still, but it would be very partial and would necessitate the exclusion of a large number of valuable varieties.

The most elaborate system of classifying fruits ever published was that devoted to the Apple in the "Fruit Manual" of 1884. Patient and prolonged study had been given to the subject, the whole arrangement was logical, methodical, and well balanced, yet experience has found that some modification is needed to render it efficient.

The three main divisions rest upon the position of the stamens in the calyx tube. Thus, in group 1 they are marginal, *i.e.* at the mouth of the tube; in 2 they are median, namely at the middle of the tube; and in 3 they are basal, that is, at the bottom of the tube. These characters are occasionally sufficiently clear to be recognised, but in many instances it is impossible to assign a definite position to what remnants of the stamens are visible in the matured fruits. The late Mr. A. F. Barron came to this conclusion some years before I had been able to devote more than a cursory examination to the matter, and there is good reason to believe that, had Dr. Hogg lived to issue another edition of his great work, considerable alterations would have been made in this respect. In consequence they are here discarded.

The next main divisions are founded upon the shape of the calyx tube beneath the eye, as seen when a vertical section is taken. These are two, namely (1) conical and (2) funnel-shaped, and though they vary in form in different specimens, these two divisions are generally readily distinguishable, the first giving a triangular outline with straight sides, while the second is cup-shaped at the top and contracted into a more or less narrow tube at the base. As each of the three groups founded upon the position of the stamens was subdivided in this way, four of these would now have to be discarded, and the remaining sections would be arranged under the two named.

The shape of the cells (the core containing the seeds) is taken advantage of to form other divisions. This character is seen when the Apple is cut vertically, *i.e.* from the eye to the stalk. These forms are four, namely, round, ovate (broadest at the base), obovate (broadest at the upper part), and elliptical, which present no great difficulties in discrimination. Each of these groups is subdivided according to the relation of the cells to the axis of the fruit, as seen in a cross section through the centre. If the walls of the cells extend to the centre, the term "axile" is used; if they do not reach the centre, as seen in all so-called hollow-cored Apples, the term "abaxile" is employed, and I have not found any great difficulties in the utilisation of these characters.

The calyx (or eye) divisions supply material for four other sections under each of those already named. These are (*a*) divergent, with the divisions turned back and spreading (=open eye); (*b*) erect convergent, with the divisions rising straight from the eye and tending towards the centre, partly closing the eye; (*c*) flat convergent, when the divisions spread in a flat manner, partly closing the eye; and (*d*) connivent, in which the segments close the eye completely.

Next in order the form of the fruit is taken, namely round or oblate, and conical or ovate; the colouring follows, *i.e.* pale, striped, coloured, or russet. To further aid in distinguishing varieties, minor characters are at command derived from the skin surface, which may be rough, smooth, or unctuous. The flesh may be soft or hard, succulent or dry; while the flavour offers numberless variations. The depression or prominence of the eye, the position, length, and thickness of the stalk also afford many points of value.

The general arrangement of the known varieties of Apples, with the modifications suggested, would thus be in the appended form:

A. Tube conical.
  1. Cells round (axile or abaxile).
    a. Calyx divergent.
    b. „ erect convergent.
    c. „ flat convergent.
    d. „ connivent.
  2. Cells ovate (axile or abaxile).
    Subdivisions as in 1.
  3. Cells obovate (axile or abaxile).
    Subdivisions as in 1.
  4. Cells elliptical (axile or abaxile).
    Subdivisions as in 1.

B. Tube funnel-shaped.
  (Similar divisions and subdivisions in this group.)

Under this method the number of sections would be reduced from 192 to 32, which would be a step in the direction of simplification, and would also facilitate the identification of the varieties.

This example of the diversified and interesting material which fruits furnish to students must suffice to conclude these notes, the principal object of which has been to indicate the directions investigators may take who wish to pursue the subject with pleasure and profit.

EXAMINATION IN HORTICULTURE, 1904.

The Annual Examination in the Principles and Practice of Horticulture was held on April 20, 1904, when 190 papers were sent in.

Three hundred marks were allotted as a maximum, all candidates who obtained 250 marks and upwards being placed in the First Class. The total number of these was 35, or about 18·3 per cent. of the whole.

Those who secured 200 marks and less than 250 were placed in the Second Class. Their number was 93, or about 49·2 per cent.

Those who obtained 100 marks and upwards were placed in the Third Class, their number being 62, or about 32·4 per cent.

There has been a slight decrease in the number of candidates, as 198 offered themselves in 1903, and 229 in 1902. This is probably the result of a somewhat more advanced syllabus.

There has, however, been a considerable advance in the quality of the papers, as shown by the percentages; for in 1903 the First Class was only 7·6 per cent., the Second Class 31·3 per cent., and the Third Class about 56 per cent. These facts were commented on in the Report of last year (Journal Royal Hort. Soc., Vol. XXVIII., p. 119).

Year by year the students exhibit a better knowledge of practical horticulture, nearly all the questions bearing upon the culture of fruit trees and vegetables being this year well answered. Most of the candidates have also a good knowledge of artificial manures and their application to the crops in the kitchen and fruit garden. The question referring to conservatory decoration was not very well treated. Many of the candidates could name only a few of quite the commoner plants, and could give but meagre directions for culture. It may also be well to urge candidates again to keep as closely as possible to the terms of the questions; in many instances much unnecessary labour was bestowed and time wasted on the first and second questions answered, leaving not nearly enough for the third and fourth. Some of the candidates answered three only of the four questions they ought to have answered; whereas if they had apportioned the time necessary for each question, they might easily have answered all four.

George Henslow, M.A., V.M.H.
Jas. Douglas, V.M.H.

First Class.

		No. of Marks gained.
1.	Verrall, F. M., Sunnyside, College Road, Harrow	280
2.	Abercrombie, I., Swanley College	275
	Colson, E., Lady Warwick College, Studley	275
	Evans, A. B., Barnwood, Gloucester	275
	Fotheringham, G. H., Swanley College	275
	Steenwjk, de V. V., Swanley College	275

		No. of Marks gained.
7.	Jevers, K. C., Swanley College	270
8.	Armour-Brown, A., Swanley College	265
	Birchenough, W. H., Horticultural School, Holmes Chapel	265
	Britten, M., Swanley College	265
	Cyphus, J., Littleworth, near Faringdon	265
	Hardy, J. W., Grundisburgh, Woodbridge	265
	Jaszowska, A. H., Swanley College	265
	Williams, G. E. M., Swanley College	265
15.	Collinge, A. E., The Gardens, Talygarn, Pontyclun, R.S.O.	260
	Dicketts, H. R., Essex County School of Horticulture, Chelmsford	260
	Kinsey, M., Essex County School of Horticulture, Chelmsford	260
	Salway, W. H., Abyssinia House, Columbus Street, St. Heliers, Jersey	255 260
19.	Charnock, L. J., 134 Walsall Road, King's Hill, Wednesbury	255
	Dance, M. W., School House, Abbotts Ann, Andover	255
	Greaves, C. G., School House, Duxford, Cambridge	255
	Haddock, T., 110 Wyggeston Street, Burton-on-Trent	255
	Murrell, B. P. J., University College, Reading	255
	Robinson, H. S., Swanley College	255
	Robson, W., 304 Kew Road, Kew Gardens, S.W.	255
	Rylance, J., Kelvin Cottage, Naylor's Road, Gateacre, Liverpool	255
	Wace, M. F., Swanley College	255
	Walker, T. S., School House, Adderbury, Banbury	255
29.	Brown, F. C., Swanley College	250
	Hammond, M. R., Swanley College	250
	Hewetson, M., Swanley College	250
	Lewis, D., Totley Hall Gardens, Sheffield	250
	Martin, M. D., Swanley College	250
	Walker, R., Brookfield, Johnstone, N.B.	250
	Wallace, E. C., University College, Reading	250

Second Class.

36.	Amos, G., Watergates Villa, Colerne, Chippenham	245
	Balfour, G. G., Edinburgh School of Gardening, Corstorphine	245
	Coltman, H., Horticultural School, Holmes Chapel	245
	Cooke, H. J., University College, Reading	245
	Hill, R., Cinderhill Road, Bulwell, Notts	245
	Joad, G., School House, Withyham, Tunbridge Wells	245
	Langton, H. G., University College, Reading	245
	Maclear, B. G. H., University College, Reading	245
	Newport, J. J., Caritas Villa, Hooe, near Battle	245
	Peers, M., Lady Warwick College, Studley	245
46.	Baker, W. S., Essex County School of Horticulture, Chelmsford	240
	Clear, A. J., Essex County School of Horticulture, Chelmsford	240
	Dedman, J. M., 19 Sitwell Street, Spondon, near Derby	240
	Hartley, D., Swanley College	240
	Nevile-Wyatt, M., Lady Warwick College, Studley	240

		No. of Marks gained.
46.	Rowson, E., Swerford School, Enstone, Oxon	240
	Taylor, D., Kaimes Road, Murrayfield, Edinburgh	240
	Tutty, R. H., Englefield Gardens, Reading	240
	Wilson, J. M., Swanley College	240
55.	Acland, A., Lady Warwick College, Studley	235
	Andrews, A. T. W., 33 Lichfield Street, Rugeley, Staffs	235
	Attenborough, M. D., Swanley College	235
	Brooks, A. J., Agricultural School, Dominica, West Indies	235
	Butterworth, K. M. C., University College, Reading	235
	Cargill, M. H., Hambleton, near Selby	235
	Harding, P., Horticultural School, Holmes Chapel	235
	Hay, J. D., University College, Reading	235
	Livesay, L., The Lodge, Caldecote Towers, Bushey Heath	235
	Moulson, R. H., Bassingham, Lincoln	235
	Nickalls, R. W., Great Chart, Ashford, Kent	235
	Parker, R. W., Horticultural School, Holmes Chapel	235
	Pullen, J. W., Council School House, Clutton, Bristol	235
	Seymour, E. M., Swanley College	235
	Smith, G., 3 Heath End, Farnham, Surrey	235
	Villiers-Stuart, G. E., Swanley College	235
	Wood, W. J. T. P., Ripon House Gardens, Putney Heath	235
72.	Bainbridge, E. H., Vale Bank, Ashover, near Chesterfield	230
	Byford, M., University College, Reading	230
	Fuller, C., Harwell, Steventon, Berks	230
	Linton, M., School of Horticulture, Torquay	230
	Lloyd, H., Cumberland Street, Woodbridge	230
	Mackenzie, N., junr., 16 Eleanor Cross Road, Waltham Cross	230
	Munk, B., Essex County School of Horticulture, Chelmsford	230
	Powell, W. W., The School House, Gamlingay, Sandy, Beds	230
	Rees, J., Alexandra Park, Penarth, Glam.	230
81.	Eley, A., Swanley College	225
	Green, J. J., Higher King Street, Hurst, Ashton-under-Lyne	225
	James, T., Woodcote, West Horsley	225
	Lewis, N. W., Essex County School of Horticulture, Chelmsford	225
	Paulson, W., Skillington, Grantham	225
	Rogers, H., North View, Mawnan, Falmouth	225
	Rolph, J., Horticultural School, Holmes Chapel	225
	Strachan, L. C., Swanley College	225
	Sutton, H. J., Waldringfield, Woodbridge	225
90.	Aley, T., New Way Lane, Threshers Bush, Harlow	220
	Bulbeck, J., School House, Bolney, Hayward's Heath	220
	Cadman, D. A., Swanley College	220
	Chamberlain, F. U., University College, Reading	220
	Grimwood, J. C., Essex County School of Horticulture, Chelmsford	220
	Homan, I., Essex County School of Horticulture, Chelmsford	220
	Jones, D. G., Horticultural School, Holmes Chapel	220
	Middleton, J., Alva House Gardens, Alva, N.B.	220

		No. of Marks gained.
	Powell, E. B., Horticultural School, Holmes Chapel	220
90.	Row-Fogo, G., Swanley College	220
	Thomas, E. K., Leighton Hall Gardens, Welshpool	220
	Hutchinson, F. G., Dunmore, Kingston, Co. Dublin	215
	Jackson, T., 21 High Street, Walshaw, near Bury, Lancs.	215
101.	Pettinger, G., Warmsworth School, Doncaster	215
	Row-Fogo, E., Swanley College	215
	Whitaker, L., Booth House, Salterforth, Colne, Lancs.	215
	Cooper, C. S., Dewhurst School, Cheshunt	210
	Dunn, W., Horticultural School, Holmes Chapel	210
	Forder, W. H., Ruthin Castle Gardens, Ruthin, N. Wales	210
106.	Leaver, H. F., University College, Reading	210
	Livesey, H., Endowed School, Sapcote, near Hinckley	210
	Morgan, H., Ruthin Castle Gardens, Ruthin, N. Wales	210
	Smith, H., Swanley College	210
	Wynn, S., The School House, Glynde, Sussex	210
	Holmes, M. G., Swanley College	205
	Lawrence, S., University College, Reading	205
	Mackay, A. C., University College, Reading	205
	Milnes, M., 41 Park View Road, Manningham, Bradford	205
114.	Rawlings, J., Belsize Court Gardens, Hampstead, N.W.	205
	Smale, G. N., University College, Reading	205
	Starling, E. E., Essex County School of Horticulture, Chelmsford	205
	Abbott, J., 4 Church Street, Anlaby, Hull	200
	Barratt, K., Swanley College	200
	Clark, S., Swinton Gardens, Masham, Yorks	200
121.	Coleman, P. A., Upland Road, Selly Park, Birmingham	200
	Croft, T., Kynnersley, Wellington, Salop	200
	Humphreys, F., Branches Park, Cowlinge, Newmarket	200
	Jeffery, E., Moor Court Gardens, Oakamoor, N. Staffs	200
	Swindale, J. P., Lady Warwick College, Studley	200

Third Class.

	Anthony, F., Hacheston School, Wickham Market	195
	Clarke, F. C., Codford St. Mary, Bath	195
	Kimpton, G. E., 29 Uplands Road, Stroud Green, N.	195
129.	Polkinghorne, F. J., 9 Alverton Terrace, Mitchell Hill, Truro	195
	Ridge, A., Boddicot School, Banbury, Oxon	195
	Rutter, E., Horticultural School, Holmes Chapel	195
	Seaton, W., University College, Reading	195
	Laming, C., Park Lane, Birchington, Kent	190
	McGregor, W. D., Horticultural School, Holmes Chapel	190
	Paine, E., The Schools, St. Paul's Cray, Kent	190
136.	Penson, G. H., The Gardens, Warter Priory, York	190
	Traill, A. A., Swanley College	190
	Walkden, C. H., The Gardens, Virginia Water, Surrey	190
	Wells, F. G., Burcott, Bromsgrove	190

		No. of Marks gained.
143.	Davis, F. W., 4 Britannia Terrace, Holland Road, Sutton Coldfield	185
	Evans, G., Horticultural School, Holmes Chapel	185
	Ffrench, N. G., The Larches, Adderbury, Banbury	185
	Gibson, A. L., Horticultural School, Holmes Chapel	185
	Hodder, E. G., Boys' School House, Much Hadham, Ware	185
148.	Brown, S. E., Hewell Gardens, Redditch, Worcester	180
	Cope, F. H., Horticultural School, Holmes Chapel	180
	Edwards, L. J., Horticultural School, Holmes Chapel	180
	Franklin, P. J., School House, Poulton, Fairford, Glos.	180
	Hill, W., 8 Canehill Cottages, Purley, Surrey	180
	Martin, B. H., The Lodge, Middleton Hall, King's Lynn	180
	Page, E. W., Temperance Place, Blybusgate Street, Beccles	180
	Slater, A., The Elm Gardens, Retford, Notts.	180
	Warrington, T., The Gardens, Underlea, Aigburth	180
	White, B., Essex County School of Horticulture, Chelmsford	180
158.	Hawthorn, W. H., Frensham Hill Gardens, Farnham	175
	Naylor, B. H., Punnett Town, Heathfield, Sussex	175
	Power, B., 29 Camp Road, St. Albans	175
	Slade, W. H., Adderbury, Banbury, Oxon	175
162.	Bradford, M. M., Adderbury, Banbury, Oxon	170
	Bumstead, M., Swanley College	170
	Doolan, G., Albert Agricultural College, Dublin	170
	Owen, T., Horticultural School, Holmes Chapel	170
	Philp, R. W., School House, Rotherfield, Tunbridge Wells	170
	Ruse, L. F., Essex County School of Horticulture, Chelmsford	170
	Stokes, G., Horticultural School, Holmes Chapel	170
169.	Slade, J., Hewell Gardens, Redditch, Worcester	160
	Trier, E., University College, Reading	160
	Wordsworth, F., The Gardens, Warter Priory, York	160
172.	Bowers, F. J., Mid Lavant, Chichester	155
	Cyphus, J., Littleworth, Faringdon	155
	Holdroyd, J., Ashburnham School, Battle	155
175.	Ragless, G., Lowicks, Frensham, Farnham	150
	Singer, J., Longleat Gardens, Warminster	150
	Vine, J. E., Hewell Gardens, Redditch, Worcester	150
	Wain, L., Main Street, Adderbury	150
179.	Browning, G., The Gardens, Coulsdon Court, Purley	145
	Townley, F., Ramsden Cottage, Little Mill, Dalton-in-Furness	145
	Woodhouse, J. E., Horticultural School, Holmes Chapel	145
182.	Sweeney, J. E., University College, Reading	140
183.	Husk, G., 7 Vineyard Terrace, Long Lane, E. Finchley	135
184.	Kett, R., Englefield Gardens, Theale, Berks	130
	Peck, J. J., 7 Princes Street, Northampton	130
	Pilkington, J., 9 Beechwood Road, Aigburth	130
	Wiltshire, R. H., Chapel Road, West End, Southampton	130
	Worthington, R., Horticultural School, Holmes Chapel	130
189.	Gibbs, E. C., 55 East Lockinge, Wantage	125
190.	Nicholson, G. H., Hewell Gardens, Redditch, Worcester	120

EXAMINATION IN COTTAGE AND ALLOTMENT GARDENING, 1904.

EXAMINERS' REPORT.

WHILST regarding with satisfaction the considerable number of papers submitted to them of comparative excellence, there is yet reason to express regret that a large portion of them were, in respect of practical knowledge in allotment and cottage gardening, somewhat crude.

Questions relating to the composition of soils, and of manures, were in most cases answered with ease, but still generally from a 'bookish' rather than from a practical aspect.

Candidates in this Examination should seek to make themselves familiar with the actual operations needful in any really well-managed garden or allotment during the cultural season, and seek also for defects, if any be furnished, and point out how they may be remedied. Such practice would be of great service when sitting down to answer questions relating to practical gardening.

Many candidates had indifferent knowledge as to what constitutes Hardy Perennials, and less as to the most suitable kinds for garden cultivation, and specially of those suitable for furnishing flowers for cutting.

Knowledge with respect to Annuals, both tender and hardy, was imperfect.

The proper cropping of garden or allotment in winter seemed not to have been fully understood.

Still, on the whole the papers have shown better results than were originally anticipated.

Some answers were written on both sides of the paper. That practice should always be avoided.

First Class.

		No. of Marks gained.
1.	Dance, M. W., School House, Abbotts Ann, Andover	204
2.	Titcombe, E., Hayward's School, Crediton, Devon	202
3.	Dickinson, C. A., Alnut's Schools, Goring Heath, Reading	199
4.	Gripper, J. C., The Schools, Goudhurst, Kent	198
5.	Bradford, W., Bloxham School, Banbury, Oxon	196
6.	Smith, W., Hatton Council School, Warwick	175
7.	Ridge, A., Bodicote School, Banbury, Oxon	172
8.	Boulter, E. S., 31 Bell Street, Wigston Magna, Leicester	170
9.	Cooper, E., North Newington School, Banbury, Oxon	168
10.	Titterington, W., Greystoke, Penrith, Cumberland	162
11.	Newport, J. J., Caritas Villa, Hooe, Battle	158

		No. of Marks gained.
12.	Borrell, A., South Charlton School, Chathill, R.S.O	156
13.	Hall, W. H., School House, Coddenham, Ipswich	154
	Roberts, J., Leek-Wootton, Warwick	154
15.	Cowley, W. G., 11 Titchfield Road, Enfield Lock	150
16.	Huke, C., Stoke-by-Nayland, Colchester	149
	Robinson, P. R., School House, Barton, Cambs.	149
18.	Porter, G. O., Dr. Radcliffe's C. E. School, Steeple Aston, Oxon	147
19.	Honey, G., Council School, Whyteleafe, Surrey	142
20.	Andrews, A. T. W., County Technical School, Stafford	140
21.	Walton, C. R., County Technical School, Stafford	139
22.	Brodie, J. B., County Technical School, Stafford	138
	Motts, S. F., Wrentham, Wangford, Suffolk	138
24.	Fowler, G., Council School, Kingsbury, N.W.	137
25.	Butler, J. H., Spelthorne Council School, Ashford, Middlx.	135
	Franklin, H., Ford End School, Chelmsford	135
	Harrison, C. E., School House, Bedfield, Framlingham	135
	Herrington, W., National School, Cuckfield, Sussex	135
	Summerscale, P., 4 Henley Road, Upper Edmonton	135
30.	Molineux, A. W., Wing Boys' School, Leighton Buzzard	134
31.	Chapman, T., Beddington Central Schools, Croydon	133
32.	Clarke, M. A., 13 Stanhope Road, Walthamstow	132
33.	Boulton, A., 52 Bath Road, Banbury	130
	Ludbrook, G. F. C., Darsham, Saxmundham	130

Second Class.

35.	Baylis, F. C., Ardingly National Schools, Hayward's Heath	129
	Dugdale, F. E., River Front, Enfield	129
	Lodge, H. J. L., The Boys' School, Mayfield, Sussex	129
38.	Bramhall, A. G., Stowupland Council School, Stowmarket	128
	Cox, S., Oulton Council School, Stowmarket	128
	Parker, T. G., British School, Stowmarket	128
	Skinner, E. C., 4 Casterton Terrace, Penpoll Road, Hackney	128
42.	Brooks, A. J., Agricultural School, Dominica, B.W.I.	127
	Langley, I., Sibford Gower, Banbury	127
44.	Hainsworth, A., 68 Brownlow Road, New Southgate, N.	126
	Peachey, H. W., School House, Edwardstone, Colchester	126
	Penrice, J., School House, Meriden, Coventry	126
	Sylvester, E. W., School House, Bletchingley	126
48.	Crow, S. M., Boreham, near Chelmsford, Essex	124
	Hardy, J. W., Grundisburgh, Woodbridge	124
50.	Benson, S., 50 Tanner Street, Barking, Essex	123
	Cooper, J. E., Coventry Road, Bedworth, Nuneaton	123
	Cowley, A., Caldbeck Upton Council School, Wigton	123
	Green, R. E., 14 Hunger Hill, Queensbury, Bradford	123
	Mayfield, A., Mendlesham, Stowmarket	123
55.	Taylor, B. B., School House, Bucklesham, Ipswich	121
56.	Goodhew, W. S., School House, Fyfield, Ongar, Essex	120
	Fletcher, John T., Harlyn, Western Road, Lymington	120

		No. of Marks gained.
58.	Buckley, F. O., County Technical School, Stafford	119
	Godfrey, G. B., Chignall Council School, Chelmsford	119
	Wilsher, H., Victor House, Carlton Colville, Lowestoft	119
61.	Frankton, F. S., Bishopton School, Ferryhill, Durham	117
	Mellor, H., Lower Lane, Chinley, Stockport	117
63.	Booth, W., Howsham, Lincoln	116
64.	Lloyd, H., National School, Woodbridge	115
	Sutton, K. M., School House, Chapel Norton, Newcastle, Staffs.	115
	Waddington, W., Bridge House, Underbarrow, Kendal	115
67.	Burrows, J., 52 Vicarage Road, Tottenham, N.	114
	Debney, E., 15 Clarence Road, Horsham	114
	Nickalls, R. W., Great Chart School, Ashford, Kent	114
	Taylor, B., Arrow, Alcester, R.S.O., Warwick.	114
71.	Shaw, E. F., Felbridge School, East Grinstead	113
	Tunnicliffe, W., 29 Second Avenue, Walthamstow	113
73.	Stanley, J. R., Culworth, Banbury	112
	Thurley, G. H., 13 Argyll Road, Tottenham	112
75.	Higgins, W., Endowed School, Blythe Bridge, Stoke-on-Trent	111
	Hope, G. H., County Technical School, Stafford	111
	Wright, J., County Technical School, Stafford	111
78.	Holdcroft, W., Council School, Wolstanton, Stoke-on-Trent	109
79.	Matthews, A. R., St. John's Schools, Blackheath	108
	Mold, A. E., Haselor, Alcester	108
81.	Cambridge, R. B., School House, Broxbourne, Herts	107
82.	Gwilliam, R., 2 Nelson Villa, Lyme Regis Road, Banstead	106
	Platts, S. R., Odd Rode Boys' School, Stoke-on-Trent	106
	Smith, W. L., Clovelly, Falmer Road, Enfield	106
85.	Abbott, J., Anlaby National School, Hull	105
	Alexander, W. H., School House, Cully Croft, Nuneaton	105
	Hatfield, M., Lythe School, Milnthorpe	105
	Pryce, W., Barkway School, Royston, Herts	105
89.	Hassall, A., Heveningham, Saxmundham	104
90.	Amos, G., Watergates Villa, Colerne, Chippenham	102
91.	Mann, J. M., Corporation School, Harwich	101
	Reed, W. L., Mountnessing, Brentwood, Essex	101
93.	West, G. H., Boys' School, Ingatestone	100

Third Class.

94.	Anthony, F., Hacheston, Wickham Market	99
95.	Hobday, C. F., Whixall National School, Whitchurch	98
	Marsh, G. W., Cowley's School, Donington, Spalding	98
97.	Hedgethorne, W. G., Little Waltham, Chelmsford	97
98.	Gibbs, R. F., Chapel Brampton, Northampton	96
99.	Airey, R., School House, Hognaston, Ashbourne	95
	Johnstone-Fraser, E. B., Onehouse School, Stowmarket	95
101.	Parkinson, W. H., 91 William Street, Heyward	94
102.	Parnell, J. J., Cheddleton School, Leek, Staffs.	93

		No of Marks gained.
103.	Hall, R., Girls' National School, Woodbridge	92
	Boulter, A., Kirk Bampton, Carlisle	91
	Burrows, T. E., Harbury, Leamington Spa	91
	Lewis, D. J., Brynawell, Devil's Bridge, Aberystwyth	91
104.	Sanderson, A. R., 271 Lower Rushton Road, Thornbury, Bradford	91
	Simpson, J. W., County Technical School, Stafford	91
	Skidmore, J., County Technical School, Stafford	91
110.	Shipman, J. E., Castle Carrock, Carlisle	89
111.	Suckling, C., 33 South Primrose Hill, Chelmsford	88
112.	Wilks, J., School House, Allesley, Coventry	86
113.	Smith, T., School House, Wood Ditton, Newmarket	85
114.	Bailey, E. M., 1 Victoria Terrace, Wickfield	84
115.	Saunders, L. B., The Dairy, Baddow Road, Chelmsford	80
116.	Gray, G. H., Sibton School, Saxmundham	78
117.	Barker, G. F., 4 Wellesley Road, Brentwood	75
	Freeman, E. P., 66 Shrubland Grove, Malvern	75
119.	Brewer, A. C., Stoke St. Michael, Bath Road, Dalston, N.E.	74
120.	Cooper, M. J., Fern Bank, Birmingham Road, Alcester	72
	Simcox, A. W., County Technical School, Stafford	72
122.	McHardy, I., Truant School, Hollow Meadows, near Sheffield	70

PLANTING FOR AUTUMN AND WINTER EFFECT.

By the Hon. Vicary Gibbs.

Considering how many people in England spend their autumn and winter in their country homes, and the spring and summer in London, it is curious that more pains are not taken to plant trees and shrubs which are at their best during the later season of the year. I propose in this paper to make some suggestions as to plants suitable for this purpose, and as to the way in which they should be treated. It is quite a mistake to suppose that to get good winter-colouring it is necessary to obtain rare and expensive or delicate specimens; some of the finest effects can be produced by quite cheap and common stuff if properly handled. For instance, among trees, no finer contrast of coloured stems exists than that between Scotch Firs, when they have reached a certain age and lost their lower boughs, and Silver Birches, if they are intermingled, and the latter are pruned up to a height of some 12 or 15 feet. Again, among shrubs, the common Snowberry (*Symphoricarpos racemosus*), which generally occurs in neglected shrubberies as an unpleasing half-starved weed, if the suckers are collected and planted in a solid mass in open ground, with nothing over them to obstruct the light and air, and if in the spring, when the sap is rising and the first sign of foliage peeps out, they are cut down level with the soil, so that nothing is visible, they will produce an appearance hardly recognisable by those who are only accustomed to them under ordinary conditions. They make a compact growth during the year of 2 feet 6 inches to 3 feet, are covered with their delicate pink flowers in the summer, and in the autumn are set all over with the white fruit-balls, which last until the birds have eaten them. This plan of cutting down to the ground in the spring is requisite, or at least highly desirable, with many other subjects to which I shall refer later, where winter-colouring is sought for. I have often found it very difficult to persuade gardeners (whether amateur or professional) to carry out my recommendation in this particular with regard to such things as *Spiræa Douglasii* or *Cornus sanguinea*, and even when they have promised to do so, I have found that they have not been able to harden their hearts, and at the last moment have adopted the half-measure of cutting the plants a foot from the ground. This has the result of showing in winter a stiff uniform artificial line through the bed with bright colouring above the line and dull below. It should be borne in mind that it is invariably in the young wood that the most vivid colour is procurable.

What is really wanted to show autumn and winter colouring to full advantage is that the planting should be in groups and masses of the same species, and though this can be more completely carried out in large places, yet it can be done much more than it is at present in gardens of every size.

It is only of late years that it has been realised that Roses and

FIG. 30.—SCOTCH FIRS AT ALDENHAM. (*Photographed by the Hon. Henry Gibbs.*)

herbaceous plants look far better when the same variety is massed together, and before long gardeners will recognise the advantage of treating shrubs in the same fashion so as to develop the full beauty, whether of their flowers, foliage, or wood. I will now mention in detail some plants which, owing to their cheapness and hardiness, are suitable for planting in quantity and whose foliage turns a fine colour in autumn.

Pyrus arbutifolia or *Aronia floribunda* can be bought from some of the wholesale nurserymen at a very small price per hundred. It is a vigorous grower, and after it has been planted twelve months it should be cut down, when it will shoot up again freely and make good compact bushes, which are profusely covered with sweet-scented white flowers, and later with small black fruit. In the autumn the leaves turn a bright clear red, and remain in that state from ten days to a fortnight, according to the weather.

Euonymus europæus, or common Spindlewood, treated in the same fashion, that is to say cut down in the spring when it gets at all leggy and bare below, will make a fine free-growing bed of rich green colour, covered in its season with rosy-pink seed-cases, and will require no care or attention except weeding while the plants are young.

Rosa rubrifolia.—This is very seldom grown in England, nor does it, I think, figure generally in the nurserymen's catalogues here, but it is largely used on the Continent for hedges, and can be bought anywhere in France or Germany, strong plants at 6*d.* a piece, with of course a reduction if bought in any quantity. It grows fast, and, if pegged down, makes a very showy bed. The flower is a pretty pink, though insignificant, but the fruit is showy, and both wood and leaf are a soft downy plum-colour. If planted near a mass of Golden Elder or Golden Symphoricarpos, the effect is brilliant and pleasing.

Rosa rugosa, the Japanese Rose, is, of course, well known, and the wealth of odorous flower, especially of the white variety, is not to be despised; but the fine haws through August and September are its chief merit, being large, abundant, and showy. The rough hirsute stems, too, show up well when the leaf is off; moreover, it has the advantage of being cheap and reproducing itself readily by suckers. It requires no treatment except the knifing back of the strong shoots in the spring.

Leycesteria formosa, a very old-fashioned and meritorious shrub now too little planted. The white Jasmin-like flowers, backed up by the warm Bougainvillæa-like bracts, followed again immediately behind by the small black cherry-like fruit, without stalk, mark it out to any one who has a seeing eye, and, coming late in August, are very welcome. It is sub-evergreen, and a rampant grower where the frosts are not too hard on it. It stands the knife perfectly, and can be pruned back in spring as hard as is thought desirable. The bright green of the large hollow stems makes it useful in winter.

Kerria japonica var.—Its habit is quite different from the common green type, as it is compact and bushy. The effect in a mass of its delicate silver foliage is excellent, being soft and not the least garish; it has the additional virtue of doing comparatively well under the shade of trees, and it holds its leaf until winter is well advanced, when the green stems show up almost as bright as the *Leycesteria*.

Fuchsia Riccartoni is a profuse autumn flowerer, and although anywhere north of London it dies down to the ground, however mild the winter, yet the clear dark-brown wood looks very nice until the time comes for it to be cut away for the new growth. I have never known the roots to be killed, however severe the season.

Among the Bamboos, *Arundinaria japonica* syn. *Bambusa Metake* is the only one which is at once cheap, hardy, and indifferent as to soil and situation, provided it be not too much exposed to wind. Though it enjoys the vicinity of water, it does not insist on it, and its foliage is at the best in autumn and winter; in fact the only time when it looks shabby is after a course of easterly winds in spring. It sends up suckers very freely, and in some shrubberies it has a tendency to become a nuisance on this account, like the *Polygonum.* One fault it has in common with all Bamboos, that occasionally (though fortunately not often) it produces flowers something like dirty-looking Oats, and when it flowers it dies. I do not remember observing this phenomenon before last year, when in my father's garden at Aldenham, Herts, we lost a large mass of *Metake* about 15 feet high by 20 feet round, and about fifteen years old, from this cause. It flowered all over, not merely on the strong canes but on every tiny shoot, and this year every particle is stone-dead, nor has it, as I hoped it might, shot up again from the roots.

This summer also I have, to my grief, detected *Phyllostachys Castillonis* and another rare Bamboo in flower, so I fear that I shall lose them too, although I have tried the experiment of at once cutting them to the ground in hopes that I may be in time before the exhaustion caused by flowering has reached a fatal point.

The Sea Buckthorn (*Hippophae rhamnoides*) looks very well in autumn if planted in a mass, but being diœcious it is necessary to have male plants intermingled in the proportion of about one to six; when this is done the females berry profusely and the bright orange fruit contrasts admirably with the silver-grey foliage, having also the advantage, from the gardener's point of view, of being unpalatable to birds. It is often supposed that this plant requires sea air, but though the seaside is its home it will do perfectly well inland, and on soils so diverse as chalk and London clay.

Perhaps one of the most effective masses of autumn colouring can be produced by collecting a lot of suckers or young plants of the common Stag-horned Sumach (*Rhus typhina*) and treating it precisely as I have suggested earlier in this paper in the case of the common Snowberry. The ordinary sticky, leggy appearance of the plant is avoided, and by summer time you have a dense level sheet of semi-tropical-looking foliage, 2 feet 6 inches to 3 feet high, which attracts universal attention in September by the brilliance of its red and orange tints.

Rhus glabra laciniata colours equally well and has a more elegant form, but is far less vigorous, and more expensive.

Among late-flowering trees and shrubs I can recommend *Robinia neomexicana* (pale violet); *Olearia Haastii* (white); *Spartium junceum* (rich yellow), a very suitable flower for table decorations; *Desmodium penduliflorum* syn. *Lespedeza Sieboldi* (dark violet); *Hibiscus* of sorts, particularly the single white (*totus albus*); *Rubus fruticosus fl. pl. roseo,* a free

Fig. 31.— Old Moat at Aldenham with Bulrushes and Water Lilies. *(Photographed by the Hon. Henry Gibbs.)*

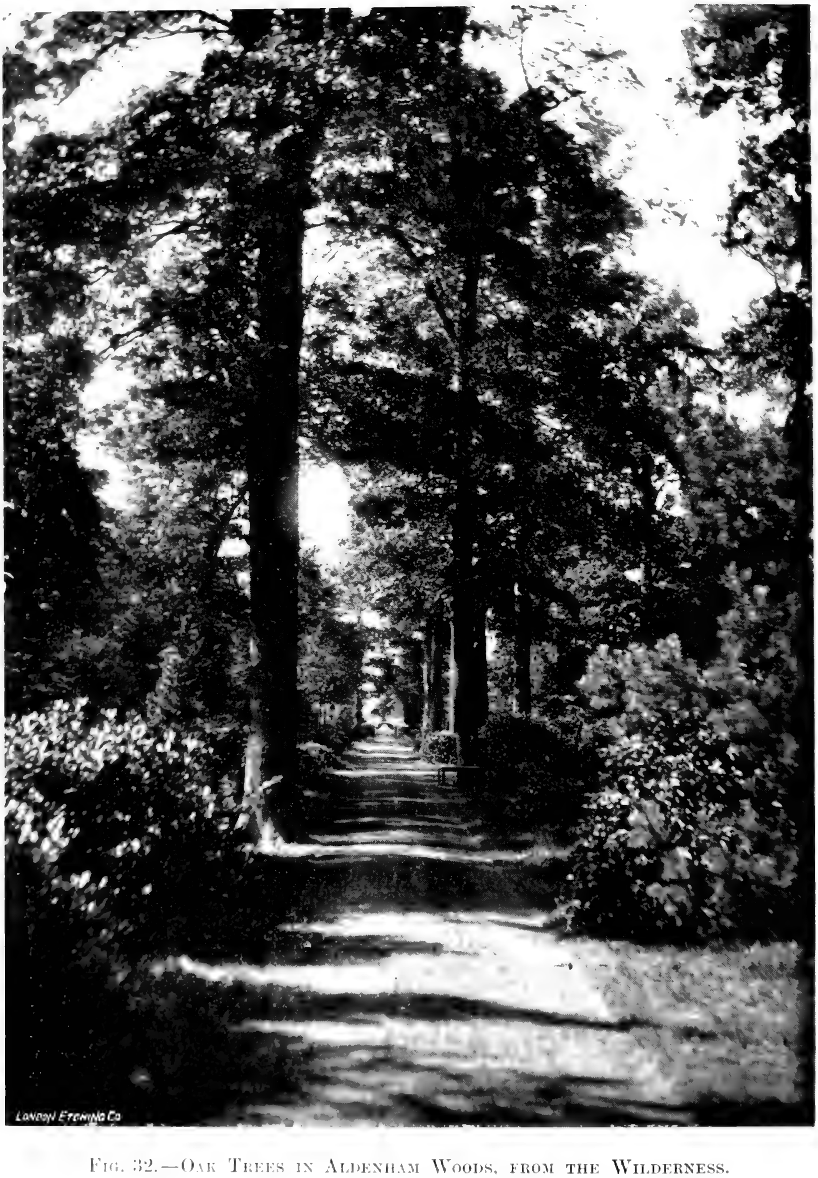


FIG. 32.—OAK TREES IN ALDENHAM WOODS, FROM THE WILDERNESS.
(*Photographed by the Hon. Henry Gibbs.*)

double-flowering Bramble with pompons of light pink; *Colletia spinosa* (white), covered with Lilac-like blooms in mid-September; *Ceanothus americanus* (white), a very free flowerer; also the light blue deciduous variety, as to the proper name of which I am not certain; and latest of all, not flowering till September, *Caryopteris Mastacanthus* (Heliotrope blue), which is one of the Sage family.

Besides the above plants which I have suggested as producing a good autumn effect when planted in groups, I would recommend the following as suitable for single specimens: *Taxodium distichum*, or the deciduous Cypress, prefers the neighbourhood of water, but will do quite well without, and develops at the fall of the year a bright rust-colour which is very conspicuous. The weeping form is also distinct and beautiful. *Photinia villosa*, a deciduous form, is a small erect-growing tree, not unlike a Pyrus in appearance, whose autumn colouring is amber and orange; it is very rarely seen in English gardens, but quite worth growing, though it does not appear to be of very vigorous constitution. I obtained our specimens from my neighbour, Mr. Cutbush, at Barnet. *Liquidambar styraciflua* is perhaps too well known for description. It prefers a lightish soil, is rather troublesome to start, but when once established grows rapidly. The change of foliage varies very much on different specimens from red and orange to purple and green, but it is almost always beautiful.

The Maple class is too large to deal with in a paper of this description, but their reputation for gorgeous foliage is well established in America, and though perhaps not so resplendent in this country, there is hardly one of them which is without merit when the leaves begin to colour. The true Sugar Maple (*Acer saccharinum*) is a hardy free grower and one of the cheapest and most effective of its genus.

Disanthus cercidifolia.—I have known this only for two or three years, and cannot speak as to its constitution or special characteristics, but the quality of its autumn foliage is undoubted, the tender green circular leaves turning to a beautiful uniform rosy-pink.

Parrotia persica, a medium-sized tree, and like the *Disanthus* a member of the *Hamamelis* order, takes on a fine autumn colouring in which purple and orange predominate. It is quite hardy.

Enkianthus japonicus and *Stuartia Pseudo-camellia* are two plants seldom seen in England, of which the dying leaves become deep red.

All the American Oaks are more or less effective at this season of the year; but far the best of them in my judgement, both for brilliance and for the length of time during which it retains its clear crimson colour, is *Quercus coccinea*, Anthony Waterer's variety.

The Amelanchiers, or Snowy Mespilus, are equally valuable for their blossom in spring and their foliage in autumn. The three best with which I am acquainted are *A. canadensis*, *A. oligocarpa*, and *A. asiatica*.

I have found *Rubus fruticosus fol. var.* a general favourite when grown as a creeper on a pole. About the second week in September, when part of the fruit has ripened, the presence of the four colours, black and red in berry, and silver and green in leaf, all clearly defined, produces a unique effect.

Within the limits of this paper I cannot deal at length with autumn fruits from a decorative standpoint, but in passing I may just mention four varieties of *Pyrus Malus* 'Ringo,' 'Beauty of Montreal,' *fructu luteo*, and 'John Downie' as four of the best crab-apples.

Many of the Vines look well in September, such as *Vitis Thunbergii* and the large-leaved *V. Coignetiæ*, if grown on larch poles and dotted about in the shrubberies, but none surpass the old-fashioned *V. vinifera purpurea* (often known as the Claret-leafed Grape), which is hardy, free-growing, and inexpensive.

Rhus Toxicodendron, the Poison Sumach, can be grown either as a creeper or as a bush, and is one of the most gorgeous in foliage at the fall of the year. The colour is that of a glorified Virginia creeper, orange-scarlet and vivid green intermingled. The highly poisonous character of its sap is its chief drawback, which prevents many from planting it, although we have grown it for the last twenty years without experiencing any ill effects.

Euonymus europæus latifolius and *E. alatus americanus* are the two finest forms of the common deciduous Spindlewood, and are deserving of a place in every garden, the first (which can be procured either as a shrub or standard) on account of its bold red seed-cases, shaped something like a biretta, and the second because the leaves turn a clear uniform rosy-red. They make strong bushes.

Cercidiphyllum japonicum looks like a refined pyramidal form of Judas tree, and though not, I think, very hardy, and suffering from spring frosts, is worth growing for the shape and soft red autumn colour of the leaves.

Vaccinium corymbosum, the most showy variant of its class, and *Fothergilla alnifolia* are somewhat rare plants which colour well, and both thrive better where the soil is peaty.

Spiræa ulmifolia and *S. Fortunei superba* are two of the best of this large class; in autumn, in the case of the first the leaves change to a deep plum colour, and in that of the second they are varied and brilliant in tone.

For the same reasons *Berberis Thunbergii*, *Cerasus vulgaris*, and *Rhus Cotinus* should not be neglected, but they are too well known to need further recommendation. I would only add a warning that the last is not very patient of the knife, and should be but lightly pruned, and that only in spring, just as the sap is rising.

I will conclude this branch of my paper with mentioning *Idesia polycarpa*. It belongs to a rare order, the *Bixineæ*, and thrives well in a strong soil; its large light green leaves and bright red petioles give it a decidedly taking appearance.

For brilliance of winter colouring of the wood or twigs, nothing can surpass *Cornus sanguinea* or Scarlet Dogwood if planted in quantity and treated as recommended for *Symphoricarpos*. In summer it has no special merit, but from the moment the leaves begin to turn, it steadily improves in colour until the sap is thoroughly down, and then on a bright frosty day the hundreds of canes some 4 to 5 feet long glow in the winter's sun like a pigeon's blood ruby. The silver variegated form has greatly the advantage in summer, but it is, comparatively speaking, a weakly grower, and does not make half the show in winter. I may mention here that we have succeeded lately in fixing a bold yellow variegated sport which appeared on one of our plants of *C. sanguinea* at Aldenham. It gives promise of being just as vigorous as the type, and ought to prove a valuable addition to the garden.

Cornus flaviramea.—I have had this only two or three years, having bought it from Späth in Berlin. At present it is rare in England, but need not remain so, for it strikes very readily from cuttings. It is similar in vigour and habit to the preceding, but has, as its name imports, bright yellow instead of scarlet bark in winter. It will, I think, prove a desirable acquisition.

Cornus sanguinea atro-sanguinea.—This is a somewhat improved form which was recently introduced by Veitch of Chelsea, and though at first it showed a disposition to revert to the type, now that the variant is thoroughly fixed it is worth growing as a single specimen by those who care for this interesting and diversified order of plants.

Sambucus nigra aurea, the Golden Elder, is too garish when seen close, and when too freely used, as is often the case in small villa gardens, approaches nearly to a disfigurement; but when planted at the water-side the reflection is very brilliant. The right way to use it is to mass it where it can be seen from a distance, and to cut it also clean down every spring. The canes, which grow to about the same height as *Cornus sanguinea*, are then in winter of a uniform very light grey, and contrast admirably with any adjoining dark evergreen mass such as *Cotoneaster Simonsii.*

Forsythia suspensa is fast in growth and graceful in habit, but wants plenty of room. The long waving pendulous shoots are covered with yellow bloom in early spring, and show up with a clear brown colour in winter.

The canes of *Rubus odoratus roseus* have much the same colour as those of the common Raspberry, but it has the advantage of a handsomer leaf and a more decorative compact habit. Moreover, the bloom is very nearly as good as *R. nobilis*, the charms of which I see my friend, Sir Herbert Maxwell, has been vaunting. It has the additional advantage where quantity is required of reproducing itself very freely from suckers. It should be lightly pruned and the dead canes removed in spring.

Rubus phœnicolasius, or Japanese Wineberry, is one of the best of the Brambles in autumn and winter. It has much the same habit as the common Blackberry, is perfectly robust, and sends up a fair amount of young plants. The scarlet fruits, with their rust-coloured sheaths and the stout hirsute lake-red canes, all join to make it a valuable addition to a wild garden. *R. biflorus* is generally treated as synonymous with *R. leucodermis*, which is in fact distinct from it, and has a creeping habit like a Blackberry, whereas the former has upright canes like a Raspberry, and is most showy in winter, when it presents the curious and distinct effect of having been washed all over with lime white. In the cold stiff clay soil to which I am accustomed it does not, however, appear to be over hardy or vigorous.

Spiræa Douglasii, of which *S. bella* is a somewhat improved form, grows with us like a weed, and reproduces itself by the hundred. I used to look upon it as barely worth growing until it was massed and cut down every spring; now the beds are quite a sight. They are about 2 feet

6 inches high and perfectly solid, a sheet of flower in August, rather later than if the plants had not been cut, and a couple of months later the fine straightish canes will all turn to the tone of the clearest hazel-nut.

Spiræa callosa, though somewhat more expensive to plant in mass, is very fine if treated in the same fashion. The flowering is improved rather than injured by the treatment, and the canes, though of the same colour when bare as the last-named, are much stouter, of looser habit, and bolder and more varied in growth.

Spiræa canescens and *S. hypericifolia* look well at all times of the year, and however dealt with, make large graceful shrubs of pendulous habit, covered with small clear white bloom, or if cut down and massed they grow thickly about 18 inches high, and the tiny refined leaves are always admired, while the bright dark wood makes them conspicuous in the dead of the year.

Berberis vulgaris purpurea.—The handsome foliage of this shrub is well known, but it has a tendency to get leggy, carrying few or no leaves within 2 or 3 feet of the ground. A couple of years ago I tried the experiment of cutting down a fairly large bed in the spring, with the result that we had a very fine show of plum-coloured stems in the following winter; but this rich purple is entirely confined to the young wood.

Populus canadensis aurea.—A showy bed can be produced by cuttings of this free-growing plant if cut down each spring, and it has the merit of being at its best in September, when the Golden Elder and other like foliage shrubs have lost their brilliance. Moreover, the yellow wood retains its tone for some time after the leaf has gone.

Paulownia imperialis.—The expense of buying this in quantity has deterred me from making a bed of it and keeping it cut down, but the good result of doing so can be seen at Kew, where they have the nation's purse in which to dip their hands.

Deutzia crenata fl. pl.—In the case of this well-known shrub, I have also been prevented from taking a similar course, but for a different reason, namely, that it hardly grows with sufficient vigour on our heavy clay, but in a lighter soil I am convinced it would be a success, for, as in nearly all plants, the full beauty of the light brown bark is confined to the season's growth.

Ailanthus glandulosa.—In many places I have seen this tree sending up suckers freely over a wide circumference round the parent stem; and in such cases it would be well worth while to collect them and form a bed treated as I have described in the cases of *Rhus typhina*, *Symphoricarpos*, &c. By so doing, that which hitherto has been a nuisance could be converted into an ornament.

Next to the *Cornus* there is nothing that looks brighter in bark and stem than the young growth of Willows. I have been collecting these for some years, and I do not think I can do better than give you the benefit of my experience by making a short list of those which I consider most striking among the many varieties that exist; several of them are easily obtainable in England, and others I have got from Herr R. Larche, Baumschulen, Muskau, Silesia, who possesses a fine collection of forest trees. They are as follows:—

Salix grandifolia moschata (black).
„ *daphnoides* (chalky grey), one of the very best.
„ *uralensis* (dark).
„ *laurina* (dark plum).
„ *cardinalis* (bright red).
„ *alba britzensis* (scarlet).
„ *incana* (rich brown).
„ 'Jaune des Ardennes' (yellow).
„ *alba vitellina* (yellow).

Owing to my conviction that I have already somewhat abused your patience by the length of this paper, I have confined myself to the colour of the woods and not attempted to describe the foliage of the above varieties, which often differs materially and adds to the charm.

While on this subject, although not strictly germane to the matter in hand, I cannot resist mentioning *Salix annularis*, which may be unknown to some of you, and which presents one of Nature's most curious "freaks" in the way of leaf-production.

Willows naturally are found, and look more at home, by the riverside, but I have observed that they do perfectly on high ground far removed from water; at any rate, that is the case on our strong soil.

Colutea arborescens (Bladder Senna) forms a cheap and free-growing bed. It stands annual cutting down well, and the greyish-green bark with whitish stripes, as well as the large seed-cases from which it takes its popular name, alike distinguish it in winter from all its surroundings. It requires protection from ground game.

Corylus Avellana purpurea is certainly at its best when the leaf is on, but, like all Hazels, it stands the knife so well, and the darkness of the young wood is so conspicuous, that it should not be overlooked when planting for winter effect. The plants will not require annual cutting-down, but only when they begin to show too much wood.

Lycium chinense.—This will grow anywhere, including London and the seaside, and has a good appearance in winter when planted above an embankment wall or parapet, so that its very long trailing branches can be seen to advantage. Its violet flowers make up in number and continuance for lack of size; the fruit is scarlet. It is sometimes absurdly called Tea tree, though it has no relation whatever to the Theas, Camellias, &c. The name arose owing to the labels on a *Thea sinensis* and a *Lycium* which had been imported by a Duke of Argyll having been transposed in error. However, the dog having once got a bad name, there is no stopping it any more than in the case of the so-called Mountain Ash, which, of course, is no *Fraxinus* at all but one of the *Rosaceæ*.

Tamarix japonica is another of the few plants which enjoy sea breezes but are happy away from them. The effect of annual cutting down on a large scale can be well seen at Eastbourne; when not so treated it is apt to look mangy and ragged. The pink flower is most pleasing in September; the young wood colours well, and the feathery foliage is so distinct as to make it well worth growing inland for the purpose of contrast with such types as *Laurus nobilis* or *Arbutus Unedo*. I may remark here that the careful juxtaposition of plants which differ in habit, colour, form, and size of foliage, is too often neglected in the case of both trees and shrubs.

Hydrangea paniculata grandiflora makes a grand show in August and September, the profuse clear white inflorescence being conspicuous from a great distance; nor is the beauty over then, for the dead flower heads which remain on the plants all winter are very striking. When in December of last year (1903) we showed a collection of cut twigs and stems at the Royal Horticultural Society, nothing attracted more attention than this. The plants are rather expensive, but we have a large bed of them which, with trifling renovation, has lasted for seventeen or eighteen years—a long life compared with the choice Roses nowadays.

The plants should be lightly pruned in spring.

Many of the *Cytisus* class are worth growing for the dark green wood as well as for their flowers, and *Spartium junceum* has a bolder, more open growth with stouter twigs than the others; none of them will tolerate hard pruning in the old wood.

Cassinia fulvida syn. *Diplopappus chrysophyllus* has a soft golden colour in twigs and leaf if pegged down and trimmed over annually. It does best in a hot dry light soil.

Rosa nitida, which is far too rarely seen, should be dealt with in the same way; not only do the leaves all turn a clear red in autumn, but the fine hirsute twigs all take on the same colour until the sap rises, and the plant is as hardy as it is beautiful.

Among other plants for winter which from rarity or other reasons are more fitted for single specimens I would include:

Fraxinus excelsior aurea, the Golden-barked Ash in its erect or weeping form, whose name is sufficient description.

Salix aurea pendula, a weeping form of the Golden Willow, which can be procured from Mr. Bunyard of Maidstone.

Betula aurea.—I have too recently received this new Golden-leaved Birch, from Mr. G. Paul of Cheshunt, to be able to speak confidently as to the colouring of its wood in winter, but it mostly happens that the same cause, viz. insufficient chlorophyll, which produces the yellow tone in the foliage, makes for a like effect on the bark and twigs.

Taxodium sempervirens, the Red-wood Cedar.

Euonymus verrucosus, a rare deciduous variant of Spindlewood whose stem is covered with curious warts, and simulates to an extraordinary degree a rusty iron pole.

Arbutus Unedo, which when old and untrimmed shows a great deal of fibrous chocolate-coloured bark. It is none too hardy north of London, but has flourished and fruited well with us, surviving the terrible winter of 1894–5.

Stephanandra flexuosa has very delicate foliage, almost like a Japanese Maple when seen a little way off, the very fine waving twigs are a reddish-brown. I note that it suffered from burning in the recent hot dry summer.

S. Tanakæ is a stronger, coarser, less compact form which is hardly ever seen in England; it is inferior in grace of foliage and superior in the clear red of its twigs. The charm of either is destroyed if the ends of the shoots be cut over, so they must be allowed such room as they require.

They are said to be allied to the Spiræas, but have little or no superficial resemblance to them.

Dimorphanthus mandshuricus, which is an *Aralia,* I have not yet tried in mass cut down, but I mean to do so, as it suckers most freely with us in Herts. The subtropical-looking foliage, large heads of flowers, small black fruit, and strange thorny rugged limbs when bare, all tend to make an old plant a remarkable object. It is perfectly hardy when dormant, but is liable to be killed by hard late frosts in April.

Aristotelia Macqui, a native of Chili, is stated in the 'Kew Hand List' to be tender and to require a wall, but has grown to be a large healthy bush with us; its flower is a greenish-white, the petioles are bright red, and the wood is a conspicuous reddish-brown.

Cratægus horrida is very remarkable in winter, having clusters of thorns at short intervals, which face every way. This was one of the woods we exhibited at the show last year.

Cratægus chlorosarca is a novelty which I got from Louis Chenault at Orleans. It has stout limbs, a bold indented foliage, chocolate-coloured varnished wood, with large dark purple leaf-buds.

Cratægus Pyracantha Lelandi, though usually grown as a creeper, forms a valuable evergreen standard, and fruits very freely on a strong soil, the orange berries lasting as long as the birds will let them.

Ribes alpinum grows in a close compact form with slender grey knotted twigs, and has an appearance after the fall of the leaf quite unlike any other Currant, or indeed any other plant known to me.

Sambucus pyramidata has the same light grey wood as the common Elder, but its extremely close fastigiated form makes it surprising that it is so rarely seen, especially as it is easily propagated from cuttings.

Spiræa ariæfolia and the old-fashioned *S. Lindleyana,* the largest grower of its varied tribe, are both conspicuous in winter, the former for its graceful dead flower-heads, and the latter for its stems.

Garrya elliptica, a diœcious plant, rather tender when not on a wall, is of value for its evergreen Ilex-like foliage, and still more for its fine grey catkins, lasting from November to February. No one but a botanist would imagine that three plants, superficially so distinct as the *Garrya,* the *Aucuba,* and the *Cornus,* all belong to the same order.

Ligustrum coriaceum, a curious evergreen, quite hardy, but a slow grower, has rich dark green convoluted leaves in such profusion that no wood is seen; they almost suggest a sea-shell in their form.

Syringa Josikæa is an old Lilac which came from Hungary in 1835 and for some reason has gone out of fashion here. It is quite unlike the ordinary Persian type; it most nearly resembles *S. Emodi* of any which I know, but the foliage is larger, darker, and more striking; the stout stiff scarlet-coloured twigs with dark purple leaf-buds make it very noticeable in winter. It grows to be a very large shrub. We have one 20 feet high in our London garden with the stem as thick as a man's thigh.

Elæagnus parvifolia is worth growing for the clear silvery-grey wood. It is deciduous, and hardier than its evergreen congeners. *E. argentea,* another deciduous form, has the same merits as the preceding in winter, and the silver undersides of the leaves look well when there is a breeze; it bears also in autumn a profusion of small red berries.

Cladrastis tinctoria, sometimes, but I believe incorrectly, called *Virgilia lutea*, and popularly known as Yellow-wood, is an elegant tree that thrives in any soil. It has drooping racemes of white flowers; the bark is a pale yellow, but not so conspicuous as many that I have mentioned. The finest specimen I know in England is in Anthony Waterer's nursery at Woking.

Alnus incana aurea is a recent introduction from Germany as far as I am concerned. It is perfectly different in appearance from *A. glutinosa aurea*, as the foliage is not specially brilliant, but the twigs are orange-yellow and it is covered with red catkins. I think that every one whose grounds are blessed by the presence of ornamental water ought to give it a place where it can get its roots into the moisture and develop its remarkable beauty.

The mention of Alders brings me naturally to other waterside plants, and, at the risk of wearying you, I cannot conclude this lengthy screed without enumerating a few herbaceous plants that have learnt the art of dying gracefully, and are as good or better in December as in June.

Polygonum sachalinense, the strongest grower with the largest leaves of all the Knot-weeds, easily reaching to 12 or 15 feet high if planted in a moist site, does not absolutely require water, and can safely be planted in shrubberies, as it spreads only to a very moderate extent. It comes from Saghalien Island, I believe, and has been in this country only about thirty years.

P. cuspidatum, a better known but less striking plant, cannot be recommended for shrubberies, unless most carefully kept in check; nor does it show the full beauty of its red winter stems unless its roots can reach water.

Rumex Hydrolapathum, the Giant Water Dock, when on the edge of an old moat, as it is seen in my home, is indeed a case of a weed in its right place; but it is not till it begins to wither in September that the merit of its strong burnt-sienna-coloured brown leaves can be appreciated.

Phragmites communis is a real joy, both summer and winter, with its purple flower-spikes borne on the top of its tall reeds. It is always waving and rustling on the stillest days, and gives to a pond a natural and luxuriant look which is delightful; indeed it pleases eye and ear alike.

Typha latifolia and *T. angustifolia* should both be planted, and near together—the rich colour and large size of the first so-called bulrush go so well with the refinement and lighter brown of the other.

Gynerium argenteum is the best form of Pampas grass. It must have protection, or at any rate a very sheltered site, if it is to survive very hard frost; but its silvery lightness repays taking some trouble.

Oreocome Candollii is not often seen. The foliage reminds one of fennel. It is one of the Selinums, and I note that Nicholson's 'Dictionary of Gardening,' iii. 415, boldly states that "the species possesses no interest from the garden standpoint." In point of fact, it is one of the prettiest and most distinct waterside plants. It grows to about 4 feet high, is covered with flowers and keeps on the heads through winter, while the foliage, as it dries, turns to a soft golden hue. We have had a plant a long time, but so far, alas! it has not reproduced itself. This year it shows every intention of ripening its seeds, so I hope we shall be successful in raising some more.

Eulalia japonica zebrina and *E. japonica gracillima fol. striatis*, or more correctly, *Miscanthus*, are both good all the year round. They grow about 3 feet high and are highly ornamental water-grasses. The first has yellow blotches or transverse bars on the leaves; the second has a longitudinal stripe of cream-colour on both edges and on the centre of every leaf. The flowers are reddish-brown plumes, something like those of *Phragmites*, and in warmer countries, where they appear more freely, add greatly to the beauty.

Cyperus longus is a perennial Sedge, rare in its wild state as a native, though it grows freely in the Channel Islands. It has a stiff three-cornered or triquetrous stem, and rises to 4 feet or more, carrying graceful brown flowers at the top of the plant, borne umbel-fashion on radiating leafy bracts.

Now my long tale has really drawn to its end, and some may think, who know the subjects which I have treated, that I have exaggerated and laid on the colours too thick, that such words as "brilliant orange" or "vivid scarlet" are out of place in describing live woods. To them I would reply as Turner did to the man who objected that he never saw such colours in real sunsets as appeared in the artist's picture of them—"Don't you wish you could?"

In deed and truth it is the old story of "eyes and no eyes." Given bright sunlight, without which no colours can be fully seen, there they are if we will only observe them, and the more we look the more we see. It is the perfect harmony of Nature's work which hides her brilliant hues from the careless, though to the patient watcher she reveals fresh beauties both of form and colour every day. Those who know Lord Tennyson's works know that he was not only a great poet, but a keen and accurate observer of England's flora. They will find recalled the coal-blackness of the Ash buds, and the sanguine vivid spot of colour in the heart of the Horse-chestnut bloom—things which many a countryman has lived and died without noticing.

How many thousands have seen the common Hazel in spring, and could not tell you whether it had any flower at all! still less would they know that the female bloom, though too small for the Florists' Exhibition board, is surpassed by no ruby in brilliance.

I must apologise for the unscientific character of this lecture, having regard to the audience to which it is addressed; but I make little claim to botanical knowledge, and all that I can urge in its favour is that whatever I have written is the result of some twenty-five years of practical persistent personal experience as an arboriculturist.

If I should ever have the privilege of speaking to you again, I should like to read a paper on rare trees and shrubs growing at Aldenham, because I think it is not generally realised how large is the number of choice and interesting plants which can flourish without protection in the open air, not only in Scilly or Cornwall, but in our not specially clement climate of Mid-Herts, and in the London clay basin.

SHRUB GARDENING ON THE WEST COAST OF ROSS-SHIRE.

By Osgood H. Mackenzie, F.R.H.S.

The winter and spring of 1903–4 were as favourable as any such seasons could possibly be for the welfare of exotics; there was neither the intense cold of the early spring of 1902, nor the never-ceasing hurricanes and floods at the same period of 1903, and thus there are no casualties to report. A heavy snowfall without wind early in December broke a few of my pet shrubs, particularly a fine *Oxydendrum arboreum* syn. *Andromeda arborea*, which still retained its beautifully tinted leaves, and my big Japanese Loquat lost several boughs, some of my Phormiums also had a portion of their leaves bent over; but otherwise everything has pulled through extremely well.

After some forty years' experience I have come to the conclusion that we do not take half enough trouble to make our places look beautiful in winter, and, moreover, that there is no reason why they should not be nearly, if not quite, as charming in winter as in summer. Why the general public restricts itself so much to planting masses of Laurels, Privets, and Ponticum Rhododendrons close up to their doors, I cannot imagine; and when I look at my own grounds, I feel thankful that there is not one of these plants to be seen in any of my choice shrubberies, though I do not object to a big specimen Portugal Laurel in an open glade, or to an undergrowth of Ponticum Rhododendrons in the plantations.

I will now describe what I venture to think is a better way of planting shrubberies, and will tell of three of mine, of which I took a note one fine morning last January. The first, which goes by the name of the "Fantasie," has a background of Silver Fir, Monterey Cypress, and Turkey Oak, the latter retaining its russet leaves well into the spring. Some of these are outside the enclosure, and, showing up well against them are some slender feathery specimens of *Eucalyptus coccifera* with their white stems and pale bluish foliage; then come a number of tall *Cotoneaster Simonsii,* nine or ten feet high, covered with their vermilion berries: the only plant that with me keeps its fruit on till well into spring.

Among the Cotoneasters are also some tall Portugal Brooms, waving their glaucous sprays in the breeze, and of much the same tint before they bloom as the Red Gums, by which name I believe the *Eucalyptus coccifera* is known in Australia. Then, mixed in among these, are large bushes of *Diplopappus chrysophyllus*, sparkling like gold in the winter sun; American Dogwoods, with their crimson stems and twigs; Camellias, Pampas Grass, New Zealand Veronicas, and Pittosporums; and, for spring and summer show, bushes of *Rosa rugosa*, two species of *Forsythia, Prunus Pissardi,* many varieties of Crabs, *Pyrus*, and *Philadelphus*, and the ground is carpeted with *Gaultheria Shallon*, St. John's Wort, and *Erica vagans*, the Cornish Heath, which flowers on till late in the autumn.

So much for the "Fantasie." I now pass on to notice two enclosures which I call "America" and "Sikkim." They lie near one another, so I will place myself at the gate of the former and describe what I can see from the one standpoint. At the back, a big *Eucalyptus coccifera*, clad down to the ground with its charming foliage, and glimpses of other Eucalypti such as *E. pauciflora*, *E. cordata*, *E. Gunnii*, and *E. urnigera* (showing up against a background of rare Conifers outside the enclosure), each and all of these Australian Gum trees in perfect health, without an injured leaf; a *Podocarpus Totara* (one of New Zealand's best timber trees) and a big *Abutilon vitifolium*; my pet bush of *Rhododendron Nobleanum*, covered with its crimson trusses of bloom every January and February; an oval bed filled with Van Houtte's best single and double Ghent and Mollis Azaleas, with a specimen of the Bamboo, *Phyllostachys viridi-glaucescens*, in its centre; magnificent plants of the giant *Erica arborea* and *E. codonodes*; opposite the Azalea bed, huge bushes of the so-called New Zealand Holly (*Olearia macrodonta*), a still bigger bush of *Buddleia globosa*, and a smaller one of its cousin *Buddleia Colvilei*, both semi-evergreen; clumps of *Bambusa Metake* that made shoots fully ten feet high last autumn, and most tellingly picturesque they are with a sprinkling of rare and curious Rhododendrons from Sikkim and Bhotan (one or two of them not yet named), some with the undersides of their leaves dusted with gold and others again with silver; beautiful New Zealand Tree Groundsels (*Senecio Buchanani* and *S. Grayi*), the New Zealand Ti Tree (*Leptospermum scoparium*), and the ground covered with the white Irish Heath (*Menziesia polifolia alba*) and the American Foam-flower (*Tiarella cordifolia*) running wild all over the place, with lots of *Erica herbacea carnea* already in January showing pink through it.

And now lastly comes my enclosure called "Japan," which, like its namesake in the East, though young, is very prosperous and go-ahead; for though it is only three or four years since it was reclaimed from a wild state of nature, it has made rapid strides, and is now a most civilised little spot. It is just a glade in the plantation, close to the salt water's edge, and one is struck at once by its very foreign look, chiefly owing to its Cordylines, Palms, Bamboos, Eucalypti, and New Zealand Flaxes. Why does not every one start growing Phormiums and Bamboos, when they are quite as easy to grow as my pet aversions, the Laurels and the Privets? Anything handsomer than giant clumps of either of these I cannot imagine. I have the former in great variety. The plain green original tall species from the New Zealand swamps, the silver-striped, two varieties of gold-striped and banded, the purple Phormium and two dwarf ones which I am told grow on hard ground in their native land. One of them, *Phormium Colensoi*, is a perfect gem, which every one should have; nothing injures it, as its shorter leaves never get bent or broken over like those of its big sisters.

Of Palms I think I can speak with some authority, having grown them out of doors for thirty years, and I have never known one of them in the slightest degree injured by wind or weather. I started with a little bag of seed of what was said to be *Chamærops Fortunei* from Japan. The seedlings came up like mustard and cress, and I could have stocked half Scotland with them; but though I guaranteed them hardy, I could find no one with sufficient faith to relieve me of my surplus stock. I am trying *Chamærops excelsa* and *Chamærops humilis*, and they also appear to be quite hardy.

But though I have mentioned these five families of exotics as being the main feature of my "Japan," there are endless other most interesting things in it. There is a great mass of *Aristotelia racemosa* from Australia, and the show plant of the place, my big *Crinodendron*, various Magnolias and Desfontaineas, a European Olive, a *Paulownia imperialis*, and nearly all known hardy New Zealand Veronicas. Climbing up a tall Fir-tree is a *Billardiera longiflora* with its striking blue berries, mixed up with the *Clematis montana*; up other Fir-trees I am trying to grow *Lapageria* and *Wistaria*, with little success as yet, but I have had very few failures in "Japan." At the foot of most of my smaller shrubs in "Japan" I have patches of low-growing treasures, chiefly bulbs; *Narcissus Bulbocodium* (the Hoop Petticoat), *N. triandrus*, and *N. cyclamineus*, which are so fascinating; all the American tall Erythroniums (Dog-toothed Violets), *Epigæa repens*, a creeping gem which blooms in March, patches of Tulip species, mostly from Central Asia, curious wild Anemones, one of them a tiny yellow one * whose name has gone from me, &c.

A part of "Japan" is steep, and this little brae I utilise for growing hardy Cyclamen; for a big bed of St. Brigid Anemones, which are a most perfect success; for those most lovely of flowers, the Californian Calochorti; and for Ixias and Cape bulbs.

My two *Drimys* (both *D. Winteri* and *D. aromatica*) are most thriving bushes, and so are the Benthamias, Abelias, Daphniphyllums, *Metrosideros lucida*, Eucryphias, &c. My Chilian Fire-bush (*Embothrium coccineum*) is coming on grandly, and in another year I shall expect it to show its fiery blossoms. I rather think that (like my new treasure, *Davidia involucrata*) it is the only one of its kind in the North Highlands, but last year I saw a fine specimen on the shores of Lough Eske, in the highlands of Donegal, which flowers profusely.

I made with great pains, this last winter, special places for Bamboos. Should they be called Bambooseries, or what? I first of all made these enclosures proof against red-deer, roe-deer, and rabbits. Would that I could make them proof against field mice and voles, who gnaw them clean through, mistaking them, I suppose, for sugar-canes! I expect great things from these new "follies"—as fancy work of this kind was called in the olden times. I have made the pits very deep, with alternate layers of black peaty earth, manure, decayed seaware, bone-dust and old lime mortar. I have placed them in nooks in the wood, with the trees cut out to allow the rays of the sun to strike straight on them. A year or two will prove if I have done my work well, and I shall be much disappointed if my Bamboos do not grow into giants.

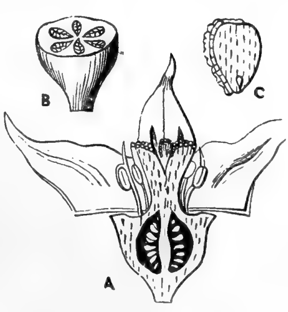
How time changes things! In 1864 I was planting these bleak shores with Firs, &c., and every one else was shaking his head and prophesying nothing would ever grow on the exposed promontory and in the thin covering of sour peat upon wet rocks; and for a good many years it was a case of having to suffer the condolences of kind friends that the wee plants were going back instead of forward. Indeed, in spite

* Probably *A. ranunculoides*.—Ed.

of being young and sanguine, I must say I often felt doubtful myself as to the result, and had I dreamed that I should live to cut down trees fifty feet high, and to be tying up home-grown *Eucalypti* to home-grown Bamboo stakes (which we have been actually doing of late), I should on awaking have exclaimed, "What an absurd dream! It cannot come true." But it has.

The climate here is decidedly favourable to many exotics, and they only require shelter to be given them, and good soil provided for them, to make them a success. In May I had five specially striking plants in bloom: viz. a grand clump of *Trillium grandiflorum*, on which we counted over fifty blooms; several plants of *Bryanthus*, nice healthy things, smothered with crimson and rose-coloured blossoms; big patches of *Anemone nemorosa* var. *Robinsoniana* with their mauve-grey flowers, just, as a lady friend remarked, made to match the ribbon on a Quaker lady's bonnet; and a fine old plant of *Podophyllum peltatum*, with its curiously cut bronzy-green leaves and cup-shaped flowers of a lovely pink and white, like big apple blossoms; and last but not least *Pyrus* 'Columbia,' which no scarlet Geranium can beat for colour. June produced all kinds of floral wonders. Rhododendron 'Pink Pearl' was one of them, and it is certainly the Queen of Rhododendrons. My vine-leaved Abutilons were better than ever, and so were my Buddleias, especially *B. Colvilei*. *Calceolaria violacea* was distinct and interesting with its small blue slippers, but it is not very hardy, though it stood out safely here. *Kalmia angustifolia* var. *rubra* was nice, and never fails like some of the other Kalmias. July was rich in white flowers. The very best was *Escallonia pterocladon*; also *E. Phillipiana*, *Leptospermum scoparium*, and *Zenobia speciosa pulverulenta* were lovely; and for size of bush and for being literally smothered with blossom, *Olearia macrodonta* was marvellous. August, though it is a month when the blooming of shrubs is nearly over, gave us more colour. The Desfontainias were brilliant, with their scarlet and orange tubes, and *Mitraria coccinea* never did so well, having scores of its vermilion mitres on it. Next in beauty came *Veronica salicifolia*, which seeds itself as if it were a native, coming up in masses, and is a great acquisition in our shrubberies. I had two other bright shrubs in August, viz. a *Crinodendron* which blossomed then, whereas its big parent did so in May, and against a wall I bloomed *Metrosideros lophantha* with its crimson bottle-brushes.

But have I not told a long enough story? I think I have, but I shall be pleased to start afresh another year if my horticultural experiences prove of any interest or use to any of the Fellows of our old Society.



COMMONPLACE NOTES.

By the Secretary and Superintendent.

Market Fruits.

It will surely by this time be admitted universally that, fruits and vegetables being meant primarily to be eaten and only incidentally to be looked at, the one quality of good flavour should be in unmistakable evidence if any fruit or vegetable is to obtain recognition and award from a society like ours, whose verdict carries so much weight, not only all over the British Empire, but also in foreign countries. When any new fruit or vegetable is pleading for recognition, if the judges judge of it in the first instance by anything save by flavour, surely they are putting the cart before the horse? The elements of size and appearance no doubt enter into the problem, but only in a second degree. The first question with a judge of a fruit or a vegetable should surely be: "Does its flavour entitle it to any award? Does it hold a high place amongst its kind of fruit or vegetable for the pleasure it gives to the palate?" If the answer be "No, it does not; its flavour is quite second-rate," then surely the matter is ended—there should be no further appeal. "But look how big it is!" or "Look how pretty it is!"—if it will not pass muster for flavour it ought to be nonsuited at once.

If, however, it do pass the test of flavour, then several other questions arise. And the next to be asked with regard to a fruit or vegetable intended for cooking should be "Will it cook well?" Such an Apple as 'New Hawthornden' would on this point utterly fail, as there are no two opinions but that an apple ought to cook soft. With some things it is possible there may be distinct differences of taste. In Potatos, for example, some like a Potato to be yellow and waxy like a new Potato all the year round, and some like them to boil into lumps of white floury starch. In such cases each side ought to be willing to allow the claims of the other so long as the Potato answers the first test of all and is of good flavour.

After flavour and cooking quality comes crop. Does the variety bear well? for it may be of excellent flavour and cook to perfection; but if you only get a crop one year in ten the variety in question is of little practical value.

These three points, flavour, cooking, and crop, having been established, then—but not till then—should come in the quite subsidiary questions of size and appearance. Taking size first, it is quite possible for a fruit or a vegetable of first-class flavour, excellent cooking quality, and a good cropper to fail in the matter of size. A cooking Apple, for instance, must have a reasonable amount of flesh between the core and the rind, or it cuts to such waste as to be practically worthless. The thicker, therefore, the depth of the flesh, the more valuable *for cooking* the Apple will be. With Potatos, it seems to us the position is in some respects exactly reversed.

For plain boiling a Potato may very easily be too large and can hardly be too small—the smaller, in fact, a Potato is (provided it is a properly ripened tuber), the better its flavour and the easier it cooks. A large tuber is very frequently found to be squashy outside and hard inside. And even for Potato chips, though the very small ones are useless, the moderate sizes are far nicer than the very large ones. And even with Dessert Apples it is no doubt possible (but highly improbable) for them to be too small, but it is a very common fault that they are too large. No Apple for dessert purposes ought to exceed three inches in diameter. That should be the maximum, and such varieties as 'Pearson's Plate' are by no means too small. Pears, again, may well be too large, but owing to their variability of shape it is difficult to suggest any definite measure. Suffice it to say that we should never dream of putting such huge fruits as 'Pitmaston Duchess' on our own dinner-table, and the enormous specimens of 'Uvedale's St. Germain' which we have seen are absolutely vulgar as well as uneatable.

After flavour, cooking quality, crop, and size, comes appearance, and we maintain as strongly as we can that appearance without flavour should never for one moment or under any circumstances stand any chance of award. If two fruits are otherwise equal and one is beautiful to look at and the other is less so, the superior beauty is a distinct point in its favour. But however beautiful to look at one may be, if it is not the equal of the other in flavour it should be considered to be its inferior. Appearance is an additional asset where other points are equal, but if such equality does not exist then appearance should be of absolutely no account.

And this brings us to the question of so-called "Market Fruits." And we ask why should our Society grant awards to flavourless fruits or fruits of distinctly inferior flavour as 'Market Fruits' simply on account of their beauty? True, they are sure to sell if they look luscious and ruddy, no matter how much they belie their appearance. But surely a society like ours should disdain such a sordid motive as certificating a fruit because it will sell—because the inexperienced public can be caught by the eye in ignorance of the want of quality. It does not matter what Pear you put on a London barrow, if only you shout out "Fine Williams!" you are certain to sell them. But a society such as ours should do its best to educate the public to know a good Pear or good Apple by sight, and not leave them to buy flavourless stuff by false name or misleading appearance, and to certificate a pretty but flavourless fruit under the title of "as a Market Variety" is to a certain extent to join in deceiving the public who will quickly lose sight of, if indeed they can even be expected to understand the meaning and bearing of, the qualifying words "Market Fruit." Market Fruit! why the best should be grown for the market, and the best is the best flavoured, and to encourage the palming off of inferior varieties because they are pretty is unworthy of the Royal Horticultural Society.

Roses in New Zealand.

A note from Wellington says: "The soil in this locality will grow almost anything (O fortunate New Zealanders!), and we have besides a mild and sunny climate, the temperature in winter rarely falling below 35°. But we cannot grow Roses to perfection—that is to say, they grow and bloom freely, but we cannot get good show blooms. 'Teas' and 'H.T.'s' are fairly satisfactory, but 'H.P.'s' are almost useless." Well, well, we must not expect in this world to have everything. A soil that will grow anything and a sunny climate which never falls quite to freezing are blessings enough for one land. And it is almost certainly this mild climate, with its abundant sunshine and absence of frost, allowing the Roses no season of rest, which prevents the 'H.P.'s' giving show blooms, and probably throws them instead into sappy Willow-like growth. On the French Riviera, where there is mild weather all the year round, the hot rainless autumn affords to some extent the check and rest which almost all Roses require, and yet even there the 'H.P.'s' (and especially the red ones) do not do well, and seldom if ever produce what in England would be called good show blooms. The Teas do not demand such an absolute rest as the 'H.P.'s,' and the more Tea blood there is in an 'H.P.,' the better suited we should expect it to prove to the New Zealand climate.

Lilies in Shade.

How well some Lilies succeed, planted under deciduous trees, is well known to many Lily lovers, but not to others. Special mention may be made of *Lilium rubellum*, a lovely Japanese species, growing about 3 feet high, and very sweet-scented. The flowers are of a beautiful shade of soft pink, with bright yellow anthers, and produced in the shade in clusters of five to seven on a stem, while in the open and free from shade the average is certainly not more than three flowers on a stem.

Lilium giganteum does wonderfully well in the shade, with big fleshy healthy leaves and strong spikes more than 8 feet high, well furnished with large flowers, while another lot of plants in the sun most of the day had leaves much smaller and thinner, and only one plant blossomed. In each case the bulbs had been established for a number of years.

Lilium Szovitzianum, with its lovely citron-yellow flowers, is particularly happy in shade, and, like the above, is much finer than it is out in the open. Both on grass and on cultivated parts it is equally good in shade, and should prove a most valuable plant for naturalising in the wild garden. All the above grow at Wisley under the shade of Oak trees, where it is quite impossible for the sun to reach them. Under the same conditions Lily of the Valley blossoms were enormous, proving what excellent things they are for shady borders or positions. No top-dressing except leaf-mould has ever been given, and no doubt this was the most suitable thing they could have had.

Lawn Grass Treatment.

A correspondent complains that the lawn is so full of "coarse tough grass" that the lawn-mower lays it flat and will not cut through it. We fancy it is the old old story of not beginning to mow, &c., soon enough. There is no grass, however small and fine, which, if once allowed to run up, will not become long and wiry. The very grasses our correspondent sends specimens of, if they had been kept mown and rolled from the first and not allowed to shoot up seed-culms and long leaves, would probably have made a very good lawn, but if they are once permitted to get into a bad condition it is almost impossible to do anything with them. We advise cutting the grasses with a scythe at once (this was in July), and the lawn well raked and mown and rolled in autumn, and bare patches being sown with fresh seed. This and a dressing of artificial manure in the spring, together with earlier and regular mowing, at least once a week, will no doubt ensure better results. Rye Grass is the quickest variety to grow, and, when kept close and stimulated with manure, the easiest with which to make a lawn, but if not kept mown it will grow at least 2 feet high.

Daisies and Salt.

We are always being asked how to kill Daisies on lawns. One ounce of sulphate of ammonia to a square yard, carefully and evenly sprinkled over the lawn in May, and again in June, and again in July, will kill all Daisies if done in dry weather. It is almost useless to do it once—it must be followed up for the three consecutive months, May, June, and July—and it is no good in wet weather.

The same Fellow asks whether common salt is good for meadow land. We have often used it at the rate of 5 cwt. an acre with excellent results. One of the heaviest Hay crops we ever had was after such a dressing, and the aftergrass sprang up again sweet and thick for the cattle.

Autumn-flowering Roses.

The Show of Autumn-flowering Roses, held in the Hall of the Royal Horticultural Society on September 20 last, was quite a revelation to many who had no idea of the great value of Roses for autumn effects, and on all sides visitors were busy taking notes of varieties to grow. A month later, viz. October 19, we had the opportunity of seeing a magnificent collection growing in the West Midlands and flowering in a most profuse manner, in spite of having passed through six degrees of frost, but without the slightest apparent injury. It may be useful to intending Rose planters if we give the names of those varieties which had not only the finest flowers, but also the greatest quantity of blossom. As Hybrid Teas were the best, they are named first in alphabetical order, viz. 'Camoens,' bright rose, one mass of lovely buds ; 'Clara Watson,' salmon-pink, very free ; 'Gruss an Teplitz' was one sheet of bright scarlet, both in bush form, and as a climber ; 'Lady Henry Grosvenor,' soft pink, a very fine variety ; 'Caroline Testout' was not only covered with flowers, but most of them were fit for the exhibition table ; 'Mrs. W. J. Grant,' with its lovely pink flowers, was equal to any in all respects ; all the Waltham Climbers, viz. Nos. 1, 2, and 3, were very fine as bush or pillar varieties, No. 1 being the deepest crimson. Among Teas, 'Comtesse de Nadaillac' (orange-copper and salmon), 'Enchantress' (white), 'Ma Capucine' (orange-yellow), 'Maman Cochet' (flesh-colour), and its white form, 'Muriel Graham' (pale cream), and 'Mrs. Edward Mawley,' were all first-class.

Practically all the Noisette varieties were covered with flowers, but although a little "off colour," 'William Allan Richardson' stood out above all others by its enormous quantity of flowers on bush or climbing plants. Many other very good varieties could be named that were well worth a place in every garden; but as many have only moderate-sized gardens, we have confined our list to those which stood out as especially valuable.

Royal Horticultural Hall.

Fellows, of course, are aware that it is most earnestly to be hoped that we shall be able to let the new Hall from time to time for bazaars, concerts, and such like. There is no better place of its size for the purpose in all London. It was so used on Tuesday, November 22, on the occasion of a special concert by the St. Margaret's Musical Society. Vocalists and orchestra together numbered nearly 300 performers, and there was an audience of 1,000. The acoustic properties of the Hall were thus fully tested and the result was eminently satisfactory. There was no trace of an echo, the voices being effectively heard in every part of the hall. The lighting, heating, and ventilation were also considered to be admirable. The programme of this first concert in the new Hall included the greater part of Handel's "Messiah," Schumann's Advent Hymn "In lowly guise," a selection from Mozart's Symphony in E flat, and Gounod's "Nazareth."

Ericaceous Plants.

A very frequent question put by visitors to the Society's Gardens at Wisley is, "Why do Ericas, Kalmias, Pernettyas, and similar things grow so well with you, and yet are entire failures with us?" adding that no expense has been spared in preparing sites for them with the best soil procurable. The answer is, that where lime is found in any quantity naturally in the soil, it is almost impossible to grow Ericaceous plants. They may exist for a number of years, but scarcely any growth is made; flowers are conspicuous by their absence, and eventually the plants grow less and die. Some say, "Oh, but I had all my beds dug out two or three feet deep, and filled up with good peat, and yet the plants are a failure." And so they usually will be, because the water passing through the soil from the ground adjoining is so charged with lime that in a very short time the new soil you put in becomes impregnated with lime and thus forms a very unsuitable rooting medium for the plants. Where Rhododendrons and other Ericaceous plants refuse to thrive, the best plan is to make a raised bed above the ground level, so that the water constantly filtering through the surrounding earth only rises very slightly, if at all, into the soil made up above the usual level. Even then the beds should, if possible, be watered only with rain-water, and, if there is any risk of drought, should have a mulch of thoroughly decayed manure, which will not only enrich the soil, but assist materially in keeping the soil cool and moist during hot weather. Leaf-mould, again, is a most excellent mulch for all Ericaceous plants, and always looks neat and tidy, whereas birds are very fond of scratching even well-decayed manure off the beds, and making the margins untidy. We have seen such beds made, and the sides and bottoms cemented for these plants. Not only is this costly, but it is not always the success anticipated.

Heating.

A Fellow asks whether we can give him any hints especially bearing on economy of heating. It is a very large subject, but there are a few governing principles we may mention, such as that the coal, coke, and other fuel he speaks of, should always be burnt separately, not mingled together. The fire should always be kept near the furnace door, so that the flames travel the whole length of the boiler ; if the fire is made at, or allowed to get to, the far end of the furnace, a large part of the boiler surface is scarcely touched by the heat from the flame. The stoker must use judgment and common sense; on a bright sunny morning he will hardly need to start the fire actively, cleaning out the clinkers and ashes will probably suffice ; whereas on a cold dull morning the fire must be started again into activity until sufficient heat is generated in the house. At night the fire must be carefully banked up the last thing, using fuel that has been broken up rather fine, and putting the finest of all over the top; in a good boiler, with good banking up, the heat may be maintained within a few degrees for from 10 to 12 hours. On the other hand, in the daytime it is better to keep a small bright fire by putting on little and often than by using heavy charges of fuel.

Another Fellow of the Society writes us that when he has a biggish fire and the sun suddenly comes out and the heat begins to run up he covers the fire with lumps of chalk, which at once deadens the heat, and at the same time gives him lime for use in the garden. We have no personal experience of this, as we are far from a chalk county, but it sounds very feasible.

Canker in Fruit Trees.

A correspondent, Mr. Thomas Sharp, sends us an account of his treatment of this disease with lysol and top-dressing the roots. He says: "The method is simplicity itself. Cut out the diseased tissue, either in the resting or growing season, and dress the wounds with 'lysol'—a 6*d*. bottle will dress a very great number of wounds. Result: healthy tissue all round the wounds, gladdening the heart of the grower. In addition to the lysol dressing, my trees—growing in poor soil, chiefly sand poisoned with coal ashes—had their roots top-dressed with two inches of compost consisting of about one-third heavy (gault) loam, one-third chalk loam, one-third sandy loam, plus 3 to 4 ounces of 30% superphosphate, and about 1½ to 2 ounces of sulphate of potash per square yard."

BOOKS REVIEWED.

"A Botanical Excursion during Midwinter to the Southern Islands of New Zealand." By L. Cockayne, Ph.D. 8vo., 109 pp.

This paper, extracted from the "Transactions of the New Zealand Institute" (vol. xxxvi.), is a valuable addition to the knowledge of Antarctic plants and their conditions of growth. Its need and scope are described by the author thus: "Up to the time of my visit all the botanical observations in the Southern Islands had been made in spring or summer. It was therefore with very great pleasure that I joined the 'Hinemoa' at Lyttelton in the middle of June 1903 for the purpose of making a winter botanical excursion to the islands, the winter aspect of the vegetation as a whole being undescribed, and, so far as the endemic plants were concerned, unknown."

Dr. Cockayne visited the Auckland, Antipodes, and Bounty Islands, and Campbell Island, but unfavourable weather prevented landing on the Snares. He describes the climatic conditions of those islands visited as being very similar, and consisting of cloudy skies, frequent showers, a mild winter and cool summer temperature, and frequent and violent winds accompanied by rain, hail, or sleet. It appears that these winds are more violent on Campbell Island, and arborescent growth is thereby reduced, and the forest formations of Auckland, composed of *Metrosideros lucida* and *Dracophyllum longifolium*, or *Olearia Lyallii*, are replaced by a scrub of *Dracophyllum longifolium* and *D.* sp., *Coprosma cuneata*, *C. ciliata*, *C. parviflora*, and *Suttonia divaricata*, closely allied to that of the subalpine region of Auckland. On Antipodes the scrub almost reaches the vanishing point, and on Macquarie Island is altogether wanting. These islands thus "afford an instructive example of how arborescent plant formations even in a rain-forest climate may be inhibited by frequent and violent winds and their place taken by meadow growths, which, notwithstanding the wind, are so stimulated by the moisture as to be of very great luxuriance."

Each of the islands visited is described separately, as also its different plant formations.

Thus in the Auckland Islands we have (1) Sand-dunes; (2) Coastal rocks; (3) forest formations—(*a*) Rata forest, (*b*) *Olearia Lyallii* forest; (4) lowland tussock; (5) *Pleurophyllum* meadow; (6) subalpine meadow; (7) subalpine scrub. And in each of these the nature of the soil is described, and the more important plants found in each formation are enumerated, and finally detailed descriptions with exact measurements are given of those endemic, or of special interest in their winter state.

The view within the Rata forest must be very remarkable. The trunks of the Metrosideros trees being frequently prostrate from their bases for more than half their length, gnarled and twisted naked branches are given off at all angles, and so twisted as to make a bewildering network; the ultimate branches are erect, and form with the foliage a dense flattened head roofing in the forest. Though this roof plainly shows the powerful effect of the gales, its density keeps the interior of the forest calm and feebly illuminated, which, with the extremely moist and equable climate, encourages the spread of the forest and the growth of numerous filmy Ferns, Liverworts and Mosses, and such plants as *Nertera depressa*, *Stellaria decipiens*, and *Epilobium linnæoides*. In certain islands the forest floor is in many places quite bare, owing to the sea-lions making wide tracks through it.

Nor can the *Olearia Lyallii* forest be less wonderful; thus in a quotation from Kirk's description of these plants on the Snares we learn: "When this grows a certain height it falls down with the weight of the leaves and the pressure of the wind, and takes root where it touches ground; then it grows upwards again, and after a while it falls again, tearing its oldest root up and rooting itself a third time." This species is closely allied to *O. Colensoi* of Stewart Island, belonging to that section of the genus with large solitary heads. Its leaves are very large, the upper surface a dark green and varnished, the under clothed with a white flannelly tomentum.

But of all the formations described the *Pleurophyllum* meadow seems the most attractive, its magnificent display of flowers having gained for it the name of 'Fairchild's Garden,' 400 acres in extent and filled with beautiful flowering herbaceous plants, such as *Pleurophyllum speciosum*, with huge ribbed leaves 2 feet long, so crisp that they give way with a crash as of thin ice when trodden on, and spikes of fine purple flowers; *P. criniferum* with white flower-stalks 3 feet high and brown rayless flower-heads 1 inch across; *Celmisia vernicosa*, with leaves "gleaming like polished nephrite;" the orange *Bulbinella Rossii*, *Ligusticum* (*Aciphylla*) *latifolium* and *antipodum*, large umbellifers with reddish flowers, *Gentiana cerina* (white striped with red), *Myosotis capitata* (violet blue), *Veronica Benthami* (deep blue), *Epilobium confertum* (pink), *Stilbocarpa polaris*, a noble plant resembling *Gunnera chilensis*, and other plants of great beauty but also met with in New Zealand.

A section is devoted to the effect of animals, both indigenous and introduced, upon the vegetation. Of the indigenous, sea-birds, such as penguins, petrels, and albatrosses, kill the timber or scrub wherever they form rookeries, and certain small plants grow among the old nests, especially *Acæna*, the seeds of which cling to the breast feathers and so get disseminated, and on Antipodes Island the endemic *Senecio antipoda* is found growing in the bare ground manured by the giant petrel, just as is *Cotula Featherstonei* on Chatham Island near the holes of mutton-birds.

The sea-lions, as before noted, make bare spaces on the forest floor, and also on the sandhills.

Pigs and rabbits have been introduced on some of the Auckland Islands, but the sheep-farming now carried on on Campbell Island seems to have had most effect. Certain Grapes and the magnificent Pleurophyllums are favourite foods with the sheep, and *P. speciosum* they devour greedily, eating right down to the rootstock, and wherever sheep can feed this fine plant will be destroyed. It seems a pity that "one of the most wonderful natural museums in the world," as Dr. Cockayne calls

Antipodes Island, should be destroyed for the sake of the trivial and problematical gain that could be acquired by sheep-farming thereon.

On the question of the origin of the flora of these isles, two explanations are discussed: first that seeds were brought by winds, birds, currents or icebergs over wide stretches of ocean; secondly, the possible former existence of an antarctic continent, and this view is accepted as the more tenable. The difficulty in inducing seeds of New Zealand plants to germinate unless the conditions be very favourable, and the presence on Chatham Island of earthworms, and again on the Bounty Islands of spiders, both closely related to South American forms, and neither capable of tolerating sea travel, are powerful arguments in favour of this view.

Then follow a classified list of the indigenous spermaphytes and pteridophytes of the Southern Islands, a bibliography and fourteen plates, maps, and excellent photograms of many of the plants and plant formations described.

As so readable and interesting a paper is the outcome of a visit during midwinter, it is to be hoped that Dr. Cockayne will soon be able to recount to us the results of a summer visit.

"The Book of the Carnation." By R. P. Brotherston. Sm. 8vo., 95 pp. (John Lane, London and New York.) 2*s.* 6*d.* net.

A considerable portion of this interesting book is given to the description of some forty-two species of *Dianthus*, and a chapter on the history of the Carnation. Its early history, the author says, is involved in obscurity. The same may be said of most of the old-fashioned garden flowers; but in truth the Carnation has had its history investigated to a greater extent than any other garden flower. An American writer stated that Theophrastus wrote about the Carnation 300 years B.C., and gave the genus the name of *Dianthus*. The author of this little book says that the very earliest record of the Carnation does not go further back than the beginning of the sixteenth century, and that Chaucer does not mention the Carnation. "All good authorities," he says "concur in identifying Chaucer's plant with the Clove tree of commerce." Chaucer's lines are:

> Ther springen herbes greet and smale,
> The licorys and the cetewale,
> And many a clow gilofre,
> And notemuge to put in ale,
> Whethir it be moist or stale.

Edward the Fourth was born at Rouen in 1442, and an undoubted portrait of him was sold at Christie's from the Bernal Collection in 1855; it is the portrait of a young man, and he holds a Carnation daintily in his hand. Chaucer died in 1400, so that it is quite possible and even probable that the Carnation was a garden flower in his time. But in truth very few Carnation cultivators trouble themselves about the ancient history of the flower. What they do want to know is how to obtain the best varieties, and what is the best way to grow them, under glass and in the open garden. The author has had most of his experience as a cultivator in Scotland, which is probably the reason why growers in England would give somewhat different directions as to culture. Chapter III. is headed "The Carnation as a garden plant." It is stated that "the layers should be put down at the earliest possible moment, the middle of July being quite late enough, so that nicely rooted plants may be ready for planting any time from the end of August till the middle of September." In the south, layering begins about the third week in July, and is generally finished by the middle of August. The layers are taken off after the middle of September, and the work is continued until the second week in November or later. If Carnations are layered at or before the middle of July, they would not even be in flower, and no admirer of the Carnation would care to disturb his plant at that time. As to the time of planting, there is no need to be in such a hurry. Some twenty-five or thirty years ago, the Show Carnation, that is the flakes and bizarres and the white-ground Picotees, used to be exhibited at Newcastle-on-Tyne, and multitudes of plants might be seen growing in the gardens of cottagers and others in the Tyne valley. These plants were layered in August and planted out about the second week in November, the soil being well prepared and enriched with manure from the sweepings of the cattle market. A trial of this late November planting was for many years made in the south of England, and the plants always succeeded admirably. It is well, as the author suggests, to be careful with manure, but even fresh manure is not injurious if it is placed six inches below the surface.

There is a chapter on the cultivation of Carnations in pots, which is excellent; for although this, and indeed all the species of *Dianthus*, are quite hardy, and well adapted for garden cultivation, the best flowers are undoubtedly obtained from plants grown in glass houses. The manure question is a difficult one for amateurs, and a passage at page 28 is obscure. After instructions for watering, placing sticks to the plants, &c., the cultivator is instructed to "apply manure as required." Probably manure water is meant; if so, it should be very much diluted, and given seldom. One cultivator, who grows many thousands of all classes in pots under glass, never uses manure water at all, or artificial manure of any kind. A fourth part of good decayed stable manure is mixed with the potting soil, and that is found sufficient to carry the plants through the flowering period. It is a good plan (if fine exhibition blooms are wanted) to place a slight surface dressing of equal parts decayed manure and loam on the surface. Ground oyster-shells in the proportion of a six-inch potful to a barrowload of compost is a better material to keep the compost open than sand.

The Pink family is also treated in three chapters; the author has taken much pains here again to trace it through several centuries. At page 51 of the history it is stated that "the Pynkes and small feathered Gillofers are like to the double or cloave Gillofers;" surely this is some confirmation that Chaucer meant the Carnation and not the Clove of commerce when he wrote of the "clow gilofre."

In the chapter on "Mules or Hybrids" it is stated that the pollen of the Sweet William is impotent applied to the Carnation. If the reader is meant to infer from this that the two do not cross, it is rather a misleading statement, as a cross has been recently obtained between 'Uriah Pike' Carnation and a Sweet William. About a thousand seedlings were obtained, and they were altogether destroyed but one, and a very handsome garden plant it is. The Floral Committee of the R.H.S. gave it an Award of Merit under the name of 'Lady Dixon,' and it is now being sold for the benefit of the New Hall fund. The Garden Pink and the Sweet William crosses will also produce seed pods, and we suspect *Dianthus hybridus* was probably obtained in this way. The list of garden and exhibition Pinks might also be improved. Only very old varieties are named, the newer ones being almost entirely omitted. One of the best garden Pinks, 'Snowdrift,' certificated by the R.H.S. in 1903, is left out. Among laced Pinks, 'Excellent,' 'Mrs. Pomeroy,' 'Mrs. Waite,' 'Old Chelsea,' 'Rainbow,' 'Zufra,' and 'Sarah' should be added. All these laced Pinks are among the most beautiful of garden plants. A list of yellow-ground Picotees is given at page 33 which is very imperfect. The following should, we think, have been included: 'Amphion,' 'Borderer,' 'Edna May,' 'Empress Eugénie,' 'Gertrude,' 'Henry Falkland,' 'Hesperia,' 'Lauzan,' 'Lucy Glitters,' 'Lord Napier,' 'Mrs. Walter Heriot,' and 'Othello.' The list of selfs would also be greatly improved by the addition of 'Daffodil,' the best yellow; 'Glowworm,' scarlet; 'Etna,' scarlet; 'Bridegroom,' pink; 'Trojan,' white; 'Roseleigh Gem,' lavender; 'Midas,' orange-buff; 'Miss Shiffner,' pink; and 'The Dawn.' To the list of fancies we should add 'Banshee,' 'Dido,' 'Molly Maguire,' 'Horsa,' 'Lady Ardilaun,' 'Perseus,' 'Queen Bess,' 'Professor Cooper,' and 'Ivo Sebright.' The chapter on diseases and garden pests contains much useful information. It is interesting to be informed that "Rust" is not at all troublesome in the north of England and Scotland, and that when it is introduced from the south it speedily disappears. There is an interesting chapter in the way of an appendix by Martin R. Smith, Esq., V.M.H., which all young and ardent cultivators should read carefully. And those who are impatient at finding single varieties amongst their seedlings will therein learn that 'the seed from large selfs properly hybridised should give 50, 60, or 70 per cent. of double flowers." But all who are the least interested in the Carnation, the Pink, the Sweet William, and the various species of *Dianthus* should procure the book, which should find a place on the shelves of every garden library. The "omissions" are few, and the information contained is most interesting and suggestive.

"Wayside and Woodland Trees." By Edward Step, F.L.S. Sm. 8vo., 182 pp. (Warne & Co., London.) 6s.

It would be difficult to conceive a more concise and valuable book for the history and identification of our native trees and shrubs than that under consideration. Both text and illustrations are excellent; indeed, in the matter of detail and clearness the latter could hardly be improved upon, while the novel method of having the tree photographed both in summer and winter is for various reasons to be commended. Generally speaking, the information given regarding each tree or shrub is amply sufficient for purposes of recognition, especially when aided by the illustrations; while the folklore, and value of each in an economic sense, bring together in small compass almost everything that is worth knowing regarding our native woodland species. We are glad that the author has clearly defined which is the true London Plane, for an erroneous opinion regarding this well-marked variety is unfortunately by no means uncommon.

"Trees: a Handbook of Forest Botany for the Woodlands and Laboratory." By H. Marshall Ward, Sc. D. Vol. i., Buds and Twigs. 8vo., 271 pp. (Cambridge University Press.) 4*s.* 6*d.* net.

It is not often that we find the physiological botanist equally at home in morphology, but a perusal of this book will reveal the fact that the author has a deep insight into both, and has been able to bring home to his readers a partially new but most fascinating subject—buds, their form, position, and constitution. But it is not alone for the purely scientific botanist that this work has been prepared, for we can see what a boon it will be even to the gardener, nurseryman, and forester who wish to be abreast of the times and to treat their hardwooded plants, particularly in the matter of pruning, in a reasonable and common-sense way. Of particular value will be the tables, which have been prepared at a great outlay of time and thought, on the best method of recognising various species even in winter, when the foliage is absent; while the illustrations will greatly help by their clearness and aptness to explain the text. The book is to be highly recommended.

"Two Prize Essays on the Adaptation of Land for Afforestation." By Mr. A. C. Forbes and Professor W. R. Fisher. 8vo., 104 pp. (Laughton & Co., Strand.)

Both are excellent essays, one especially, that of Mr. Forbes, having the true ring of the practical forester about it, the whole treatment of the subject being that of the man who has passed through the ranks and engaged personally in the various operations connected with the management of our woodlands.

For those who are interested in the afforesting of our waste and unprofitable lands much valuable information as to acquiring the necessary ground, clearing, fencing, planting, and after management will be found in these papers, while the important question of cost has not been overlooked.

The pressing necessity for the planting of mountain and heath land so as to provide at home some of the vast quantity of timber annually required in this country has on many former occasions received attention, and it is to be hoped that the do-nothing attitude of the State in the past in the matter of increasing the acreage of our woodlands will receive a stimulus by these excellent essays. We are also confident that re-afforesting would have a most marked and beneficial effect on our climate, and still more so on the regulation and storage of our water supplies.

"The Timbers of Commerce and their Identification." By Herbert Stone, F.L.S., F.R.C.S. 8vo., 311 pp. (W. Rider & Son, London.) 7*s.* 6*d.* net.

A wonderful compilation when the vast range of timbers dealt with, and the difficulty in many cases of procuring specimens, are taken into account. That the author has done his work well a perusal of the three hundred pages, with excellent illustrations elucidating the text, clearly points out. No less than 247 species are dealt with, in which the natural orders, synonyms, sources of supply, physical characters, anatomical characters of the wood, uses, and authorities quoted, are all legibly given. The difficulty of distinguishing one wood from another has in the past been very great; but, thanks to the perseverance and keen insight of Mr. Stone, a most valuable work on the subject has now been sent out, which, to timber merchants and others interested in wood industries, should prove of the greatest interest and value.

"The Physiology of Plants." A treatise upon the metabolism and source of energy in plants. By Dr. W. Pfeffer, Prof. of Bot. Univ. of Leipzig. Second, fully revised edition, translated and edited by A. J. Ewart, D. Sc., Ph. D., F.L.S. Vol. i., royal 8vo., 632 pp., cloth, 23*s*. net.; half morocco, 26*s*. net. Vol. ii., royal 8vo., 290 pp., cloth, 14*s*.; half morocco 16*s*. net. (Oxford, Clarendon Press.)

This great work consists of two volumes. Vol. I. contains ten chapters with the following titles: Physiological Morphology; Nutrition and Molecular Structure; Mechanism of Absorption and Translocation; Mechanism of Gaseous Exchange; Movements of Water; The Food of Plants; Constructive and Destructive Metabolism; Respiration and Fermentation; and Translocation. Vol. II. deals with Growth, Reproduction, and Maintenance.

It would be quite impossible to discuss the innumerable subjects treated of. It can only be said that each is entered into exhaustively, and the latest discoveries given, together with an abundance of references as footnotes, chiefly, however, to German authors. There is an excellent index to each volume, while the table of contents give the matter of every section of each chapter. Every English student should master these two most important volumes.

"The Book of Orchids." By W. H. White, A.R.H.S. Sm. 8vo., 118 pp. (John Lane, London.) 2*s*. 6*d*. net.

The name of the author is a sufficient guarantee for the excellence of the work. To one with the vast experience which Mr. White has had, the task of conveying information on every point bearing on Orchid culture is an easy one. But the difficulty of imparting instruction on the more important details of such a vast subject within the limits of the 118 pages of this little book must have been great.

Words have not been wasted, yet sufficient explanation of each matter dealt with has been given, all difficult points being made clear in a manner which only one who has had to contend with the difficulties himself and has them at his fingers' end could possibly effect.

The result is a neat little volume which can be carried in the pocket for reference at all times when any subject on which enlightenment is required presents itself.

The cultivation of Orchids is the chief object of the work, and hence the first part of the work is taken up by chapters on Orchid culture generally, on imported plants, materials for potting, Orchid houses, ventilation, watering, uncleanliness and disease, and botanical Orchids; all the subjects being fully dealt with. Then follows in alphabetical order an enumeration of the ninety most important genera, with an enumeration of the best species under each genus, and further cultural requirements and the peculiarities of each section referred to where desirable. An illustration of *Masdevallia Chimæra* is given as a frontispiece, and ten other Orchids are illustrated. There are also fewer errors than are usually found in technical works, and as the book is so good and cheap it should find its way into the hands of all interested in Orchids.

"Flower-time in the Oberland." By Rev. H. D. Rawnsley. 8vo., 337 pp. (Jas. MacLehose & Sons, Glasgow.) 5*s.*

Canon Rawnsley has, in the volume before us, left his own lakeland and gone as a change to the uplands, that is the highlands, of Switzerland. His wanderings—which are those of an old traveller over well-known ground—were done in the month of May, the flower-time in the region visited, and it is apparent that it is the season he loves, as he takes us from point to point, view to view, painting for us, in prose, the scenes that unfold from flower-strewn meadows to wooded heights and the snow-capped peaks beyond. Our nature-loving Canon has the æsthetic sense strongly developed; he is a master of happy phrases, and has a large stock of superlatives. With close study this book might be made into a tour-book or into a guide to the common flowering plants of the regions traversed, but it would then lose its charm. It is a book to read and then day-dream over. It will appeal most strongly to those who have already visited the scenes pictured, for the picturesque descriptions will bring many of them back. As a student and lover of nature this worthy Canon of Carlisle is well known, and in this book he shares with the reader his knowledge, love, and enthusiasm. We therefore welcome the book, and in doing so can only express our regret that the writer had to go to Switzerland for his flower-land, for it could be found, we venture to think, much nearer home.

"Agriculture." By R. Hedger Wallace. 8vo., 352 pp. (W. & R. Chambers, 1895.) 3*s.*

This book was written chiefly on the lines of the old syllabus of the Science and Art Department for the elementary stage. It deals with the more important facts of chemistry and physics, and applies them, in a skilful manner, to practical farming. As far as it goes it is similar to the well-known "Fream's Agriculture:" the one might be substituted for the other, except that this work does not deal with animals; readers will differ as to which is the better. Students who desire to get a sound elementary knowledge of the principles of agriculture, with a view to colonial life, should get this book. Already several varieties of plants mentioned have been supplanted, and some of the implements are not now of the most approved kinds. However, the general principles of agriculture are unusually well set out, and it is a book which should be much more widely known.

"Manual of British Botany." By the late C. C. Babington. Ninth edition. Edited by H. and J. Groves. 12mo., 580 pp. (Gurney and Jackson, London.) 9*s*. net.

This is an improved and enlarged edition. It is based on notes and additions left by Babington, with new species, &c., added in smaller type by the editors. An appendix contains a conspectus of the species of *Rubi*, reprinted from the "Handbook of British *Rubi*," by Rev. W. M. Rogers; while the species of *Hieracium* have been drawn up under the direction of Mr. F. J. Hanbury, from his notes and specimens, by Miss R. F. Thomson, Babington's descriptions being retained wherever possible. At the commencement the Linnean classification of the older editions is replaced by that of the natural system. A useful glossary is added, and the scheme for ascertaining any order is on the same plan as Bentham's "Handbook," adapted from the French method. We do not know why the authors change *Centranthus* into *Kentranthus*, when they retain *Callitriche*, *Cotyledon*, *Cypripedium*, &c.

"Small Culture." Series II. Orchards, Vegetables, Allotments, Glass Culture, Bee-keeping. Edited by W. J. Malden. 8vo., 80 pp. (Marlborough, London.) Wrapper, 1*s*.; cloth, 2*s*.

It has been well said that of the making of books on gardening there is no end. If, however, the general public are as anxious to purchase and read these books as writers and publishers are ready to supply them, then is there no cause for complaint. The weakness of the bulk of the books on gardening now so common is that they are generally either mere gossipy descriptions of imaginary gardens, or, when they deal with practical gardening, do but serve up somewhat diversely hashed what has been written scores of times previously. It seems to be so difficult to find much that is new in gardening, certainly in its cultural aspects. It is perhaps more in the realms of science that horticulture must look for purely fresh matter and for new ideas.

The book under notice has the merit of cheapness, and it is well in these days to purchase gardening books cheaply lest they prove to be lacking in cultural value. Publishers generally have for some time realised that outside of the moneyed section of the community there are the millions who are fond of gardening, and for whom, through one-shilling publications, they now cater. In addition to the editor, five writers deal with diverse subjects, commencing with the paying value of allotments—a matter that is generally described, but much more of detail is wanting. We have seen figures, taken from an ordinary 20-rod plot in Surrey, set forth in greater detail, and far more convincingly. That allotments, if rent be of a moderate amount and culture and cropping be good, do pay, there can be no doubt. Still, the carefully prepared balance-sheet of a competent allotment worker would naturally command most respect.

Bee-keeping: its pleasures and profits.—A good portion of the book is devoted to this interesting subject, although it is rather incongruously wedged in between allotment culture and vegetable culture. That the information with respect to bees is excellent is certain, and the descriptive matter is lucid and here and there much aided by illustrations. The details with regard to management are such as should easily be followed by any one at all familiar with bee-keeping. That the knowledge county associations and bee literature are now diffusing is greatly helping to promote more scientific practice in relation to bees there can be no doubt. All the same, it is just as well to take much of what is said as to the profits of bee-keeping with a grain of salt. Enthusiasm in any direction often tends to exaggeration. That fact, however, should in no case deter cottagers or amateurs who have gardens from keeping bees and breeding them on the most approved principles.

Vegetables.—These are treated under two sections: those grown for roots, and those for leaves, shoots, and as salads. Oddly enough, under the first head kinds bearing pods and fruits are included, but are not so specified. The method of classification seems to be an imperfect following of what may be found more methodically defined in the primer on "Vegetable Culture" published by Macmillan. Moreover the diverse vegetables are alphabetically placed in the book, while root, pod, or fruit-bearing things follow in very mixed order, which is rather confusing. Many of the selections given are bright and up to date, and any new book should be relied upon to have the newest and best kinds or varieties of vegetables specified. Salads and herbs get full notice, and generally the advice is excellent. But this cannot be said in relation to Asparagus, as to which it is advised to fork in dressings of manure in the spring. Forking just then might prove to be exceedingly harmful. There are not a few errors in spelling names, such as Hames for James, Allini for Cellini, Leach for Peach, Baumans for Baumanns, and others, showing very slovenly editing.

Orchard fruit has several pages devoted to it, inclusive of causes of failure in fruit-growing; the planting of new orchards, number of trees required per acre, cost of same, planting and other items are set forth. When it is said, however, that the trees in fruit may give a return varying from £40 to £100 per acre, it is overlooked that any fair estimate of returns must not be for one year only, but spread over several years.

Glass Culture.—Several pages, with illustrations of glass houses, are devoted to the culture of fruits and vegetables under glass. The mouths of readers are made to water with the information that forced Strawberries in March will secure 20*s.* per lb. in the market. It is statements of this kind, especially in relation to just one or two small houses, which bring to small growers so much disappointment. Cultural detail is more reliable and better to follow.

"The Khedive's Country: the Nile Valley and its Products." Edited by G. M. Fenn. 8vo., 180 pp. (Cassell, London.) 5*s.*

This little book, based on information supplied by Mr. T. Wright, the superintendent of the Khedive's agricultural estates, is very interesting. It describes the nature and cultivation of the Delta, and the great advantage of the Nile barrage. Abundance of photographs are given of men and cattle at work in the fields. Information is supplied on drainage, roads, and irrigation by hand. Then follows a description of the cattle and horses and sheep. Any one investigating the subject will find much interesting matter about it in this pleasant little book.

"Flora of Hampshire." By Frederick Townsend, M.A., F.L.S., F.R.H.S. New edition. 8vo., 658 pp. (Lovell Reeve, London.) 21*s.* net.

The first edition of this excellent work was published in 1882, and now the patient and clever author has completed a second edition in which the material in the original work has been revised, and the vast amount which has been accumulated since the first edition was published added, so that the present work is as complete as possible, and consequently it will be invaluable to the student of British botany.

The book is excellently well arranged as a work of reference, a map of the county of Hampshire and the Isle of Wight, divided into numbered sections, being given, and corresponding numbers appended to each record to facilitate location of the species on the map.

The enumeration of the genera and species, together with the records of the localities in which each has been found, and notes respecting them where necessary, takes up Part I. of the work and occupies five hundred and thirty-six pages.

Part II. gives a Summary of Orders, number of genera in each order, &c.; Summary of Geographical Distribution of Species; Notes on the Districts, with lists of the rarer plants in each district; Comparison of the Hampshire Flora with some other districts, and an Appendix in which some species of special interest are noted and a list of popular names given. There are also a very complete index and a coloured plate of *Erythræa capitata sphærocephala* Townsend, and *E. Centaurium capitata.*

"The New Forest." By H. G. Hutchinson. With fifty illustrations (reproductions of water-colours) by W. Tyndale and Miss Kemp-Welch. 8vo., 300 pp. (Methuen, London.) 21*s.* net.

The following are the subjects treated: Forest Laws, Courts and History of the New Forest, The Vert and Venison, The Northern Postern, Lyndhurst, &c.—Beaulieu and the south-eastern angle, Ecclesiastical Establishments, New Forest Folk, Gipsies, Fauna and Flora, Hunting, &c., Index. Those who are familiar with the New Forest will find this a pleasant and instructive book, while the coloured drawings are very good and are a valuable addition to the work.

"Garden Pests." By Phœbe Allen. 8vo., 229 pp. (Wells Gardner, Darton, & Co., London.) 3*s.* 6*d.*

The *raison d'être* of this book is not very apparent. The authoress, in her preface, says that "it has been written in the hope that it may not merely awaken interest among amateur gardeners in the characteristics and nature of some well-known enemies of the vegetable kingdom, but may also convey sufficient information to help the plant-lover to distinguish between friend and foe." How far, however, these hopes will be realised one cannot tell, for it is difficult to imagine to whom the style of the book would appeal, unless it is to the young, and to them a great portion of it would not be of any interest. The authoress's idea in writing the book was to give a certain amount of information about various insect pests in what she no doubt considered an amusing manner, so that the dull facts are assimilated without any unpleasant flavour, like the powders of our youth which were administered in jam. The "plot" of the book is that a court of assize is formed, presided over by a bird (the blackcap, a very suitable name); before him the commoner of our insect pests are arraigned by the plants on which they feed, and are accused of their various misdeeds. At the end of the account of each trial there are paragraphs headed "What was not said in court," and these portions are by far the most instructive parts of the book; they are written in plain language, and not in the supposed utterances of insects and plants wrangling with one another. In an appendix various recipes are given for the destruction of insect pests, and then, under the names of various insects (which are very casually grouped together), are given the best means for destroying them. As an instance of this grouping, the saw-flies, the asparagus beetle, and the onion fly are placed together, for what reason is not apparent, and there are other equally strange combinations. Most if not all of the pests are figured, but the majority of the figures are very poor indeed. There are various inaccuracies in the text. Among them the female "mussel scale-insect" is said to be of "about the size and shape of an ordinary pea." The insect in question is really shaped like a mussel-shell, and is about one-eighth of an inch in length; the figure of the scale is not at all like it. There is a figure of a crane-fly emerging from its chrysalis case which is not at all correctly drawn, and it is described as "Pupa escaping from case of Leather Jackets." To destroy the magpie-moth the reader is advised to remove the surface soil from under the bushes and burn it so as to destroy the chrysalides which are formed in it. The chrysalides of this moth are not formed in the soil, but the chrysalides of the gooseberry saw-fly are. This work cannot be recommended as a useful addition to the amateur gardener's library, though the perusal of it might cause some amusement to those who appreciate the idea of animals and plants being supposed to converse.

"The Classification of Flowering Plants." By A. B. Rendle, D.Sc., &c. Vol. i., Gymnosperms and Monocotyledons. 8vo., 403 pp. (Cambridge University Press.) 10*s*. 6*d*. net.

"The present is an attempt to give the student who has some acquaintance with the rudiments of botany a systematic account of the flowering plants." In this the author has succeeded very well; the novelty lies in introducing orders known only in the fossil state which have helped to trace affinities between Cryptogams and Gymnosperms, as well as the existing orders of the last to pre-existing and extinct groups.

After an historical introduction, in which previous systems of classification are given, Dr. Rendle discusses in detail the structure of the vegetative and reproductive systems of all the orders of Gymnosperms and Monocotyledons, with the addition of 187 figures.

A few points invite slight criticism. While retaining those old terms which do not carry a wrong impression, the author regards *Equisetum* as a "flowering plant" (p. 32); "angiospermous" means "seeds in a vessel" (aggeion) not "covered" (p. 32); seed of *Ginkgo* is covered by the aril (?), but it is not angiospermous.

Transfusion tissue is twice incidentally referred to; but nothing is said about it in connection with figures 24, 25, and 26.

With regard to the "cyme," we are glad to see the old text-book explanation for "scorpioid cyme" abolished. Perigynous, hypogynous, and epigynous should not be applied in its totality, but to the petals and stamens only, the calyx and pistil being inferior or superior. This imparts precision to the structures.

A better illustration of dédoublement or branching is seen in the stamens of *Malvaceæ*, which commence as five papillæ only; Crucifers hardly come under the term.

It is hardly correct to say "In epigynous flowers syncarpy alone is possible." The Hawthorn has often only one carpel; and in the *Pomaceæ* generally the fruit is correctly styled "falsely syncarpous."

The free-central placenta of *Primula* is more probably produced by keel-like processes from the base of the carpels, as described by Henslow.

"Eleanor Ormerod, LL.D., Economic Entomologist: Autobiography and Correspondence." By R. Wallace. 8vo., 348 pp. (J. Murray, London.) 21*s.* net.

The life of Miss Ormerod, the well-known authoress of various books and papers on economic entomology, has been written, or perhaps it would be more correct to say compiled, by one of her very intimate friends (Prof. Wallace). From what is said in the preface he suggested to Miss Ormerod that she should write her biography, and several chapters are written by her; but the "remainder of the autobiography was left in crude form, requiring much piecing together and editorial trimming." From the point of view of the general reader the editorial scissors might have been used much more freely with advantage. No doubt many particulars, letters, and little anecdotes, which are of little or no interest to the public, are of the greatest value to her relations and intimate friends. This book, however, is not published for private circulation, and at any rate the letters should have been pruned much closer.

Miss Ormerod was undoubtedly a remarkably gifted person. The diversity of her talents was very unusual. She was a very fair artist, a good linguist, was more or less proficient in carpentering, wood carving, electrotyping, and modelling, besides her attainments as a meteorologist and entomologist. Up to the time when she first began to publish papers on economic entomology, but little had been done in this branch of science. Except the classic work by Curtis on farm insects and various papers, and two works by Prof. Westwood, there was nothing published in this country on the subject, so that the issue of the first of her annual reports was quite a "new departure." These reports were very valuable, as they contained information, about various insects which were destructive to farm crops, of the most interesting nature. The first report was published in 1877, and subsequently one was issued every year in April or May with the greatest regularity until failing health compelled her to desist from the very laborious task of their compilation. The last was published in 1900. Her "Manual of Injurious Insects," a book of some 320 pages, and profusely illustrated, was published in 1881, and proved a great boon to all interested in the subject of economic entomology in this country, as it supplied a long-felt want, Köllar's "Treatise on Insects injurious to Gardeners, Foresters, and Farmers, with Notes by Prof. Westwood," and Curtis's "Farm Insects" both being out of print and by no means "up to date." A second and much enlarged edition was published in 1890. Besides the reports and this manual, this indefatigable writer published various other works which are enumerated in her biography. Owing, no doubt, to her extreme anxiety to give full credit to all her correspondents who had given her information as to infested crops and the means they had employed in combating the foe, she printed a great deal of quite unnecessary matter, so that at times when consulting her writings it is very difficult to find the required information, and the value of her works would be much enhanced were they judiciously edited. How much her labours were appreciated is shown by her appointment as "Consulting Entomologist" to the Royal Agricultural Society, her account of which is very amusingly told on page 76; as External Examiner in Agricultural Entomology at the University of Edinburgh; and the conferring on her of the degree of LL.D. by the same University. She also received the Victoria Medal of Honour from the Royal Horticultural Society.

Miss Ormerod was one of an old Lancashire family (the Ormerods of Ormerod). She was born in 1828 at Sedbury Park, in Gloucestershire, near the banks of the Severn. She was the youngest of a family of ten, and appears to have been a child of a very happy disposition, a quality which remained with her all her life. She continued to live at home until her father's death in 1873, when the home was broken up, her mother having died some years previously. She then lived with her sister Georgiana (to whom she was devotedly attached) for three years in Torquay; they then moved to Isleworth, and subsequently to Torrington House, St. Albans, where her sister died in 1896. Miss Ormerod survived her sister some five years, and after a protracted illness, which was borne with true Christian fortitude, died on July 19, 1901. This book is very well got up, well printed on good paper, which is not too heavy. It is illustrated with no less than thirty plates, and a great number of illustrations in the text; many of the former are portraits of her family and of places in the neighbourhood of her old home.

"Freaks and Marvels of Plant Life, or Curiosities of Vegetation." By M. C. Cooke, M.A., LL.D. Fifth thousand, revised. 8vo., 463 pp, with nearly 100 woodcuts. (S.P.C.K., London, 1904.) 4*s*.

This new and revised edition of a useful and interesting volume, brought up to date, will be welcome to all who are interested in the curiosities of plant life. It was originally issued as a popular explanation of the researches and hypotheses associated with the name of Darwin, and contains chapters on such carnivorous plants as the Sundews, Venus's Fly-trap, Side-saddle Flowers, Pitcher Plants, and the Minor Carnivora. To these are added much useful information on Gyration of Plants, Heliotropes or Sunflowers, Twiners and Climbers, Sensitive Plants, Sleep of Plants, Meteoric Flowers, Hygroscopism, Dispersion of Seeds, Mimicry, Vegetable Giants, Luminosity in Plants, Mystic Plants, and Flowers of History. The most interesting phenomena of plant life are thus brought under notice, and explained in a manner devoid, as much as possible, of technicalities, and calculated to interest young and old. Above all, such a volume must serve the excellent purpose of exciting and stimulating a love for flowers, and fostering an anxiety to learn somewhat of the story they have to tell. The volume is neatly got up, well illustrated, and would make an excellent gift-book for young folk.

"Forestry." Translated from the German of Dr. Adam Schwappach by Fraser Story and Eric A. Hobbs. Small 8vo., 158 pp. (J. M. Dent, London.) 1*s*. net.

In the preface to the translation of Professor Schwappach's *Forstwissenschaft*, the translators say that the matter contained in the book is quite as suitable for British as for foreign readers. Certainly a great deal of it is, but what practical forester in this country would plant a tree as described at page 49, kneeling before the pit and placing the soil in position with the hand, a plan more suitable for garden than forest planting? The methods of seed-sowing, too, are antiquated and not suitable for this country.

If the author visited some of the farms on the leeside of mountain lands that have been afforested in Aberdeenshire, or nearer home on the Snowdon hills, his ideas of the influence of afforestation would hardly fall in with the remarks at the top of page 22. The Historic Sketch of the Development of Forests (chapter 1) is interesting reading, so is that on Forest Statistics from the Board of Agriculture; but in perusing the book, useful as it may be, we cannot but feel that it is hardly required.

"Cucumber Growing under Glass." By A. A. Fabius, F.R.H.S. 8vo., 57 pp. (From the author, Emsworth.)

We are frequently asked, "Can I get a good cheap book on Cucumbers?" and this is a book we can recommend, as being a thoroughly practical little book by a practical man. The information is easily understood, and deals with Cucumber culture under glass in all its bearings. A most useful Appendix is a reprint from the JOURNAL of the Royal Horticultural Society of an address by George Massee, Esq., V.M.H., "On a method for rendering Cucumber and Tomato plants immune against fungus parasites." We would suggest that Mr. Fabius, in his next edition, should have the price of the little book printed on the cover, and on page 25 it would add to the value of the work if it were stated how much nitrate of ammonia and nitrate of potash should be used. As no quantity is stated, the inexperienced grower might easily do his plants great injury by applying one or both too strong.

"Gardening for the Million." By Alfred Pink. 8vo., 267 pp. (T. Fisher Unwin, London.) 2*s*. 6*d*. net.

A very handy book of reference, beautifully printed, and arranged in alphabetical order. Each kind of plant mentioned has instructions on the time and mode of propagation, and in some instances the names of the best varieties are given, but in a work of this size it would be impossible to mention them in all cases. Valuable information is supplied on the soil and situation for which the plants are most adapted. Altogether we can commend this work of Mr. Pink's.

"Pictorial Practical Gardening." By Walter P. Wright. 8vo., 157 pp. (Cassell, London.) 1*s*., cloth 1*s*. 6*d*.

This is an excellent book teeming with sound practical information that is most valuable for the amateur gardener, and the professional gardener may learn some very useful lessons from its pages. Very good lists of flowers, fruits, and vegetables to grow on nearly all kinds of soil are given. Modes of propagation, the best means of combating insect foes and fungi, heating, garden tools, formation of gardens, &c. are all dealt with clearly. The book is well indexed and clearly printed.

"Pictorial Practical Vegetable Growing." By Walter P. Wright. 8vo., 152 pp. (Cassell, London.) 1*s*., cloth 1*s*. 6*d*.

A valuable treatise of handy size, containing a fund of excellent advice in a very concise form. The instructions on how to crop a garden or allotment varying in size up to one acre are very good, and the chapters on successional cropping, how to till the soil, manuring, appliances, diseases and insect pests, varieties of vegetables to grow, and the cultural information are most reliable, and will prove very serviceable to small garden owners.

"Pictorial Practical Fruit-growing." By Walter P. Wright. 8vo., 152 pp. (Cassell, London.) 1*s*., cloth 1*s*. 6*d*.

Another of Mr. Wright's charming little books dealing with fruit-growing for the amateur in all its phases. The chapter on the A B C of pruning is specially useful, as it explains briefly but clearly the main objects to be aimed at in pruning all kinds of trees and bushes. The selection of varieties to grow is a good one, but we should exclude New Hawthornden from the list of Apples, for though the fruit is large, and the tree a great bearer, we have always found it one of the most difficult cookers. Again, in the list of Pears (12) of fine flavour we should substitute 'Louise Bonne of Jersey' and 'Beurré Hardy' for 'Knight's Monarch' and 'Maréchal de la Cour.' However, this may be a matter of opinion, and we have nothing but praise for this useful little book.

"Forestry in the United Kingdom." By W. Schlich, Ph. D., &c. 8vo., 71 pp. (Bradbury, Agnew, London.) 2*s*. net.

Within the pages of this little book will be found a great amount of information, useful alike to the forester and owner of woodlands. The contents of several chapters, however, savouring too much of Continental usage, do not appeal to the British student.

Regarding the financial results to be obtained by afforesting mountain and heath lands, we have not met with the "great difficulties" brought forward by Dr. Schlich at page 39. Perhaps he is not aware that on several estates in this country the expenses connected with planting and tending the woods have been carefully recorded, and, as some of these plantations were formed upwards of sixty years ago, a very fair approximate return of the financial results has been arrived at. A hill plantation on the estate of Balfour, in Scotland, was formed in 1842, sixty-two years ago, and at forty-three years' growth the larches were valued at 20*s.* each; and a similar return was made from Carnarvonshire, in North Wales, only here the price was a few shillings higher. Strathkyle plantations in Ross-shire, extending to upwards of 4,000 acres, at altitudes ranging to 1,200 feet, were planted in 1871; and those of Lord Powerscourt, near Dublin, ten years earlier, or in 1861.

Regarding both of these very full details of cost of planting, tending, and value of the timber produced at various stages of growth, have been recorded, and the results obtained justify us in recommending afforestation of heath and mountain lands on a very extended scale. If only for statistics the value of this book must be apparent to every one interested in forestry, and it is a welcome and suggestive omen that Professors of Continental woodcraft are now becoming interested in British forestry and our home timber supplies.

"Physiography." By T. H. Huxley. Revised and partly rewritten by Professor R. A. Gregory. 8vo., 423 pp. (Macmillan, London.) 4*s.* 6*d.*

Very similar to, but in somewhat more popular style than, Lord Avebury's "Scenery of England." Problems concerning the physical structure of the earth and its surroundings are treated of in the simplest possible language, there being a marked absence of all technical and difficult terms that could possibly be avoided, and when quite unavoidable they are always explained in footnotes, both as to meaning and derivation. There are also 300 illustrations which vastly assist the understanding of the text. Delightful, however, as the book is, the relations of plants and plant life to physiography are very briefly touched upon, so that it is on general grounds, and not from a horticultural point of view, that we commend, as we do most heartily, this little volume.

"Nature Teaching." By Francis Watts and W. G. Freeman. 8vo., 193 pp. (Murray, London.) 3*s.* 6*d.*

A thoroughly good book, intended for schools, but useful in other spheres, describing the life-history of plants from the seed upwards, with the structure and functions of roots, stem, leaves, flowers, and fruit; with chapters on soils and plant foods, weeds and insects. Every chapter and subject treated of has experiments or demonstrations suggested which the student is advised to make for himself—and this is an excellent feature which cannot be too highly commended, for one experiment or demonstration made or conducted for oneself will impress a fact more than reading it ten times.

"The Book of the Iris." By R. Irwin Lynch, A.L.S. 8vo., 214 pp. (Lane, London.) 2*s.* 6*d.* net.

Having once glanced at the name of the author, one immediately anticipates a book not only of general excellence but of the most minute and scrupulous care bestowed on the smallest details, and accurate beyond the possibility of criticism. And one is in no way disappointed. Mr. Lynch is a most wonderful and most painstaking worker, and this book, short as it is, and easily as it reads, betrays on every page the evidences of really laborious investigation and experiment; and it is far too little to say of it that it is by many degrees the best popular and yet scientific treatise on the Iris family that has ever been produced, and it will be many a long day ere it will be worth anyone's while to attempt to write another. Part I. treats of the history and structure of Iris; of the general rules for the cultivation of the different sections; of hybrids and hybridising; of diseases and injurious insects. And Part II. describes every known species, with notes on the particular requirements of each. There are 36 full-page illustrations, which are excellent.

"Some Wild Flowers of Kashmir." By Emilia E. Noel. 8vo., 364 plates and 35 pp. (Bell, Nottingham.)

An enumeration of more than 300 flowering plants met with during travels in Kashmir and on the slopes of the Himalayas, together with most beautifully drawn and hand-coloured figures of a very large proportion. The book, in fact, is a book of plant portraits with a few notes attached, and is enough to make the lover of wild flowers long that fate might one day send him also to Kashmir.

"The Scenery of England and the Causes to which it is due." By the Rt. Hon. the Lord Avebury. 8vo., 508 pp. (Macmillan. London.) 6*s.*

This is not a description of the scenery in the more usual acceptation of the words, but rather a description of why the scenery is as it is, and how it became so. Lord Avebury always writes in a most fascinating and lucid manner, and in this volume he carries his readers with him through an examination of and inquiry into the different geological ages and their individual effect upon the contour of the earth's surface, as far as England and Wales are concerned. He shows the causes which led to the formation of the mountains and hills; he traces the origin and course of the rivers and lakes and the reason for them; he examines the principal forces which have conduced to the existing scenery and notes their influence not only on the fauna and flora but also on the laws of the country and on the customs of each district, and their determining influence on the position of towns and villages. The book is interesting to all, but will appeal most strongly to those who have some little knowledge of geology and physical geography.

"The Alps from End to End." By Sir W. Martin Conway. 8vo., 300 pp. (Constable, London.) 3*s.* 6*d.* net.

A most delightsome book of Alpine travel, illustrated with 52 full-page photographic reproductions. As the sun thaws the ice and sets the water circulating in the pipes, so does the reading of this book thaw the congealing blood in the veins of the old Alpine climber, and set him on fire again with mountain fever and with youth renewed; in fancy, if not in reality, he lives again in all the glorious scrambles in the Alps and hair-breadth escapes Sir Martin Conway tells of. The object of the book is to describe a route, or rather a combination of climbs, the descent from each ending at the starting-point of the next, so that a climber may begin at one end of the snowy ranges of the Alps and walk up and down through their midst to the other end over a continuous series of peaks and passes. And most admirably has this object been attained, beginning at the Col di Tenda, a few miles north of the Riviera, and aiming for Mont Blanc; thence, turning in a north-easterly direction, through the Bernese Oberland and onward through the Tirol, ending at Ankogel, the last snowy peak some 200 miles this side of Vienna. But delightful as the book is to the lover of Swiss mountains, we are bound to notice that it hardly even mentions the Swiss flowers.

"The Culture of Fruit Trees in Pots." By J. Brace. 8vo., 110 pp. Murray, London.) *5s.*

We took up this treatise with the liveliest expectations, knowing beforehand so well that the author has the subject at his fingers' ends, and anticipating that he would also be able to convey his knowledge in a clear and practical manner. We must confess to some little disappointment. The knowledge is all there, but the expression of it is often by no means clear, as we will show presently, and in one case at least is very far from being practical.

The book opens rightly with details as to the best sort of houses, their dimensions, and the way to construct them. There is a curious statement on page 3 that "iron should be avoided because it has a tendency to absorb much moisture." We quite agree in the advice, but for the very different reasons of its heat in summer and its cold in winter, but we should never have accused it of absorbing moisture, though doubtless it often condenses it. However, that is a small point; but on the same page we come to the somewhat cryptic announcement that "the plan is correctly drawn to scale and fully explained in the notes." To find a plan at all one has to turn over the next page, and there one finds a skeleton ground-plan and two outline elevations, but no scale is mentioned, and no notes whatever are to be found, and no reference to them either till one comes to page 107, and no hint is given on pages 3, 4, or 5 that these same notes are located at page 107. Again, 'The columns referred to in plan, &c.;" but no such reference is to be found, although there are on the plan eight little round marks which presumably are the columns intended to have been "referred to." "These columns will then have to be affixed to the T-iron in the middle of the roof;" but there has as yet been no mention of a T-iron at all, nor is it shown on the plan, and after puzzling the matter out we are inclined to think that "middle of the rafters" should be read for "middle of the roof." And so the book goes on, full of evidence of accurate knowledge possessed, but also of lack of ability to convey it clearly. Even in his own special department of cultivation the author is not always clear; *e.g.* on page 52 he gives a "Diagram of a tree that requires *no* pruning," and on page 53 points out four spots to which it *ought to be* pruned back for the sake of thinning and to give uniformity to the tree. Any one who understands the work knows instinctively what the author means, but presumably the book is written for those who do not know.

What seems to us the most extraordinary statement in the book is when the author tells us how we may determine the number of fruits a tree may be allowed to carry. We are not to judge by its size or its extent of branches or of leafage, but by its price!—by what we paid for it when we bought it!! Thus a tree that cost "half a guinea may safely carry eight fruits," and so on. No doubt the author is right as to trees he himself seeds out (unless, by the way, they are quite new varieties, of which a half-guinea tree would be a very small plant indeed), but any such *rule* is preposterous, as it supposes one of two things: either that every one buys his trees from one source, or that all sellers send out exactly equal trees.

We have felt bound to point out what seem to us blemishes because the book is well worth the trouble. It is full from end to end of excellent advice and practical details, but they all want a little puzzling over to be sure we understand the author aright.

"Wanderings in the Great Forests of Borneo." By Odoardo Beccari. Translated by Dr. Enrico H. Giglioli. Revised and edited by Dr. F. H. H. Guillemard of Cambridge. 8vo., 424 pp. (Archibald Constable, London.) 16*s*. net.

This is an English translation of "Nelle Foreste di Borneo," but lacking some of its appendices, while it contains an added chapter concerning the political and social condition of Sarawak at the present time. Dr. Beccari visited Borneo the Beautiful for the first time in June 1865, so that much that the present volume contains was written nearly forty years ago, but this need not deter the naturalist from reading a most interesting book, since natural history never grows old. A couple of years or so were profitably spent in Sarawak in exploring the rivers Bintulu, the Rejang, and the Batang Lupar, and very interesting collections of animals, birds, insects, and plants were obtained.

Dr. Beccari's success as a collector is widely known, and perhaps no one has done more in this way since Dr. Alfred Russel Wallace visited the Malay Archipelago, including Borneo, now many years ago.

Throughout the book there are numerous references and observations on the natives and their customs and beliefs, as also anent the timber and fruit-yielding trees, the Palms, Ferns, Orchids, Nepenthes, and other rare and beautiful or economic types of vegetation with which Borneo abounds. The capital city of Brunei, the Island of Labuan, and other places were visited, and it is to be regretted that Dr. Beccari was disappointed in not being able to reach the wonderful mountain of Kina Balu. This gigantic range, as seen now and then from Labuan, is extremely picturesque, although more than a hundred miles away. It is 13,698 feet high, and is the highest mountain not only in Borneo, but in the whole of the Malayan Archipelago. "I watched it," says Dr. Beccari (p. 248), "with the greatest interest, for the time seemed drawing near when I should tread its summit. This was the dream of my youth, but it was never to be realised. Yet the marvellous plants which are to be found upon the mountain had more than anything else induced me to visit Borneo." The travellers who have really succeeded in ascending the sides of this botanical paradise are but few. The pioneer was Mr. (now Sir) Hugh Low, who originally discovered on its rocky declivities the Great Pitcher plants or *Nepenthes* in 1850. In the succeeding year he again ascended the mountain, accompanied by Mr. (now Sir) Spencer St. John. Mr. Thomas Cobb made an attempt to reach the place some few years later, but the natives prevented him. Still more recently an Italian expedition was but little more successful. In 1877 F. W. Burbidge and P. C. M. Veitch spent some days on the mountain and collected specimens of all the remarkable Nepenthes which grow there, and, so far as is known, there only.* These are *N. Rajah*, *N. Edwardsiana*, *N. villosa*, and the unique *N. Lowii*, with its hard flagon-shaped pitchers. A natural hybrid between *N. villosa* and *N. Edwardsiana* was also found and has been named *N. Harryana*, it being so far believed to be the only wild hybrid in this genus at present known. Of these wonderful *Nepenthes* only *N. Rajah* has at present been introduced alive to Europe, the others still remaining in all their glory, happy and luxuriant in their native wilds. A second journey to Kina Balu was made by Mr. Burbidge in 1878, and the account of his two expeditions is detailed in his "Gardens of the Sun." In 1887–8 Kina Balu was successfully explored by Mr. G. Whitehead, a well-known ornithologist, whose work is well known, while Dr. D. G. Haviland examined it botanically as recently as March and April 1902. Borneo is a wonderland, and its great mountain is the focus spot of its interest from nearly every scientific point of view. For Dr. Beccari's work we have nothing but praise, although by no means adopting all his views as to the evolution of men or plants as expressed in its pages. The book is carefully edited by Dr. Guillemard, who is also a Bornean traveller; it is well printed, and consists of 424 pages, including index, three maps, and many photographic and other illustrations. The appendix on the Bornean Forest is mainly botanical, and affords a good idea of the climate and vegetation of the largest island in the Indian Sea.

"The Business Side of Agriculture." By Arthur G. L. Rogers, M.A., 8vo., 163 pp. (Methuen, London.) 2*s*. 6*d*. net.

It may be asked why the Royal Horticultural Society should review in its Journal any books devoted wholly to agriculture. But on consideration it will soon be realised how closely the two sister arts are connected in many of their branches, and how often their aims and objects are practically the same. In one respect horticulture may be regarded as the parent of agriculture, as the plants grown and the experience gained in the garden are often transferred to the field, and of course *vice versa*; for, as was stated in the second volume of Transactions issued by the Society (1818), "improvements made in the one may be rendered applicable to the other; and a tacit co-operation may take place between them, with great advantage to both. Agriculture may occasionally furnish the gardener with new ideas, and suggest contrivances and manipulations that may facilitate and further his labours."

This interdependence of the two sister arts is admirably exemplified in the excellent little book under review, and many of its pages would apply to horticulture as much as they do to agriculture, and the information contained therein is concise, comprehensive, and thorough. The book deals mainly with marketing and distribution. Co-operation, organisation, and railway facilities are also all fully treated of, and the various methods

* These remarkable and practically unknown species are figured in colour, but reduced in size, in St. John's *Life in the Forests of the Far East*.

of disposing of crops—as they stand, by auction, through dealers and salesmen at market, or direct to the consumer—are described. Some of the common faults of not properly grading the products, and not sending them up for sale in the best possible style, whereby they are often beaten by really inferior foreign competitors, are admirably enforced.

"House, Garden, and Field. A Collection of short Nature Studies." By L. C. Miall, F.R.S. 8vo., 316 pp. (E. Arnold, London.) 6*s*.

This interesting and instructive little book, one would gather from the preface, was written principally for the benefit of those who are, or will soon be, engaged in teaching, but it also appeals very forcibly to all who appreciate the study of natural objects, and there are few who do not in some form or another. The writer says:—"A good method of nature study should exhibit some of the following features: (1) It should bring out the most remarkable properties of the object studied; (2) Common objects will be preferred to rare ones, partly because they are more easily procured in large quantities, and partly because the inquiries they suggest are more likely to be resumed in after-life; (3) A good method of nature study will stimulate the curiosity of the pupils; (4) Various powers of mind and body will be exercised." The author gives no less than fifty-three of these short suggestive studies, which include a great variety of subjects, as the reader may judge from the following headings of some of the chapters:—Leaf-mining insects, The human face, Old English gardens, Rats and mice, Solar shadows on the pavement, The cheese-hopper, On a chalk hill, Museums and the teaching of natural history. Of these studies, sixteen are on plants, twenty-four on animals, and thirteen on other subjects. In the chapter on "Old English Gardens," Professor Miall mentions that "we know very little of English gardens before the thirteenth century, but the names which have been handed down to us from that remote time tell us this at least, that a number of useful plants of foreign origin had been already introduced, and were popularly known by their Latin names, altered more or less to suit the taste of people who understand no Latin:" for instance, Febrifuga became Febrifuge, and finally Feverfew. "The old English garden before the time of the Tudors lacked many of our most valued trees, roots, and flowers. The borders showed no Lilacs, Laburnums, Larkspurs, Christmas Roses, Dahlias, or Fuchsias; the kitchen garden no Potatos, Rhubarb, or Currants. No botanical garden existed anywhere, for the first were founded in Pisa and Padua in the sixteenth century (1545), while England did not possess one till near a century later (Oxford, 1632)." The author then points out that "among the single benefactors who have enriched the gardens of Western Europe with flowers and trees unknown to mediæval times, few deserve our gratitude more richly than Busbecq, who was an unwearied collector, and one who had unusual opportunities for enriching his collections." Most of the biological studies are illustrated with woodcuts in the text. In the study on "Natural History Clubs," the writer is very severe in his criticism of them. He says: "I have belonged to many natural history clubs, but have found hardly any of them profitable. This must be my excuse for proposing changes which I know beforehand will be unwelcome to many brother naturalists." Professor

Miall would not allow any papers to be read before the club; the effect of reading papers on the listeners "is melancholy beyond the power of words to describe. No assembly of free agents can be kept together on such terms. I will go a step further and add, let there be no lectures, as a rule. Now and then, I admit, it may be stimulating to hear some naturalist of experience discourse, but even he is generally tedious. Let no local lists be prepared, read, or printed. They are hardly ever worth the paper they are printed on." He then goes on to describe how they "maintained a useful and agreeable college natural history club for several years without papers, lectures, or local lists. This style of natural history club may do very well at the University of Leeds, where it appears to form more of a class than a society, but it is very questionable whether ordinary Natural History Societies could be worked on those lines. Professor Miall's experiences must have been peculiarly unfortunate, and it is not likely that many will be found to endorse his views on this subject. These studies are written in the author's particularly lucid style, and besides the information which they contain they are valuable for the suggestive way in which the matter is brought before the reader, which must conduce to its further consideration. Every one who is interested in the study of nature should take an opportunity of reading this book.

"English Estate Forestry." By A. C. Forbes. 8vo., 332 pp. (Edward Arnold, London.) 12*s.* 6*d.* net.

This is an instructive and well-written book on forestry matters generally, though, as the author says in his preface, it contains little that is new. However, the contents of each of the thirteen chapters into which the work is divided have a genuine ring about them, and clearly point out that the author has a good practical knowledge of forest operations generally and knows well what he is writing about. Regarding the Japanese Larch (page 96), it is by no means exempt from the attacks of *Peziza Wilkommi*, for we know a wood in Gloucestershire in which this tree has suffered severely from this scourge of our Larch plantations. Surely the yield of timber of the Douglas Fir (page 38) is much underestimated at 1 foot per year, as at Penrhyn Castle, in Wales, we have measured trees which showed an increment of nearly 5 cubic feet annually for fifty years. The author does well in the second chapter to draw attention to the absurd practice of leaving the management of woodlands in the hands of the estate agent. As we have frequently pointed out, the estate carpenter, gardener, or farm bailiff is too often placed in management of woods and plantations, a practice that has been fraught with very serious results in both an ornamental and an economic sense.

"The Cultivation and Preparation of Pará Rubber." By W. H. Johnson, F.L.S. 8vo., 99 pp. (Crosby Lockwood, London.) 7*s.* 6*d.* net.

Rubber, or caoutchouc, has an interesting history in that it was discovered some 400 years ago, while later, in 1770, it was recommended for erasing lead pencil marks, and half a century later was used by Macintosh in the manufacture of waterproof garments. But in our own time the demand for rubber has increased to an enormous extent in the making of cycle, carriage, and motor tyres, the annual consumption at the present time being valued at £16,000,000. The book is of great interest from the fact that the whole history of the rubber industry is brought down to the present time, the cultivation of the tree, collecting the rubber, and preparation of the same being minutely recorded. The illustrations, too, are good, that of the Pará Rubber tree in the Botanic Gardens, Ceylon, and a flowering branch of the same, as a frontispiece, conveying a good idea of this valuable species, which hails from the forests of the Amazon valley. To those who are about to take up the cultivation of this rubber-producing tree the information contained in this well-written book should prove of the greatest value.

"Vegetables and their Culture." By T. W. Sanders, F.L.S. 8vo., 463 pp. (W. H. & L. Collingridge, London.) 5*s.* net; by post, 5*s.* 6*d.*

A thoroughly practical and scientific work, with numerous excellent illustrations, and containing most useful information on the formation of gardens, paths, drains; the cultivation and improvement of various soils; suitable manures to use for the different crops; excellent information on injurious and beneficial insects, diseases, &c. The common and botanical names of each vegetable are given; the lists of varieties of each kind of vegetable are up to date and thoroughly reliable. A number of kinds, with cultural details, that are seldom grown in this country are described fully and are well worthy of more attention. The information is plain, concise, and so easily understood that even a novice could scarcely make a mistake in following out its instructions. And we can confidently recommend the work to all interested in vegetable culture.

"The Book of Shrubs." By George Gordon, V.M.H. 8vo., 83 pp. (John Lane, London.) 2*s.* 6*d.* net.

A small well-printed book, containing valuable information in a brief form. Some of the best kinds of trees and shrubs and the most ornamental varieties are described, with information on the best position and soils in which to plant them. We can specially recommend the chapter on planting and the culture of trees and shrubs, which does not always receive the attention it deserves.

"The Book of Town and Window Gardening." By Mrs. F. A. Bardswell. 8vo., 105 pp. (John Lane, London.) 2*s.* 6*d.* net.

A very attractively written book, dealing with a subject of much interest not only to town gardeners but also to country gardeners, and containing a mass of valuable suggestions. But what will be useful to Londoners is the advice of what plants to grow to withstand the mischievous influences of fog. On page 100 *Anemone apennina* and *A. Hepatica* are recommended as wall plants, but unless the wall is much moister than most walls, we are afraid they would be a failure, as we find they succeed best in a moist cool position. The book is well illustrated and nicely printed.

"Pictorial Practical Bulb-growing." By Walter P. Wright. 8vo. 152 pp. (Cassell, London.) 1*s.*; cloth, 1*s.* 6*d.*

A valuable and handy little book, dealing in a comprehensive and practical form with both hardy and tender bulbs, insect foes, the best varieties, cultural requirements, &c. A very useful book for the amateur or gardener.

"Pictorial Practical Chrysanthemum Culture." By Walter P. Wright. 8vo., 128 pp. (Cassell, London.) 1*s.*; cloth, 1*s.* 6*d.*

Like all this author's books, this is an excellent manual, dealing fully with Chrysanthemum culture in all its phases, from the charming border varieties up to the monstrosities of the exhibition board. Careful instructions are given on "taking" the bud, which really means "leaving" the bud, and the would-be exhibitor will find all he wants to know, while the grower of quantities of flowers will find a fund of good reliable information.

"Pictorial Greenhouse Management." By Walter P. Wright. 8vo., 144 pp. (Cassell, London.) 1*s.*; cloth, 1*s.* 6*d.*

An excellent little book, dealing briefly with the culture of greenhouse plants, the selection of kinds and varieties, the proper structures, heating, succession of flowers, and other practical matter, which will make this book specially serviceable to the amateur.

"Bulb Culture." By D. Grant McIver. 8vo., 62 pp. (Dawbarn & Ward, London.) 6*d.*

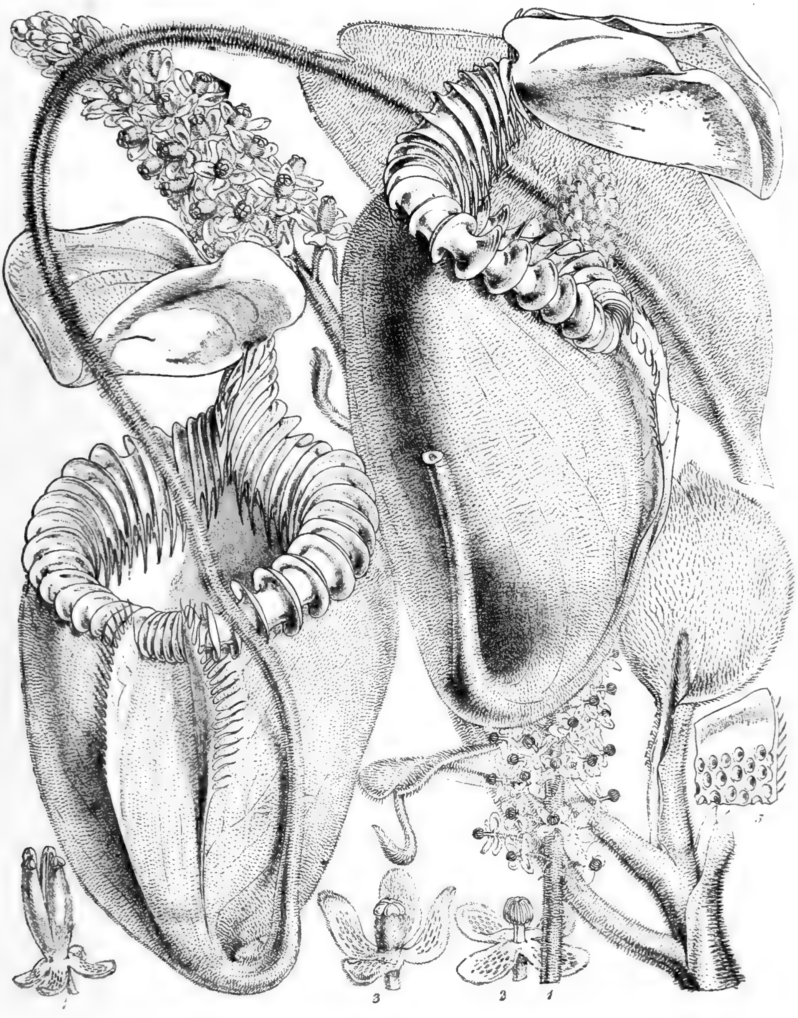
A little book dealing with bulbs indoors and out, and a list of the best varieties to grow, but we are surprised that 'Empress' and 'Maximus' are omitted from the list of Daffodils at the end of the work, which are two of the best varieties in our opinion. Again, Barr's bulb planter is a much better instrument for planting bulbs in grass than the one figured on page 11; but it is a good practical book that should prove useful to the small grower.

"Pictorial Practical Rose-growing." By Walter P. Wright. 8vo., 152 pp. (Cassell, London.) 1*s.*; cloth, 1*s.* 6*d.*

This is an excellent little work, and will be welcomed by all interested in Roses and Rose culture. It tells the reader not only what to do, but also, by means of illustrations, exactly how to carry out the instructions given, and there are very few pages without one or more of these practical illustrations. Almost everything bearing on Rose-growing is dealt with—from inserting a cutting to laying out a Rose garden. The most helpful little Rose book for the beginner that has yet appeared.

"Roses and their Cultivation." By T. W. Sanders. 8vo., 162 pp. (W. H. & L. Collingridge, London.) 2*s.* 6*d.* net.

A revised and enlarged edition of a small book by the same author which came out a few years ago. Besides the usual information about planting, budding, pruning, &c., it contains interesting descriptions of the different types of Roses, beginning with the *alba*, the original of which was in cultivation as far back as 1597, and ending with the *Wichuraiana* the original of which was first introduced into this country from Japan in 1893. Over 1,000 cultivated Roses, with their descriptions as to colour, date of introduction, habit of growth, &c., are also given in tabular form. Besides numerous other illustrations, there is a capital portrait in colours of the new Tea Rose 'Lady Roberts.'



REPORT ON POTATOS AT WISLEY, 1904.

Fifty stocks of Potatos were received at the Society's Gardens for trial, but of these nine were sent so late (May) that, owing to the late planting and a period of drought before much growth had been made, they were practically a failure. The Fruit and Vegetable Committee examined the collection on September 30, and by reason of their heavy crop, fine appearance, and freedom from disease, they ordered the following varieties to be cooked. This was done on two occasions, viz. October 4 and December 13.

Daniels's No. 1	Peckover
Great Central	Queen Alexandra
Highlander	Sir Walter Raleigh
Monarch	The Factor.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

1. Astonishment (Ross).—Round; white; russety; eyes shallow; medium and even in size. Moderate crop, free from disease. Second early or midseason.

2. Crampton's Southern Star (Crampton).—Kidney; white; russety; handsome; eyes shallow; medium size. Moderate crop, free from disease. Early.

3. Dame (Gooney).—Round; white, tinged with pink; eyes rather deep; small. Light crop, free from disease. Midseason.

4. Daniels's Distinction (Daniels).—A good crop, but badly diseased. Midseason.

5. Daniels's No. 1 (Daniels).—Round; white; russety; eyes shallow; medium size. Heavy crop, free from disease. Midseason.

6. Daniels's Sensation (Daniels).—Flattish kidney; white; eyes full; large. Light crop, slightly diseased. Late.

7. Earl of Chester (Dickson's).—Flattish round; white; eyes full; medium size. Moderate crop, free from disease. Early.

8. Early Perfection (R. Veitch).—See Vol. XXVIII., page 559.

9. Ensign Ragley (Cooper, Taber & Co.).—See Vol. XXVIII., page 559.

10. Excelsior (Deal).—Round; white; russety; eyes full; medium size. Moderate crop, free from disease. Very early. This variety is perfectly distinct from 'Excelsior Kidney,' which received a **F.C.C.** in December 1873.

11. General Buller, **A.M.** October 1, 1901 (R. Veitch).—Flat round; white tinged with pink; eyes shallow; medium size. Fair crop, free from disease. Midseason or late.

12. Great Central (Dobbie).—Round; white; russety; eyes shallow; medium to large. Heavy crop, free from disease. Late.

13. Gregor Cup (Carew).—Round; red; eyes deep; large, bad shape. Heavy crop, free from disease. Late.

14. Highlander (Deal).—Flat round; white; eyes shallow; medium to large. Heavy crop, free from disease. Midseason.

15, 16. King Edward VII. (J. Veitch, Dobbie).—Round; pale pink; eyes shallow; medium size. Light crop, free from disease. Late.

17. Long's Seedling (Long).—Not true; wants further selection.

18. Market King (Deal).—Kidney; white; russety; handsome; eyes full, medium size. Good crop, free from disease. Midseason.

19. Marie Louise (Sim).—Pebble-shape; white; russety; eyes full; pretty shape, medium size. Moderate crop, free from disease. Second early.

20. Maxim's Early (Boyce).—The Committee considered this to resemble very closely 'Myatt's Prolific.'

21. Monarch (Carew).—Round; white; russety; eyes full; handsome; medium to large. Heavy crop, free from disease. Late.

22. Northern Star (Dobbie).—Round; white, russety; eyes shallow; uneven in size. Heavy crop, free from disease. Late.

23. Peckover, **A.M.** December 13, 1904 (Boyce).—Pebble-shape; white; eyes full; handsome, rather large. Very heavy crop, free from disease. Late.

24. Pride of the South (Moody).—Flattish round; white; eyes full; medium size. Moderate crop, free from disease. Midseason.

25. Queen Alexandra, **A.M.** December 13, 1904 (Coleman).—Round; white, very russety; eyes full; rather large. Heavy crop, free from disease. Late.

26. Recompense (King).—Round; white; eyes deep; medium size. Good crop, free from disease. Late.

27. Robust (J. Veitch).—All the tubers were very small, and of no value.

28. Royal Kidney (Dobbie).—Kidney; white tinged with pink; eyes full; medium size. Moderate crop, free from disease. Early.

29. Semper Fidelis (R. Veitch).—Flat round; white; eyes shallow; uneven in size. Heavy crop, free from disease. Late.

30. Sir John Llewelyn (J. Veitch).—See Vol. XXVIII., page 561.

31. Sir Walter Raleigh (Dobbie).—Round, flat; russety; eyes shallow; large. Heavy crop, free from disease. Late. We believe this variety to be distinct from the one raised by Mr. Ross in 1881, and for which he obtained a Second-class Certificate.

32. Southern Star (J. Veitch).—See No. 2.

33. Syon House Prolific, **A.M.** September 10, 1895 (J. Veitch).—Oval or pebble shape; white, russety; eyes shallow. Free from disease. A very fine late variety.

34. The Crofter (Dobbie).—See Vol. XXVIII., page 561.

35. The Factor, **A.M.** October 1, 1901.—This variety maintains the high opinion formed of it by the Committee in 1901, and was excellent in every respect.

36. The Gentleman (J. Veitch).—No crop.

37. The Provost (Dobbie).—Round; white; russety; eyes shallow; medium size. Good crop, slightly diseased. Late.

38. The Scott (Dobbie).—Round; white; eyes full; large. Good crop, free from disease. Late.

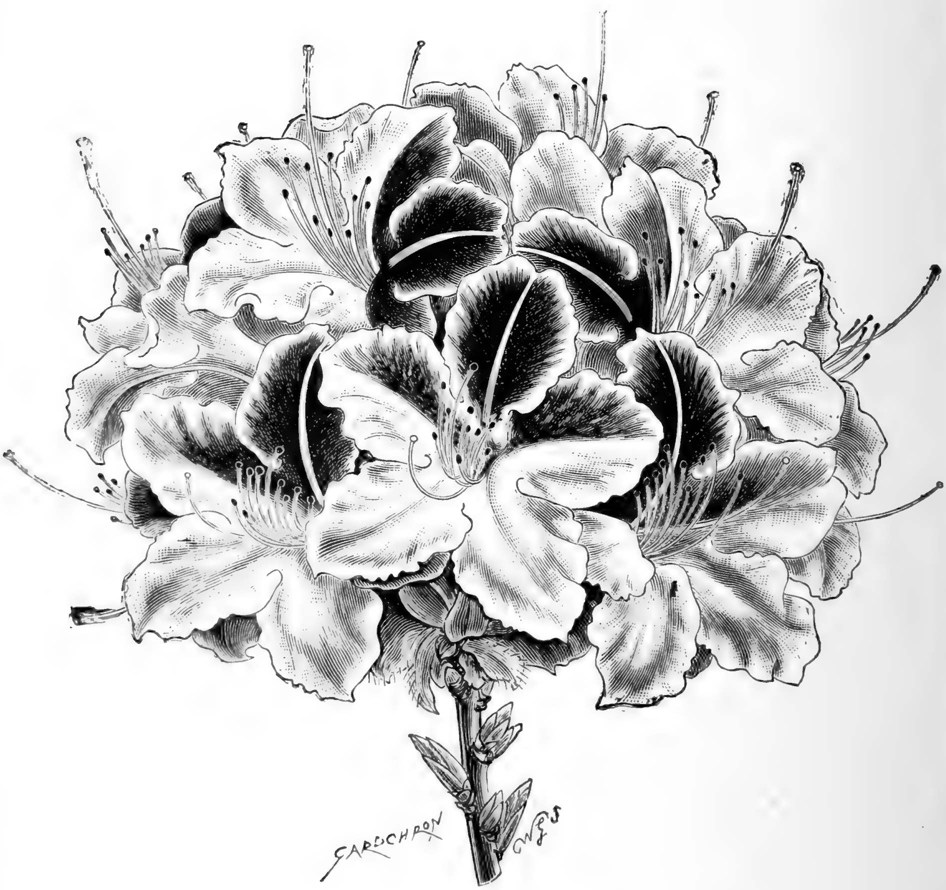
39. Thomas Southam (Tanner).—Flat round; white; russety; eyes shallow; large. Heavy crop, free from disease. Late.

40. Unnamed (Walkeley).—A variety of promise, raised from Schoolmaster × Village Blacksmith. All things sent for trial must be named.

41. Woodhay Wonder (Johnson).—Pebble-shape; white; russety; eyes full; above medium size. Heavy crop, free from disease. Late.

The following are the nine varieties received late, viz.:

Bountiful (Wythes)
Brown's Supreme (Brown)
Monarch (Wythes)
No. 1 (Mann)
No. 2 (Mann)
No. 3 (Mann)
Pride of the Cotswolds (Barnett)
Southern Star (Walker)
Unnamed variety (Mann).



JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

Vol. XXIX. 1904.

Part III.

CENTENARY OF THE SOCIETY.

On March 7, 1804, a few gentlemen met together at the suggestion of Mr. John Wedgwood, of Pottery fame, at Mr. Hatchard's, the publisher, in Piccadilly, and established what was then, and for some years after,

Fig. 33.—Corporate Seal of the Society.

known as the Horticultural Society of London. The object of the Society was the advancement of Horticulture both in its scientific and practical aspects.

Among the first adherents were Sir Joseph Banks, President of the Royal Society (whose portrait, painted by Phillips in 1820, now hangs in the Council Room), the Rt. Hon. Charles Greville, Richard Anthony Salisbury, William Forsyth, William Townsend Aiton, and James Dickson.

The new Society soon took root and flourished, and in 1809 a Charter of Incorporation was granted to it by His Majesty King George III.

From its earliest days the Society held meetings for the exhibition of trees, shrubs, flowers, and fruits, for the discussion of methods of cultivation, and for the reading of papers on subjects connected therewith. And the information and material thus gathered together was published in a series of Transactions covering the years 1807 to 1845.

FIG. 34.—DAVID DOUGLAS. (*Gardeners' Chronicle.*)

The Society did not, however, confine itself to already known plants, but from 1818 to 1864 despatched collectors to all parts of the world: amongst others, Reeves to China, Don to West Africa and South America, Forbes to East Africa, Douglas to North-Western America, Potts to India and China, Damper Parks to China, McRae to Brazil and Chili, Hartweg to Mexico and Guatemala, Fortune to China, Weir to South America. The new plants sent home by these collectors were grown in the Society's Gardens and distributed subsequently to the Fellows, and through them to the public, so that it is not too much to say that there is not a single garden or plantation in the British Islands which is not the richer to-day for the Society's efforts.

The Society's first Gardens were at Kensington and Ealing, but in 1822

Fig. 35.—Sir Joseph Banks, Bart.
President of the Royal Society.

Fig. 36.—Thomas Andrew Knight,
For Twenty-seven Years President of the Society.

Fig. 37.—Garden Fête at Chiswick, showing the side of the Great Vinery, 1843.

all the plants and the fruit trees, of which a very large collection had been made, were transferred to Chiswick, which continued to be the site of the Gardens till the present Centennial year 1904. Chiswick quickly rose in popular favour, and Garden Fêtes, on a very extensive scale, were held there from 1827 to 1857.

The first President of the Society was the Earl of Dartmouth, 1804–1810, and he was succeeded by Thomas Andrew Knight, 1811–1838, a man whose name will always hold a very prominent place in the respect of all British fruit-growers. (Fig. 36.) A medal was founded in his honour in 1836. A medal had already been founded in memory of Sir Joseph Banks at his death in 1820. (Figs. 39, 40.)

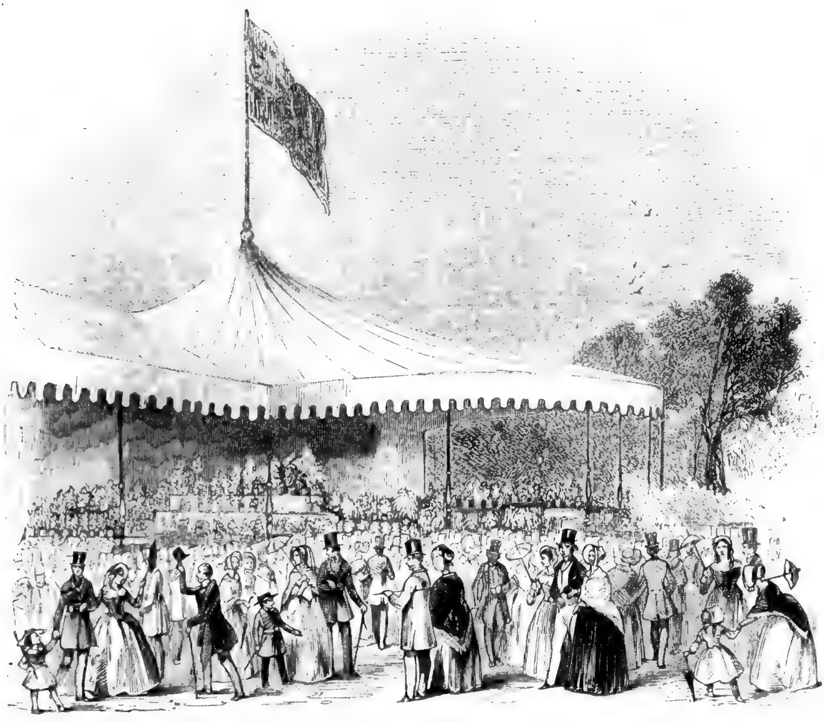


Fig. 38.—Garden Fête at Chiswick: The great Iron Tent.

In 1858, His Royal Highness the Prince Consort (who, with Her Majesty Queen Victoria, had always taken the greatest interest in the Society) consented to become President, and threw himself heartily into the work, and by his influence a new Charter was in 1860 obtained from Her Majesty, which, amongst other things, altered the style and title of the Society to the Royal Horticultural Society. It was through the Prince Consort also that a lease of the Gardens at South Kensington was obtained from the Commissioners of the 1851 Exhibition, on the site of what is now the Imperial Institute and the Royal College of Music. These new Gardens were opened with great *éclat* in June 1860, and great things were hoped for the Society, both from them and from a continuance of the Prince Consort's presidency; but in December 1861 the Prince died, and little seemed to prosper at South Kensington after that great misfortune. A memorial was erected to the good Prince's memory, which still stands at the back of the Royal Albert Hall. (Fig. 43.)

The Society has in the past been fortunate in its Secretaries. Richard Anthony Salisbury, F.R.S., held the office from 1805 to 1816. He was

FIG. 39.—THE BANKSIAN MEDAL, 1820.

FIG. 40.—THE KNIGHTIAN MEDAL, 1836.

succeeded by Joseph Sabine, F.R.S., and he by George Bentham, men of international renown in Horticultural Science. But the Society's greatest Secretary was Dr. Lindley, F.R.S., who, commencing in 1822 as Assistant-Secretary to Sabine, continued to hold the reins of office as Secretary up to 1862, when he resigned, and was at once appointed to a seat on the Council, which he held up to his death in 1865.

FIG. 41.—THE LINDLEY MEDAL, 1866.

A medal was struck in his memory, and in 1868 his Library was purchased, and is still held in trust for the use of the Society. His portrait, by Eddis, now hangs in the Library. (Fig. 44.)

One of Dr. Lindley's successors was the well-known Pomologist, Dr. Robert Hogg, who was not only Secretary of the Society, but for a great number of years Chairman of the Fruit and Vegetable Committee as well. At his death a memorial medal was struck by public subscription and presented to the Society. (Fig. 47.)

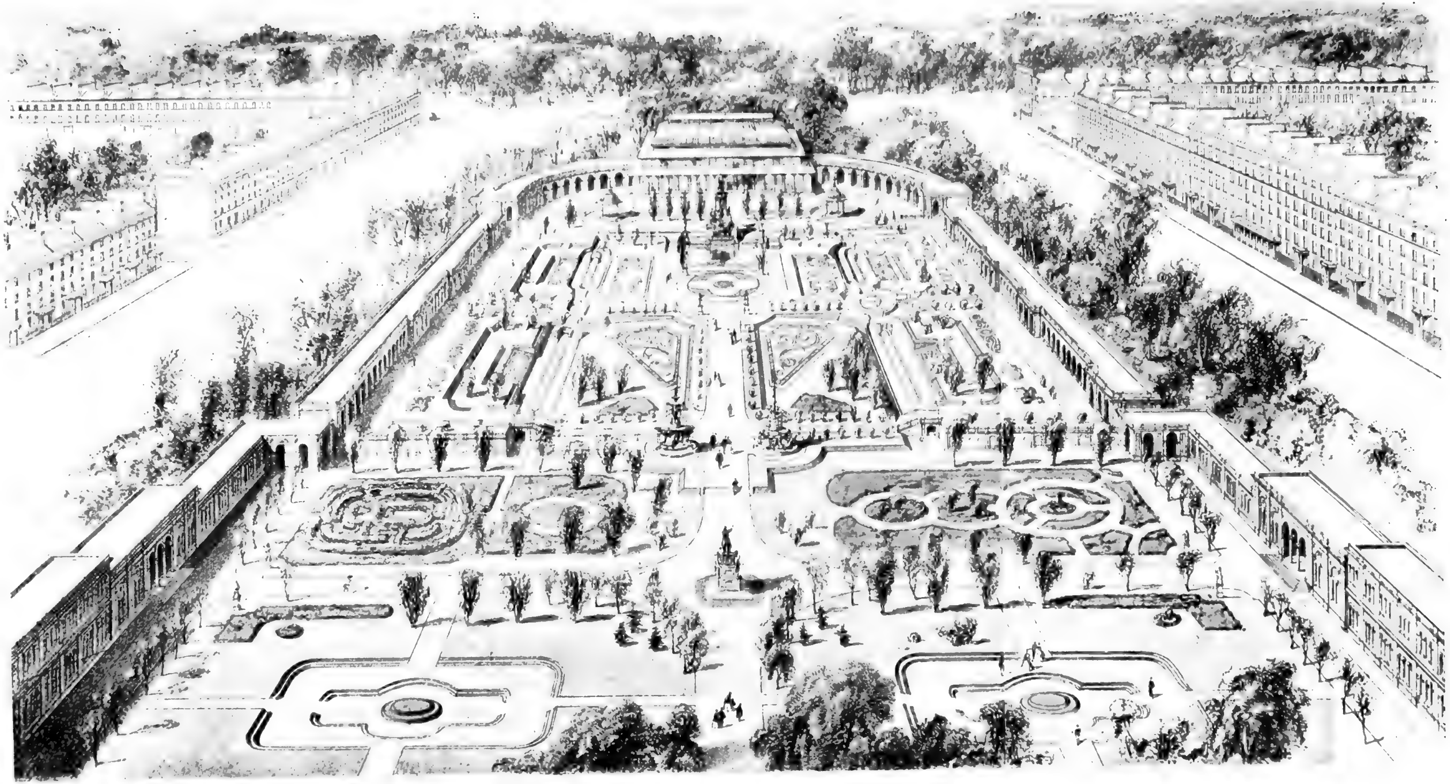


FIG. 42.—BIRD'S-EYE VIEW OF THE SOCIETY'S GARDENS AT SOUTH KENSINGTON, 1862.

Fig. 43.—Memorial erected in 1863 at South Kensington to the Prince Consort, President of the Society.

FIG. 44.—DR. JOHN LINDLEY, F.R.S. (*Painted by Eddis.*)
ASSISTANT-SECRETARY AND SECRETARY, 1822-1862.

Fig. 45 Caricature of one of the Society's early meetings by Cruikshank, 1826

Fig. 46.—Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., &c.,
President of the Society from 1885.

The first offices of the Society—very humble ones—were in 1805 in Gerrard Street, but in 1820 a large house was purchased in Regent Street, where the meetings were held, and attracted considerable public attention. A humorous skit upon them appeared from the pen of George Cruikshank,

FIG. 47.—THE HOGG MEMORIAL MEDAL, 1898.

which is interesting from the fact that, though obviously more or less caricatures, the portraits were at the time easily recognisable. (Fig. 45.)

After the death of the Prince Consort, the Society gradually drifted away to a certain extent from Horticulture pure and simple in the direction of what might be called "Tea Gardens for the upper classes of London Society." The Society never fell quite so low as this description suggests, but it was drifting in that direction, and at the same time falling

FIG. 49.—THE AFFILIATED SOCIETIES' MEDAL, 1901.

deeper and deeper into debt, until in 1887–8 all true friends of the Society and of Horticulture saw that a radical change must be made. Sir Trevor Lawrence, our present President (long may he reign), took the lead, supported by Baron Schröder, Mr. Harry Veitch, Sir William Thiselton-Dyer, F.R.S., Mr. George Paul, Sir Michael Foster, F.R.S., Dr. Masters, F.R.S., Mr. T. B. Haywood, Mr. G. F. Wilson, Sir Edmund Loder, Mr. Geo. Deal, Dr. Hogg, the Earl of Ducie, Mr. Courtauld, Colonel

Beddome, and a small company of enthusiastic gardeners—amateurs, professionals, and trade alike—all, in fact, who would consent to make "Horticulture pure and simple" their motto and their aim, as far as the Society was concerned. All through 1887, plans for reformation and renovation were discussed, and in February 1888 a new Council was elected, with Sir Daniel Morris, K.C.M.G., Honorary Treasurer, and the Rev. W. Wilks, M.A., as Honorary Secretary. The new era of the Society began with the relinquishment of the Gardens and offices at South Kensington, and the establishment of the Fortnightly Shows in the Drill Hall of the London Scottish Volunteers at Buckingham Gate, and of the offices at 117 Victoria Street, Westminster.

At the close of 1887 the Society was in debt £1,152, and the total number of the Fellows was 1,329, of whom only 773 were Subscribing Fellows, and 556 Life Fellows, the whole of whose commutation money had been spent at South Kensington, and who, consequently, brought in no income whatever. How little the then existing Fellows appreciated the

FIG. 50.—THE FLORA MEDAL OF THE SOCIETY, 1836.

return to a purely horticultural policy, is shown by the fact, that at the beginning of 1888 no less than 221 of them resigned, leaving a total of only 1,108, of whom 556 were Life Fellows, and only 552 were annual, *i.e.* Subscribing Fellows. The subscription income of the Society in 1887 amounted to only £1,938, which was raised to £2,894 by the sale of various things belonging to the Gardens, the general result being that the new Council had to take over a debt of £1,152, an annual expenditure of £3,500, and a subscription income of less than £2,000 a year.

Such was the position of affairs at the end of 1887, when the newly elected Council and Officers undertook the apparently hopeless task of rescuing the old Society and reconstituting it upon its original and purely horticultural basis. And that their task was not an easy or a cheerful one may be gathered from the fact, already mentioned, that out of the small number of 773 Fellows on whom alone they could depend for income, no less than 221—representing at least £600 a year—at once resigned.

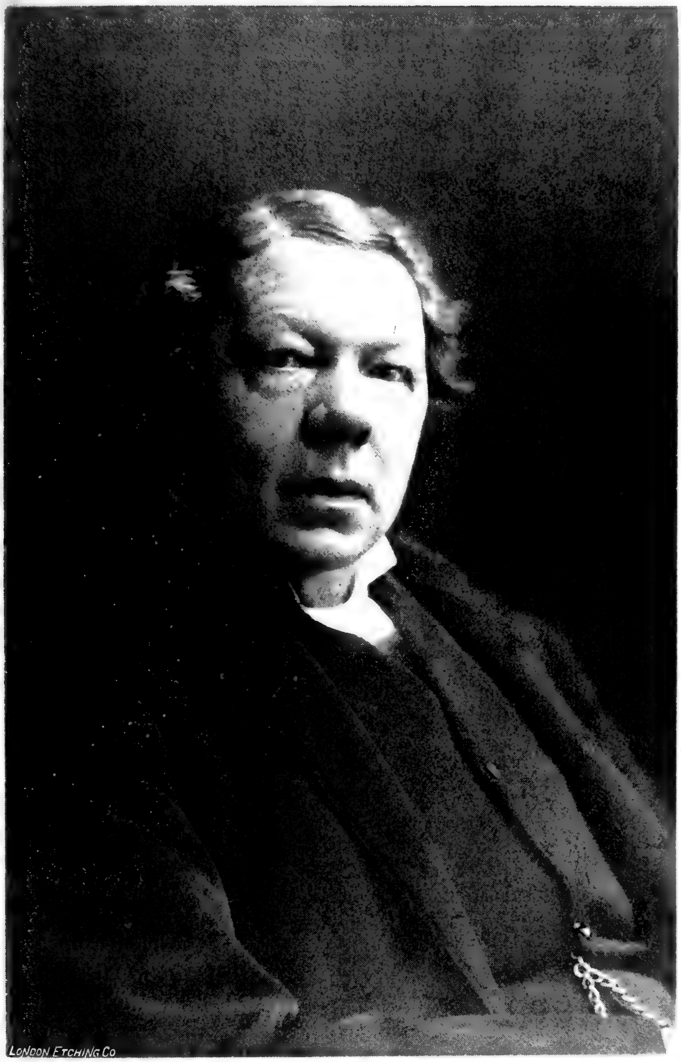


FIG. 51.—REV. W. WILKS, M.A.,
SECRETARY OF THE SOCIETY FROM 1887.

Fig. 52. Mr. J. Gurney Fowler, Treasurer of the Society from 1899.

Since that time—February 1888—to the present Centennial year of 1904, the President and Secretary have remained unchanged. Sir Daniel Morris (who did such magnificent work for the Society's finances until 1891, when he was appointed by the Colonial Office to the oversight of the Agricultural Department of the West Indies) was succeeded by Mr. Philip Crowley, and at his death in 1899, the increasing burden of the Treasurer's office was taken up by Mr. Gurney Fowler, to whom the Society owes so much for his most skilful conduct of the finances during this most difficult Centennial year. (Fig. 52.)

The following table shows in set form the satisfactory advance and progress of the Society under what may be called the New Policy of 1887, although in reality it was not *new*, but a return to the original 1804 policy of "Horticulture scientific and practical."

Year	Expenditure	Annual Increase or Decrease of Expenditure	Income	Annual Increase or Decrease of Income	Investments	Annual Increase of Investments	Year
	£	£	£	£	£	£	
1887	3,577	—	2,894	—	Debt −1,152	—	1887
1888	3,412	−165	3,617	+723	—		1888
1889	3,960	+548	3,520	−97	—	Debt paid off	1889
1890	3,866	−94	4,102	+582	—		1890
1891	4,182	+316	4,439	+337	—		1891
1892	4,872	+690	4,873	+434	479	+479	1892
1893	5,193	+321	5,591	+718	479	—	1893
1894	5,076	−117	5,550	−41	975	+496	1894
1895	5,073	−3	5,638	+88	1,768	+793	1895
1896	5,788	+715	5,944	+306	2,325	+557	1896
1897	5,481	−307	6,303	+359	2,325	—	1897
1898	5,810	+329	7,104	+801	3,691	+1,366	1898
1899	6,069	+259	7,820	+716	6,154	+2,463	1899
1900	6,553	+484	8,193	+373	8,156	+2,002	1900
1901	7,061	+508	9,312	+1,119	11,237	+3,081	1901
1902	8,236	+1,175	10,724	+1,412	13,737	+2,500	1902
1903	8,776	+540	12,418	+1,694	16,536	+2,799	1903
1904	8,789	+13	14,024	+1,606	*	*	1904

The 1,108 Fellows left at the beginning of 1888 have grown into 8,250 at the end of 1904, and the general progress of the Society—from any point of view save that of "Society Tea Gardens"—must be admitted to have been eminently satisfactory.

The Journal of the Society was recommenced in 1888, and has grown from a modest pamphlet to a valuable volume.

In 1897, with the knowledge and approval of Her Majesty Queen Victoria, the Society established a medal in commemoration of Her Majesty's Diamond Jubilee, called the Victoria Medal of Honour in Horticulture (V.M.H.). The original intention was to confine this honour to sixty recipients, but this was extended at Her Majesty's death to the number of sixty-three, in memory of the full number of the years of her glorious reign. (Fig. 53.)

As the Centenary of the Society approached, many were the schemes suggested for its due celebration, and from these, two at once sprang into

* In the current year the investments have taken the form of a loan for £3,700 to the New Hall Building Fund.

prominence, namely: a New Garden and a New Hall; and it was soon generally agreed that the celebration of the Centenary should take one or other of these forms. After long and anxious debate it was at length determined to adopt the scheme for a New Hall. While, however, the

FIG. 53.—THE VICTORIA MEDAL OF HONOUR IN HORTICULTURE, 1897.

Council was busily engaged in raising funds and in searching for a suitable site on which to build, the unexpected happened: Sir Thomas Hanbury, K.C.V.O., V.M.H., offered to purchase the late Mr. G. F. Wilson's celebrated Wisley garden and estate, and give it in trust for the

FIG. 54.—WISLEY—WHEN MR. WILSON FIRST BOUGHT IT.

perpetual use of the Society: and so it came to pass that the Centennial year of the Society found it possessed of *both* a New Garden and a New Hall and offices.

The need of a new Garden had been felt for a long time, and felt by none so much as by the officers of the Society. For years past Chiswick

Fig. 55.—Sir Thomas Hanbury, K.C.V.O., V.M.H., Donor of Wisley.

had gradually been more and more enclosed with buildings. Greater London had enveloped it entirely, and the Superintendent of the Garden had to struggle against two almost insuperable difficulties : an atmosphere saturated with London smoke, and a soil be-drained of every vestige of natural moisture. By no one, therefore, was Sir Thomas Hanbury's noble gift of Wisley so welcomed and appreciated as by the officers of the Society, who knew that sooner or later—and probably sooner than later—Chiswick must break down entirely.

Wisley is situated in the most lovely part of Surrey, some twenty miles south-west of London, and the Garden and estate are almost

Fig. 56.—Wisley—in process of transformation by Mr. Wilson.

surrounded on three sides by the wide-spreading commons of Ockham and Wisley, which are covered with beautiful Scotch firs and heather. The river Wey forms the boundary on the other side. (Fig. 62.)

Chiswick was left and Wisley was taken possession of in May, 1904. During the months that have passed a large range of glass-houses has been erected, a house built for the Superintendent, a cottage for the Fruit Foreman, and large works connected with drainage and water supply have been carried out. Seven acres have been planted with a thoroughly representative collection of Apples, Pears, and Plums. A perfectly equipped meteorological station has also been installed, and placed in connection with the Government Department of the Meteorological Office in London.

The great want at Wisley now is a laboratory for Scientific Research to investigate some of the multitudinous questions which are every day arising connected with plant diseases, plant pests, and the laws which govern plant life and development. Wisley is an ideal spot for the carrying on of such research, as it is absolutely in the country, with not a house within sight to contaminate the air with its smoke—nothing but open commons and fields stretching away in every direction. The one thing wanted is another benefactor willing to have his name handed down to posterity side by side with those of Baron Schröder and Sir Thomas Hanbury in the annals of the Society as the founder of the Laboratory for Scientific Research at Wisley. (Figs. 60, 64, 65.)

Meanwhile a capital site for the New Hall had been found in Vincent Square, and the building was rising apace. And as Sir Thomas Hanbury

FIG. 57.—WISLEY AS IT NOW IS—THE UPPER POND.

was the donor of the Garden, so Baron Sir Henry Schröder, Bart., V.M.H., will ever be regarded as the Father of the Hall; for though many others helped most generously and most ungrudgingly towards it, it is above all due to the perseverance, and owing to the liberality, of Baron Schröder that the New Hall was ever brought within the range of practical politics. Not only did he subscribe £5,000 to the building; not only did he also undertake at his own expense the fitting up of the Library and the moving of all the books, but chiefest of all he kept on for years perseveringly repeating, "We must have a new Hall, gentlemen, we must have a new Hall," until at last, by dint of constant and dogged reiteration, he got the majority of the Council and of the Fellows to believe him, and to consent to follow on if he would point the way. Thus, without for a moment ignoring the good work of others, it is Baron Schröder's name we must pass down to the

FIG. 58.—THE BARON SCHRÖDER, V.M.H.
FOR MANY YEARS AN ACTIVE MEMBER OF THE COUNCIL.

Fig. 59.—The Royal Horticultural Society's Hall and Offices, Vincent Square, S.W.

love and reverence of those who shall come after us as the Father of the Hall. Sir Trevor Lawrence was the saviour of the Society in 1887, and he has been its presiding genius ever since; Sir Thomas Hanbury was the donor of the Garden; and the Baron is the Father of the Hall. These three names will ever stand out clearly in the history of our great Society. Men may come and men may go, but the Society goes on for ever, and will ever keep in honour the memory of these three benefactors long after they themselves shall have passed away to a Society in which we are taught to believe and hope there will be no squabbles, to a Garden where plants experience no blighting frosts or scorching suns, to a Hall which we are told needs no lighting and whose foundations are of all manner of precious stones.

FIG. 60.—WISLEY AS IT NOW IS—THE UPPER POND.

The new buildings, containing the Hall and offices, have been built on the north-east side of Vincent Square, Westminster, overlooking the playing-fields of Westminster School, an open space of some 13 acres in extent. The frontage to Vincent Square is 146 feet, and the side frontage to Bell Street about 122 feet. Messrs. G. E. Wallis & Sons, of Maidstone, were the contractors. (Fig. 61.)

The buildings, erected from the designs of Mr. Edwin J. Stubbs, architect, are faced with red bricks and have dressings of Portland stone. The central frontage is occupied by a porch of Portland stone, forming the principal entrance to the Exhibition Hall, flanked on either side by the entrances to the administrative portions upon the upper stories.

In order to obtain the maximum space for the holding of the Society's Flower Shows, the whole of the ground floor, except the portion occupied

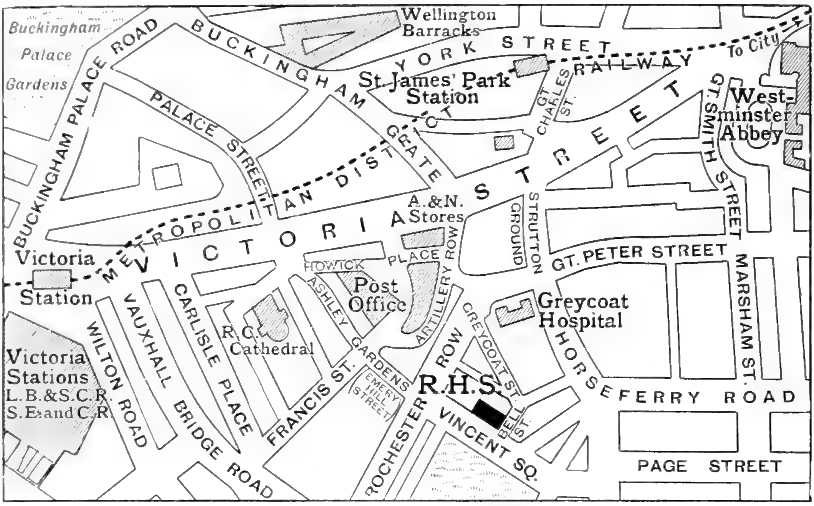


FIG. 61.—POSITION OF THE SOCIETY'S HALL.

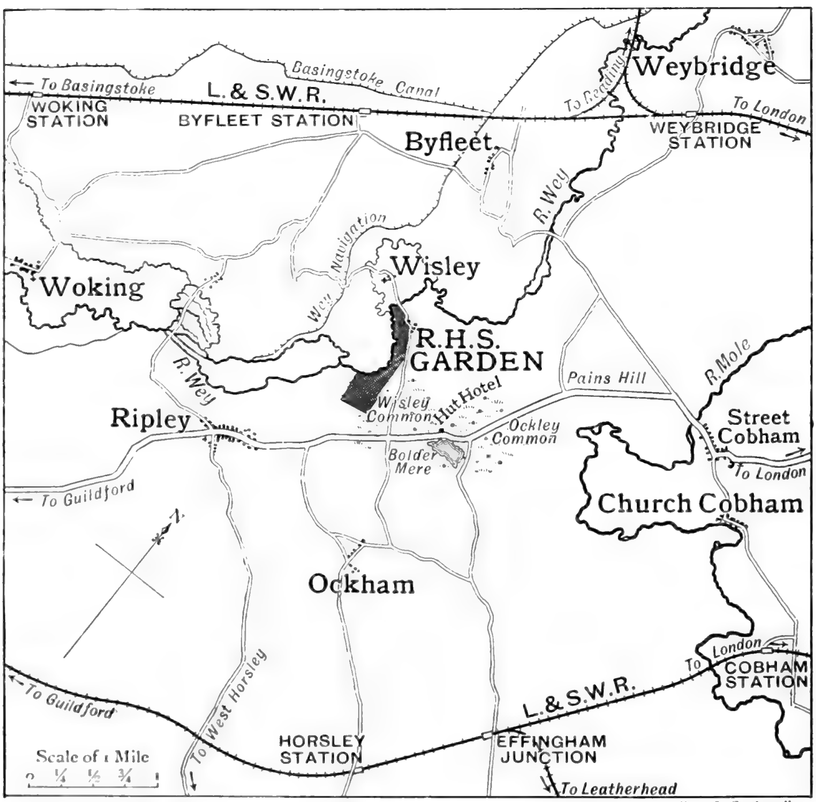


FIG. 62.—POSITION OF THE SOCIETY'S GARDEN.

Fig. 63.—The Royal Horticultural Hall, showing the Main Entrance and the Two Annexes beyond the pillars and balustrading.

by the entrance-hall and the necessary staircases, has been devoted to this purpose. The buildings are so arranged that the Exhibition Hall and Lecture Room, with cloak rooms and retiring rooms, may be let for entertainments without interference with the privacy of the Society's Council Room, Library, and Offices.

Entering at the principal entrance, sets of oak doors lead into the entrance hall, beyond which another set of oak doors gives access to the Exhibition Hall, 141 feet long, 75 feet wide, and 48 feet high to the underside of the roof lantern. On the south side of the Hall two Annexes, each about 46 feet long, 24 feet wide, and $17\frac{1}{2}$ feet high, extend to the front of the building. A musicians' gallery is provided at the end of the Hall.

Fig. 64.—Wisley as it now is—Bridge over the Upper Pond.

The whole of the roof of the Hall is of glass, supported by steel girders spanning the entire width of the Hall, and surmounted throughout its whole length by a lantern for ventilation. The walls are decorated in ornamental plaster, and the panelled dado and balustrading are of oak.

The warming of the Hall required very serious consideration, owing to the large expanse of glass, and the system adopted provides for warming the roof by means of low-pressure steam pipes carried across the roof principals and having upwards of 1,000 square feet of radiating surface. The body of the Hall is warmed by means of fresh air drawn from outside through ducts, and after being thoroughly filtered and washed, and warmed in heating chambers in the basement, it is propelled into the hall by electrically driven fans. In summer time the same fans will deliver cool washed air.

The whole of the building is lighted by hanging electric arc lamps, and by incandescent electric lighting from brackets around the walls.

Upon the first floor, approached either directly from the street or from the entrance-hall by a separate staircase, is a Lecture Room, 46 feet long by 23½ feet wide, fitted with electric lantern appliances of the most modern description. Upon this floor are also three large Committee Rooms, available for use as retiring rooms.

The whole of the second floor is reserved for the use of the Society, and is approached from the street by a separate entrance and staircase in connection with which there is an electric passenger lift. Upon this floor are the Library, the Council Chamber, the Secretary's Room, and two offices for clerks.

FIG. 65.—WISLEY AS IT NOW IS—THE LOWER POND.

The Library, where in addition to the Society's collection is housed the famous Lindley Horticultural Library, is 47 feet long, 23½ feet wide, and 13½ feet high, with caved ceiling. Windows are arranged along the upper part of the side walls, and top lighting is provided in addition. The decorations are of oak and ornamental plaster, and the floor of polished oak. The bookcases, fittings, and furniture for this room are also of oak and have been supplied at Baron Schröder's expense by Messrs. Cowtan & Sons, of Oxford Street.

The Council Chamber, situated at the Bell Street end of this floor, is 33 feet long, 23½ feet wide, 13½ feet high. The caved ceiling is of plaster enriched with fruit and flowers in high relief. The walls are lined with panelled oak work surmounted by an entablature of moulded and carved oak, and the floor is of polished oak.

Fig. 66.—Looking out of the Hall into Vincent Square.
(From a photograph by Mr. Gregory, of Canterbury Road, Croydon.)

FIG. 67.—HIS MAJESTY THE KING, WITH THE QUEEN AND THE PRINCESS VICTORIA, AT THE OPENING OF THE HALL.
(From a photograph by Messrs. Fradelle & Young of Regent Street, W.)

The third story is entirely devoted to the accommodation of the Hall-keeper and his family.

The whole of the administrative portion is lighted by incandescent electric light, gas being also laid on to every floor for heating or lighting if required. The heating is by means of low-pressure steam radiators in conjunction with open fireplaces. The joinery upon the upper stories is all of Austrian oak, and the floors of pitch-pine blocks. For the door furniture and electroliers use has been made of hammered "pewtal," a white non-tarnishable metal, supplied by Art Fittings, Limited. And all parts of the building are connected by means of an interchangeable system of telephones.

The cloak rooms in the basement have been fitted up by Messrs. Hampton and Messrs. Maple so as to accommodate a very large number of guests. One cloak room is for the use of Fellows only, another for gentlemen, and the third for ladies. Underneath the Great Hall is an enormous crypt, lit with electric light, for the storage of chairs, tabling, platform, and suchlike material, thus completing the building and making it the most admirably adapted Hall in all London for Exhibitions, Concerts, Bazaars, and suchlike functions.

The Society has been exceedingly fortunate both in the site and in the architect. All London might be searched in vain for a better site. It is at once so close to Westminster and to Victoria Street, which bids fair soon to become the main artery of traffic from the West End city-wards, and yet it is so absolutely retired, and with such a grand stretch of trees and green grass in front, that at times one might almost fancy oneself in the depths of the country. Fortunate, too, in the choice of an architect, Mr. Edwin Stubbs, of Craven Street, Strand, who has made the very utmost of every inch of the site, and produced a Hall which is the lightest and has the best acoustic properties of any in London, and a very handsome and convenient building for all purposes at (for London) a moderate cost—a building which should at once advance Mr. Stubbs's name to the forefront of his profession.

With a building so admirably adapted to the purposes of the Society, and surpassing what even the most sanguine amongst its promoters had ventured to hope for, it is a little disappointing to feel that there is a debt upon it of nearly or quite £10,000. The List of Donors to the Building Fund follows this short notice. Will not those whose names do not appear in it kindly allow them to be inserted before the final list is published? And will not those whose names already figure in the list consent to make a second contribution, considering what admirable use has been made of their first donations?

Friday, July 22, was the day fixed by His Majesty the King for the official opening of the New Hall, which was filled to its utmost extent with a brilliant assemblage of more than 1,500 guests. The day was as brilliant as the assemblage; but although the heat outside was overpowering, the Hall inside, notwithstanding the number of people, was (as the "Times" newspaper said next day) "the coolest place in London," thanks to the current of air which had been washed and passed through cold water-chambers before being forced into the Hall by the electric fans.

A large platform of four tiers was erected in the Hall opposite the main entrance and was beautifully decorated by Messrs. James Veitch &

Sons, of King's Road, Chelsea, entirely with palms and ferns, with a few exquisite white flowers, thus giving a further sense of coolness to the scene. Handsome gilt chairs were provided for the King and Queen and Princess Victoria, and behind them sat the members of their suite, upon the highest tier of the platform; and on the tiers below, chairs were provided for his Excellency the Austro-Hungarian Ambassador; his Excellency the Russian Ambassador; the Rt. Hon. the Home Secretary; the Rt. Hon. the Earl of Onslow, G.C.M.G., Minister of Agriculture and Horticulture; the Rt. Hon. the Earl of Ilchester; the Lord Medway; Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., President of the Society; Lady Lawrence and Miss Lawrence; Baron Schröder, Bart., V.M.H.; Sir John Dillwyn-Llewelyn, Bart., V.M.H., Vice-President of the Society; Sir Frederick Wigan, Bart., Vice-President of the Society; Sir William Thiselton-Dyer, F.R.S., K.C.M.G.; Sir Thomas Hanbury, V.M.H.; Sir Cecil Clementi Smith; Sir Thomas Elliot, K.C.B.; Sir Alfred Reynolds;

FIG. 68.—THE FIRST MEDAL STRUCK BY THE SOCIETY, 1811.

Sir William Treloar: Mr. Burdett-Coutts, M.P.; Mr. Gerald Loder, M.P.; the Hon. John Boscawen; Captain George Holford, C.I.E., C.V.O.; Major Haggit; Major Hussey; Mr. Frederick Lloyd, J.P.; Dr. Maxwell Masters, F.R.S.; the Rev. Professor Henslow, M.A., V.M.H.; Mr. Harry J. Veitch, F.L.S.; Mr. Arthur L. Wigan; Dr. J. Augustus Voelcker, M.A.; Mr. Edward Mawley, V.M.H.; Mr. Henry B. May; Mr. Alfred H. Pearson; Mr. George Bunyard, V.M.H.; and others.

The seating arrangements were most admirably made by Messrs. Cowtan, of Oxford Street, so that everybody found his way to his own seat without the smallest difficulty.

The following was the order of proceedings on this most memorable occasion, which is reproduced exactly (with the exception of the introduction of His Majesty's gracious reply on p. 276) for the information of those who shall have the arrangement of the Society's second centenary gathering in the year 2004.

1804 1904

Royal Horticultural Society

ESTABLISHED
March 7, 1804

INCORPORATED
April 17, 1809

Programme of

PROCEEDINGS AT THE OPENING

BY

His Majesty the King

On FRIDAY, JULY 22, 1904

OF THE

ROYAL HORTICULTURAL HALL

Built to Celebrate the Centenary of the Society.

PROCEDURE.

PREVIOUS to the arrival of Their Majesties A GUARD OF HONOUR of the Cadet Corps of the Boys of Westminster School will be stationed at the main entrance to the Building.

Their Majesties the KING and QUEEN, on arriving at the Building, will be received in the Portico by

Sir TREVOR LAWRENCE, Bart., K.C.V.O., V.M.H., President,

and by

Sir JOHN T. D. LLEWELYN, Bart., V.M.H., a Vice-President;

Sir FREDERICK WIGAN, Bart., a Vice-President;

Baron Sir HENRY SCHRÖDER, Bart., V.M.H., Chairman of the Building Committee;

Mr. J. GURNEY FOWLER, Chairman of the Appeal Committee;

The Rt. Hon. The EARL OF ILCHESTER
Captain HOLFORD, C.I.E., C.V.O.
The Hon. JOHN BOSCAWEN
Mr. W. A. BILNEY
Mr. GEORGE BUNYARD, V.M.H.
Mr. JAMES HUDSON, V.M.H.
Mr. FREDERICK G. LLOYD, J.P.
Mr. W. MARSHALL
Mr. HENRY B. MAY
Mr. ALFRED H. PEARSON
Mr. HARRY J. VEITCH, F.L.S.
Mr. ARTHUR L. WIGAN

Members of the Council;

The Rev. WILLIAM WILKS, M.A., Secretary,

who will be presented to Their Majesties by the President.

After passing through the Entrance Hall Their Majesties will be conducted across the Royal Horticultural Hall to a platform erected for their accommodation.

"God save the King" will be played by the String Band of Lieut. Charles Godfrey, M.V.O., which will be stationed in the Musicians' Gallery.

The following Address to Their Majesties will then be read by Sir Trevor Lawrence, Bart., V.M.H., President of the Society:

TO THE KING'S AND QUEEN'S MOST EXCELLENT MAJESTIES.

MAY IT PLEASE YOUR MAJESTIES,—

We, the President, the Vice-Presidents, the Council, and the Fellows of the Royal Horticultural Society—who now number more than 8,000—venture, with our loyal duty and greeting, to welcome Your Majesties to our new Hall.

The Centenary of the Society, which was founded in March 1804, is rendered memorable by the erection of the building in which we are assembled, and by the acquisition, through the generosity of Sir Thomas Hanbury, K.C.V.O., of a celebrated garden, in place of that at Chiswick, which had become unsuitable for the purposes of the Society owing to the advance of suburban London westward.

The first Charter of the Society, granted by H.M. King George the Third in 1809, set out the objects for which the Society had been founded—namely, "The Improvement of Hor-"ticulture in all its branches, ornamental as well as useful."

Through the collectors sent out by the Society during the forty years from 1821 to 1861, great numbers of beautiful and useful trees, shrubs, and plants have been introduced into, and acclimatised in, the British Isles. The success attending these expeditions may be realised when the late Mr. Andrew Murray was able to say, with undeniable truth, in his *Book of the Royal Horticultural Society*, "The results" (of the work of the Society's collectors) "have affected the "appearance of all England. Nowhere can a day's ride now "be taken where the landscape is not beautified by some of "the introductions of the Royal Horticultural Society."

Added to this, professional gardeners have been greatly assisted and encouraged by the help and support of our Society in the elaborate and valuable work of hybridisation and selection, by which new and improved varieties of plants, fruits, and vegetables have been raised in vast numbers.

The Fortnightly Shows of the Society have achieved a widespread celebrity. At them all the more interesting new plants, as well as the more important results of skilled horticultural effort, are first seen and first submitted to the judgment of the most competent experts in the kingdom.

The adherence of the Society to the work of promoting horticulture in all its branches can hardly fail to secure the approbation of the garden-loving race over whom Your Majesty reigns. This is shown by the rapid increase in the number of its Fellows, which has risen from about 1,300 in 1887 to 8,150 now. Every day witnesses advances in many directions, but no art or science has progressed more rapidly during the last fifty years than that of horticulture. The demand for flowers and fruits has grown to such an extent that it has developed a great and valuable industry, and the countenance which Your Majesties have graciously extended to our Society has largely assisted in creating, guiding, and helping this valuable national asset.

We take this opportunity of expressing our enduring obligations to Your Majesties for the many and gracious visits you have in years past paid to our Society's shows, visits which have done much to encourage us in our efforts to foster and maintain in the highest efficiency the science and art of horticulture. And in thanking Your Majesties for your presence here to-day and for the warm interest you have ever shown in the Society, we desire to assure you that the valuable help the illustrious Prince Consort gave the Society in days of serious difficulty—now some forty-five years ago—has never been forgotten.

The following Report of the Building and Appeal Committees will be read by Mr. J. Gurney Fowler, Treasurer of the Society, and will be presented to His Majesty by Baron Sir Henry Schröder, Bart., V.M.H., Chairman of the Appeal Committee.

MAY IT PLEASE YOUR MAJESTIES,

On behalf of the Building and Appeal Committees, we venture humbly to submit the following Report on the erection of the building in which we are honoured by your Majesties' presence to-day.

For very many years the Fortnightly and other Shows of our Society have been one of the most effective means towards securing the objects we have in view—viz., the diffusion of more correct knowledge of what plants should be grown, and of how they may and should be cultivated.

These fortnightly gatherings were first held at the Society's early home in Regent Street, and for many years afterwards they took place at South Kensington. When, however, in 1887, the gardens there were surrendered to the Royal Commissioners of the 1851 Exhibition, the Society moved their Shows to the Drill Hall of the London Scottish Volunteers at Buckingham Gate, Westminster, where they have been held up to the present time. They have been ever increasingly popular, and the Society has enjoyed the favour and support of horticulturists, and of the public generally, without interruption.

A few years after the removal of the Shows to the Drill Hall, we began to find the accommodation insufficient, the Hall being at times inconveniently crowded both by exhibitors (who have often not had sufficient space to stage their exhibits properly) and by Fellows of the Society, and others, who have not had proper facilities for seeing and studying the plants shown.

At the same time, the office accommodation at Victoria Street, Westminster, which has always been very limited, has for many years been wholly inadequate for carrying on the increasing general office and routine work of the Society.

Your Majesty, as long ago as 1890, addressed the Fellows in the following words:

> "I sincerely hope your labours to obtain a Hall may be successful, for I feel sure it would be of the greatest use and advantage."

Since these encouraging words were spoken, the need for the Hall has increased beyond all expectation, and the project has never been absent from our hopes and our thoughts; and it is this Hall and building, the final result of many long years of hope deferred, but of sustained effort, that your Majesty has graciously consented to declare open to-day.

Much difficulty was experienced in finding a suitable site for the building, but we are happy in thinking that our present situation leaves nothing to be desired. Funds had also to be collected, and more than thirteen hundred donations have been received from all classes of the horticultural community and others, amounting in all to £26,000.

£14,000 still remains to be raised before the Society can regard itself as the unfettered possessor of its Hall and building fully equipped.

The main purpose of the building is the holding of our Fortnightly Shows, but other interests have not been lost sight of, and we have reason to believe that the Hall will often be in demand for numerous other purposes. In addition to the Hall, we have now ample office accommodation, and a proper home for the Lindley Library, which is of such great use to all students of horticulture.

His MAJESTY the KING will then graciously reply to the Address.

HIS MAJESTY'S reply was as follows:

In the name of the Queen and Myself I thank you for your loyal and dutiful Address.

I am very glad that you have at length obtained a suitable Hall for your beautiful and interesting Shows, and adequate accommodation for your Library, and for the performance of the official work of the Society; and it is with great pleasure that the Queen and I are here to-day to declare these new buildings to be open.

We are pleased, also, to be able to congratulate the Society upon their having acquired the Garden to which you allude, and for which you are indebted to the goodness of Sir Thomas Hanbury.

The love of horticulture has increased immensely in this country within the last century, owing in part, no doubt, to the greatly extended facilities enjoyed by our people for visiting rural places; and no science deserves more encouragement than that which tends to promote the study of the art of gardening, and to stimulate a taste so wholesome and elevating as the love of trees and of flowers.

Our visits to your exhibitions have always given us great satisfaction; and I remember, and am touched by your allusion to, the interest which my dear Father took in your Society.

The Queen and Myself wish that every success may attend the opening of this new Hall and its adjoining premises; and trust that the Centenary which we are celebrating to-day may prove to be the occasion of an accession of prosperity to the Royal Horticultural Society.

The following Congratulatory Addresses will be presented to the Society:

(1) From the Société Rovale d'Agriculture et de Botanique de Gand (Belgique):

MONS EUR LE PRESIDENT,—

Le 5 mars 1904 [March 7th], la Royal Horticultural Society fêtera le centième anniversaire de sa fondation. Cet évènement séculaire sera plus qu'une fête de famille, plus qu'une solennité nationale. Son éclat rayonne sur le monde entier. Tous ceux qui, dans les deux hémisphères, aiment les plantes, s'uniront en pensée avec vous, pour saluer ces deux grandes dates: 5 mars 1804 et 5 mars 1904! Aucun d'eux ne peut oublier la puissante impulsion donnée par vos fondateurs à la culture des végétaux. Personne ne peut nier la part considérable prise par leurs successeurs au développement constant de ce mouvement horticole dont nous saluons aujourd'hui, émus et charmés, le radieux épanouissement.

Il suffit, en effet, de jeter un instant les yeux sur la longue liste des membres qui honoraient par leurs travaux votre illustre Société pour apprécier combien fut utile au monde civilisé le concours de tant d'intelligence et de si nombreux dévouements. Les théories scientifiques qu'ils ont émises sont aujourd'hui indiscutées. Les plantes introduites sous vos auspices ornent actuellement nos jardins et nos serres. Un grand nombre de celles-ci se sont si heureusement acclimatées qu'elles sont devenues presque des ornements naturels de nos parcs et de nos parterres. Quel homme, voyant ce que vous avez accompli en l'espace de ce siècle, resterait insensible devant la grandeur, la puissance et la persistance des efforts déployés par la Société Royale d'Horticulture de Londres!

Créée en 1808, la Société Royale d'Horticulture de Gand est de quatre ans votre cadette; elle a contracté, avec sa soeur aînée de Londres, des rapports d'amitié profonds et durables, depuis le jour où, sur son livre d'or, elle recueillait les signatures des plénipotentiaires anglais venant de signer à Gand le traité de paix de 1815! Toutes d'elles, nos Sociétés poursuivaient le même but: unir la théorie scientifique et l'habileté pratique de manière à confondre théoriciens et praticiens, botanistes et jardiniers, dans un même effort vers la perfection des cultures.

Pendant un siècle, sans défaillance, sans faiblesse, sans lassitude, vous avez jalonné la route de l'avenir en signalant et en récompensant tous les efforts.

Semblable à l'arbre admirable qu'il a choisi pour emblème, votre cercle reste, comme le chêne, toujours ferme et vigoureux, étendant ses rameaux puissants, à l'ombre desquels l'horticulture se développe en sécurité dans tout l'Empire Britannique!

Puissiez-vous continuer *in æternum* votre tâche civilisatrice! Puissiez-vous ne jamais cesser de briller comme un phare éclatant, pour le plus grand honneur de l'horticulture anglaise et pour la plus grande joie de l'horticulture du monde entier!

Se souvenant, non sans émotion, des temps si lointains de sa fondation, la Société Royale d'Agriculture et de Botanique de Gand adresse à sa soeur bien-aimée, la "Royal Horticultural Society," l'expression de ses félicitations cordiales et des voeux bien affectueux qu'elle forme pour sa longue, durable et féconde prospérité!

Ad multos annos!

Le Président, CTE. DE KERCHOVE DE DENTERGHEM.
Le Secrétaire Général, E. FIERENS.

Gand, le 1er mars 1904.

Presented by Dr. Maxwell Masters, F.R.S., Officer of the Order of Leopold, on behalf of Comte de Kerchove de Denterghem, Président de la Société.

(2) From the National Rose Society:

TO THE PRESIDENT AND COUNCIL OF THE ROYAL HORTICULTURAL SOCIETY.

In the name and on behalf of the National Rose Society—one of the oldest of the special Horticultural Societies in the kingdom—we desire to give expression to the congratulations and hopes which all the horticulturists and Horticultural Societies of this country are feeling at this most auspicious celebration of the Centenary of the Royal Horticultural Society.

We venture to express the belief that to-day marks the beginning of a new era of even yet more distinguished success in the history of the old Society, from which—we take this opportunity of publicly stating—the National Rose Society has, at all times and in all possible ways, received the most generous and ungrudging assistance and support.

Signed on behalf of the National Rose Society,

S. REYNOLDS HOLE, D.D., Dean of Rochester, President.

EDWARD MAWLEY, Secretary.

Presented by Mr. Edward Mawley, F.R.M.S., Honorary Secretary of the Society.

(3) From the Horticultural Society of Prussia:

HOCHVEREHRTE GESELLSCHAFT,—

Zu dem Tage, an welchem Sie in Gegenwart Seiner Majestät des Königs, Ihrer Majestät der Königin, und der Königlichen Familie die Eröffnung Ihres eigenen Heims, Ihrer Gartenbauhalle, und damit zugleich das Fest Ihres hundertjährigen Bestehens feiern, erlaubt sich auch der Verein zur Beförderung des Gartenbaues in den Preussischen Staaten seine herzlichsten Glückwünsche auszusprechen.

Ist doch die Gründung Ihrer Gesellschaft vorbildlich gewesen für die Bildung unseres Vereins im Jahre 1822, wie für so viele andere Vereine in den verschiedensten Ländern.

Als einer der ältesten unter diesen, hat unser Verein die Leistungen Ihrer Gesellschaft im Laufe der vielen Jahrzehnte stets mit Bewunderung verfolgt. Mutig sind Sie vorwärts gedrungen, trotz mancher Schwierigkeiten, und wenn der Gartenbau in England auf einer so hohen Stufe steht, so dürfen Sie sich mit Stolz sagen, dass Sie dazu ganz besonders beigetragen haben.

Heute haben Sie eines Ihrer höchsten Ziele erreicht: ein eigenes Heim! Wir empfinden ganz mit Ihnen dieses Glück, um so mehr, als auch wir nach einem eigenen Heim streben, das freilich noch in weiter Ferne liegt.

Mögen in der neuen Gartenbauhalle die grossartigen Leistungen Ihrer Gesellschaft nun um so schöner zu Tage treten und das neue Jahrhundert für Sie ein ebenso segensreiches, die Gartenbauwelt des gesammten Erdballs befruchtendes sein, wie es das abgelaufene gewesen war.

Das wünscht aus vollem Herzen der Verein zur Beförderung des Gartenbaues in den preussischen Staaten.

Berlin, den 22. Juli 1904.

Der Direktor, Baron VON CRAMM, Wirklicher Geheimer Rath, Excellenz, Herzoglich Braunschweigischer Minister, und Bevollmächtigter zum Bundesrat.

Der General-Sekretär, Prof. D. L. WITTMACK, Geheimer Regierungsrat.

[*Translation.*]

MOST ESTEEMED SOCIETY,—

The Horticultural Society of Prussia takes this opportunity of offering you its most hearty congratulations on the day on which, in the presence of His Majesty the King, Her Majesty the Queen, and other members of the Royal Family, you will open your own Home, your Royal Horticultural Hall, as a celebration of your Centenary.

The foundation of your Society served as an example for the formation of our Society in the year 1822, and also for the inauguration of similar Societies in other countries.

As one of the oldest of these, our Society has always followed with admiration the actions of your Society in the course of its many decades. You have courageously advanced in the face of many difficulties, and now that horticulture has attained to such pre-eminence in Great Britain, you may justly claim that you have contributed to this proud position in an exceptional manner.

To-day you have gained one of your highest aims—the acquisition of a Home! We rejoice heartily with you in your good fortune, the more so because we too are endeavouring to secure our own Home, though this at present looms in the far distance.

May the grand achievements of your Society shine with a still brighter light in the new Hall, and may the new century prove as fortunate for you, and as beneficial to the horticulture of the whole world, as has been that which is closed!

These are the most hearty wishes of the Horticultural Society of Prussia.

Signed—

The Director, BARON VON CRAMM, Acting Privy Councillor, Excellency, Minister of the Duchy of Brunswick, and its representative in the Bundesrath.

The Secretary-General, Professor Dr. L. WITTMACK, Privy Councillor.

Presented by Dr. Maxwell Masters, F.R.S.

The President of the Society will then request His Majesty to be graciously pleased to declare the Royal Horticultural Hall open, and on His Majesty assenting, the Architect, Mr. Edwin Stubbs, who will be presented by the President, will submit to His Majesty plans of the Society's Offices erected in conjunction with the Hall.

His MAJESTY the KING will then declare the Hall open.

Lady Lawrence will request HER MAJESTY the QUEEN to accept of a bouquet of Carnations.

Miss Lawrence will present the PRINCESS VICTORIA with a bouquet of Orchids.

Their Majesties, on leaving the Hall, will be conducted as on entering, and the National Anthem will again be played by the Band.

Programme of Music

To be performed by

LIEUT. CHARLES GODFREY'S STRING BAND

:: :: :: :: Commencing at 11.30 :: :: :: ::

1—MARCH	"Copenhagen"	*Karl Kaps*
2—VALSE	"Doctrinen"	*Strauss*
3—SELECTION	"The Orchid"	*Caryll and Monckton*
4—INTERMEZZO	"Les Cloches de St. Malo"	*Rimmer*
5—VALSE	"The Choristers"	*B. Phelp*
6—SOLO	"Violets" (Solo Cornet: Mr. PRICE)	*E. Wright*
7—CONCERT MARCH	"Pomp and Circumstance'	*Elgar*
8—SELECTION	"The Country Girl"	*Monckton*
9—SOLO	"The Lark's Festival" (Solo Piccolo: Mr. BREWER)	*Brewer*
10—VALSE	"Bleue"	*Margis*
11—DANCE	"A Coon Band Contest"	*Pryor*
12—GALOP	"The Escort"	*C. Godfrey*

:: :: :: "GOD SAVE THE KING" :: :: ::

Conductor: Lieut. CHARLES GODFREY

M.V.O., R.A.M., R.C.M., G.S.M.

DONATIONS TO THE HALL.

HIS MAJESTY THE KING . . £105 0 0

H.R.H. THE PRINCE OF WALES . £52 10 0

	£	s.	d.
A. B.	5	5	0
Ackland, Rev. C. W.	1	1	0
Adams, P.	1	1	0
Adams, F. C.	35	0	0
Adams, H. J.	10	10	0
Adamson, Miss	20	0	0
A Fellow	10	0	0
A Fellow	0	5	0
Agar, Miss M.	1	0	0
Ainslie, W.	2	2	0
Alder, Mrs.	1	1	0
Alderson, Miss	1	1	0
Alexander, Francis	10	0	0
Alexander, H. G.	1	1	0
Alexander, W. C.	10	0	0
Allan, A. R.	1	1	0
Allan, Miss	1	1	0
Allan, W.	1	1	0
Allen, George	10	0	0
Allen, J. J.	2	2	0
Allfrey, Mrs.	2	2	0
Allott, Rev. H. H.	0	10	0
Allsopp, Mrs. A. J.	1	0	0
Anderson, J. A.	5	5	0
Anglo-Cont. Guano Works ...	1	1	0
Anson, Capt. A. H.	1	0	0
Appleton, R. C....	1	1	0
Apthorpe, W. H.	2	10	0
Arbuthnot, F. G.	1	1	0
Arbuthnot, Sir Alex.	5	0	0
Arderne, Mrs. M.	5	5	0
Arkwright, G. E. P.	2	2	0
Armitage, A. S.	2	0	0
Armitage, F.	1	1	0
Armourers' Co.	10	0	0
Arnold, Mrs.	1	1	0
Arnold, T.	1	1	0
Arnott, Sam.	2	2	0
Arrowsmith, Jno.	2	2	0
Ashburnham, Lady	0	10	0
Ashby, Ern. H.	5	5	0
Asheron, E.	5	0	0
Ashton, R. J.	20	0	0
Ashworth, E.	10	0	0
Ashworth, R.	5	5	0
Aslett, Geo.	1	1	0
Assbee, J.	1	1	0
Astle, W....	3	3	0
Attenborough, H. A.	2	2	0
Austin & Co.	1	11	6
Backhouse, Mrs. R. O. ...	5	5	0
Bacon, F. H.	5	5	0
Bacon, Mrs.	0	5	0
Badcock, W.	0	10	6
Bagehot, J. B.	1	1	0
Bain, Wm.	1	1	0
Bainbridge, Mrs.	2	2	0
Baines, Mrs.	1	1	0
Baird, A. G. A.	10	0	0
Baker, C. E.	5	0	0
Baker, Sir R.	2	2	0
Balderson, H.	25	0	0

	£	s.	d.
Balfour, C. B., M.P.	10	10	0
Ball, Lt.-Col.	5	0	0
Ballantine, W. H.	5	5	0
Banbury, Mrs. C.	2	0	0
Banger, Mrs.	0	10	6
Banks, G. F. H.	1	1	0
Banting, Mrs.	2	2	0
Barclay, Col. H.	5	0	0
Barclay, F. H.	5	0	0
Barclay, Miss	2	0	0
Baring, Mrs. W.	1	10	0
Barker, G. C.	1	0	0
Barlow, F. Pratt...	2	2	0
Barlow, Miss	1	1	0
Barnard, H. A.	5	0	0
Barnard, Lord	20	0	0
Barnewell Bros.	1	11	6
Barr & Sons	10	10	0
Barraclough, G. W.	1	1	0
Barry, Sir F. Tress	5	5	0
Bartholomew, Mrs.	0	10	6
Barton, Hon. Mrs.	1	1	0
Basham, John	5	5	0
Bastin, W. L.	1	1	0
Bates, Wm.	5	0	0
Bateson, Miss	1	1	0
Bateson, W., M.A.	2	2	0
Bath, Ltd.	25	0	0
Bath, Marchioness of	1	0	0
Batten, H. Cary...	3	3	0
Batten, H. G.	1	1	0
Baxter, C. E.	1	1	0
Beach, A. E.	1	1	0
Beale, Mrs.	3	3	0
Beale, Wm.	2	2	0
Beard, W. Elliot	1	0	0
Beaumont, W. C.	10	10	0
Beck, Miss E.	1	1	0
Beckett, Edwin	5	0	0
Bedale, Miss M....	1	1	0
Beddome, Colonel	5	0	0
Bedford, Adeline Duchess of ...	5	0	0
Beebe, A. G.	2	2	0
Beech, Mrs.	1	1	0
Behrens, Miss	5	5	0
Behrens, Mrs. E. F.	1	0	0
Beit, Alfred	52	10	0
Bell, Mrs....	1	1	0
Bell, W. H.	1	1	0
Benson, Lt.-Col.	1	1	0
Benson, Mrs.	5	0	0
Beresford, Mrs. R.	1	0	0
Berger, S. S.	5	5	0
Bergheim, J. S.	2	2	0
Berkeley, Mrs.	10	10	0
Berkeley, R. V.	1	1	0
Bernard, Rev. E.	1	1	0
Berney, A. D.	0	5	0
Berry, Mrs.	1	0	0
Berry, Mrs. C.	0	2	6
Bertodano, C. de	2	2	0
Bethell, Miss	1	0	0
Bevan, Thomas	1	0	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Bevan, F. A.	105	0	0
Bevis, Miss	0	10	0
Bide, S.	2	2	0
Bidwell, J. H.	2	2	0
Biggs, Miss V.	1	1	0
Bilney, W. A.	10	10	0
Bingel, C. A.	5	5	0
Bingel, H.	2	2	0
Bingel, Miss	1	1	0
Bingel, Mrs.	1	1	0
Bird, A. B.	2	2	0
Bird, G. W.	5	0	0
Bird, M. C. H.	1	0	0
Bird, W. B. M.	10	0	0
Birkbeck, R.	5	0	0
Birkett, John	3	3	0
Birkett, P.	1	1	0
Bischoffsheim, H. L.	250	0	0
Black, Mrs. Stuart	1	1	0
Blackburn and District Horticultural Society	5	5	0
Blackburn, H. R.	2	2	0
Blaine, D. P.	5	5	0
Blair, Mrs.	1	0	0
Blaker, Dr. Shaw	4	4	0
Blandford, J. H.	1	1	0
Blencowe, Miss F.	0	10	0
Blick, Chas.	2	2	0
Blinkhorn, E.	5	5	0
Bliss, Rev. Canon	2	0	0
Bliss, Rev. W. B.	1	1	0
Blunt, Rev. Canon	1	1	0
Blyth, Sir James	10	10	0
Boardman, C.	1	1	0
Bodenham, J. R. D.	1	1	0
Body, Chas. A.	5	5	0
Bohn, H.	10	10	0
Bois, Percy	5	0	0
Bolton, Mrs.	1	0	0
Bonavia, Dr.	10	0	0
Bond, G.	4	0	0
Bone, J.	1	1	0
Bonham-Carter, Miss	2	0	0
Booth, W.	1	1	0
Booth, Wm.	1	1	0
Borton, Mrs.	1	0	0
Boscawen, Hon. John	5	5	0
Bostock, F.	2	2	0
Bourhill, H.	0	10	6
Bourne, Rev. S. E.	2	2	0
Bowen, Miss	0	10	6
Bowles, E. A.	10	10	0
Bowles, W. A.	0	10	0
Boxall, G. B.	0	10	6
Boxall, W.	2	2	0
Boyd, Mrs.	1	1	0
Boyd, Mrs. C.	0	10	0
Boyle, Hon. Mrs.	10	10	0
Braby, F.	2	2	0
Brace, Mrs.	1	1	0
Bradford, Countess of	1	0	0
Bradshaw, J.	25	0	0
Bramah, Mrs. E.	0	10	0
Bramwell, Mrs. A.	2	0	0
Brandon, S,	1	1	0
Brass, Wm.	2	2	0
Brassey, A., M.P.	50	0	0
Brazil, W.	5	5	0
Breadmore, C. W.	0	10	6
Bridgeman, B.	1	1	0
Brittan, Mrs. A.	0	10	0
Brock, H.	0	10	6

	£	s.	d.
Brocklebank, R.	20	10	0
Brocklehurst, G. W.	10	10	0
Brocklehurst, Mrs	1	1	0
Brooke, Miss O.	2	0	0
Brooker, H.	0	5	0
Brooks, W.	2	2	0
Brooman-White, R.	50	0	0
Broome, Jos.	26	5	0
Broughton, H. D.	10	0	0
Brown, E.	5	0	0
Brown, Lady Hargreaves	25	0	0
Brown, Mrs. S. B.	50	0	0
Brown, W. and J.	5	5	0
Browne, Colvile	1	1	0
Browne, Mrs. E. L.	10	10	0
Bruce, Dr.	0	10	6
Bruckhaus, J.	2	10	0
Brunton, Miss C. E.	1	1	0
Brymer, Col. W. E., M.P.	20	0	0
Buchan-Hepburn, Sir A.	5	5	0
Buckley, Lady	1	1	0
Budgett, J.	10	0	0
Bull, F.	0	10	6
Bull & Sons	10	10	0
Bulley, Arthur	1	1	0
Bullock, A.	1	1	0
Bullock, Mrs. H.	2	2	0
Bulmer, Mrs.	2	2	0
Bultee, Mrs.	1	1	0
Bunyard, Geo. & Co.	52	10	0
Burbidge, F. W., M.A.	5	5	0
Burges, P.	2	2	0
Burkinshaw, W. P.	5	0	0
Burleigh, W. F.	1	1	0
Burrell, J., & Co.	5	5	0
Burt, Geo.	10	10	0
Burton, F. M.	2	0	0
Bury, Lindsay	5	5	0
Busk, Miss	1	1	0
Butcher, A.	2	2	0
Butler, F. G.	1	1	0
Butler, J.	1	1	0
Butt, A. F.	1	1	0
Buxton, Mrs.	1	0	0
Bythway, Major	1	1	0
Caldicott, T. P.	5	5	0
Caldwell, Surg.-Major	1	1	0
Callander, Mrs.	1	0	0
Cama, D. P.	5	5	0
Cammell, Mrs.	1	1	0
Campion, Mrs.	1	1	0
Campbell, J. F.	10	0	0
Cannell, H.	25	0	0
Cant, B. R. & Sons	21	0	0
Cant, Frank & Co.	10	0	0
Capel & Dist.	1	1	0
Capel Cure, Mrs. A.	0	10	6
Carpenter, Dr.	1	1	0
Carpmael, Miss	2	2	0
Carte, Rupert D.	3	3	0
Carter & Co.	105	0	0
Cartwright, T. G.	5	5	0
Cassell, Mrs.	10	0	0
Cates, Mrs.	10	10	0
Cecil, Lady M.	1	0	0
Chalwin, H. J.	1	1	0
Chambers, B. E. C.	5	5	0
Chandler, A.	1	1	0
Chapman, Arthur	1	1	0
Chapman, B.	1	1	0
Chapman, Mrs.	0	5	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Charlesworth & Co.	105	0	0
Charrington, John	5	0	0
Chaston, H. R.	1	1	0
Cheal & Sons	21	0	0
Chester Paxton Soc.	2	2	0
Child, Walter B.	2	2	0
Chipp, T. F.	0	2	6
Christie, J. A.	1	1	0
Christy, W. M.	5	0	0
Chivers, John	2	2	0
Church, Professor	2	2	0
Churcher, Geo.	10	0	0
Churchill, Rev. W. H.	5	5	0
Cinnamond, Mrs.	1	0	0
Clark, G. & A.	5	5	0
Clark, Edw.	1	1	0
Clark, W. D.	1	1	0
Clarke, H. R. G.	15	0	0
Clarke, Mrs. Stephenson	15	0	0
Clarke, R. H.	1	1	0
Clarke, W. J.	1	1	0
Cleeves, Mrs. M. A.	2	2	0
Clementi-Smith, Sir Cecil	1	1	0
Clementi-Smith, Rev. P.	1	1	0
Clementi-Smith, Mrs. P.	1	1	0
Clibran & Son	5	5	0
Clonbrock, Mrs.	1	0	0
Clout, Richard	3	0	0
Clowes, Miss M.	1	0	0
Cobb, Walter	21	0	0
Cobb, Mrs. Rhodes	2	2	0
Cobbold, Mrs. L.	2	0	0
Coe, Miss	1	1	0
Cohen, Mrs. B. L.	5	0	0
Cole, J. W.	2	0	0
Coleman, R. V.	1	1	0
Coleman, Mrs.	0	5	0
Collet, Sir Mark, Bart.	5	0	0
Collett, E.	0	10	0
Collins, J. F.	1	1	0
Collins, B. R.	1	0	0
Collinssplatt, H.	3	3	0
Collyer-Bristow, Mrs.	1	1	0
Colman, Jeremiah	250	0	0
Colomb, Lady	1	0	0
Colston, Mrs. R.	1	1	0
Colwill, J. B.	1	1	0
Conant, Miss	1	0	0
Connell, J.	5	5	0
Connell, Mrs.	1	0	0
Coode, R. C.	3	3	0
Cook, T. H.	1	1	0
Cook, E. T.	1	1	0
Cooke, Dr.	1	1	0
Cookson, Norman C.	105	0	0
Coomber, Thos.	1	1	0
Cooper, F.	1	1	0
Cooper, J. Omer	1	1	0
Cooper, J. J.	0	10	6
Cooper, G.	0	2	6
Copeland, W. M.	1	1	0
Corgialegno, M.	5	5	0
Cornwall Daff. Soc.	20	0	0
Corscaden, Mrs.	5	5	0
Corry & Co., Ltd.	25	0	0
Corry, H. W.	1	1	0
Cotton, A. D.	1	1	0
Courtauld, Mrs.	10	0	0
Courthope, W. F.	10	0	0
Cowan, Alex.	10	0	0
Cowan, C. W.	10	10	0
Cowper, Countess	5	0	0
Cox, Col. H. W. H.	4	4	0
Cox, Mr.	1	1	0
Cox, Dr. A.	0	10	6
Cox, Fred.	10	0	0
Crane, Miss E.	1	0	0
Crane, Miss S.	1	0	0
Crapper, Thos.	2	2	0
Crawford, W. H.	2	2	0
Crawshay, de Barri	21	0	0
Crews, C. T. D.	5	5	0
Crisp, Frank	5	0	0
Crokat, Mrs.	2	0	0
Crook, T. M.	10	10	0
Crooke, Mrs.	0	10	0
Crossfield, Mrs.	5	5	0
Crossweller, Mrs.	1	1	0
Crump, W.	1	1	0
Cundey, Mrs.	2	2	0
Cunliffe, Walter	10	10	0
Currey, Miss F.	1	1	0
Currie, Miss C. Hay	2	0	0
Curtis, James	2	2	0
Cutbush, W., & Son	26	5	0
Cuthbert, R. & G.	52	10	0
Cuthbertson, M.	2	2	0
Cutler, S.	2	2	0
Cypher, James, & Son	25	0	0
Czarnikow, C.	100	0	0
Dartmouth, Countess of	1	1	0
Dashwood, Rev. R. L.	1	1	0
Daun, W. H.	2	2	0
Davidson, Miss L.	2	0	0
Davidson, Mrs. F	1	1	0
Davies, Mrs. C.	2	2	0
Davies, F. H.	5	5	0
Davies, Mrs. G. R.	1	1	0
Davis, Norman	3	3	0
Davis, Fd.	1	1	0
Davis, Miss M.	0	10	0
Davison, Col. John	1	1	6
Dawkins, A.	2	2	0
Dawson, Miss	2	2	0
Dawson, Chas.	1	1	0
Deacon, W. S.	52	10	0
Deacon, E.	5	5	0
Deacon, Miss J. B.	2	2	0
Dean, Alex.	5	0	0
Dean, Richard	3	3	0
Dean, A., Miss	1	1	0
Debenham, Mrs.	1	1	0
De Lafontaine, A. C.	1	1	0
Denison, Mrs.	1	1	0
Dennis, Chas.	1	1	0
de Pass, John	2	2	0
Dibben, H. F.	1	1	0
Dick, J. Harrison	1	1	0
Dickson, A., & Sons	10	10	0
Dickson & Robinson	10	10	0
Digby, Rev. C. D.	1	1	0
Divers, W. H.	1	1	0
Dixon, Abraham	52	10	0
Dixon, Chas.	2	2	0
Dixon, G.	5	0	0
Dobbie & Co.	25	0	0
Dobson, Mrs.	2	2	0
Dobson, H. V.	1	1	0
Dod, Rev. C. Wolley	10	0	0
Doig, Sur. Lieut.-Col.	2	2	0
Dolby, E. R.	1	1	0
Dorington, Sir J.	20	0	0
Dover, H. J.	1	1	0
Douglas, James	21	0	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Douglas, Miss Scott	2	2	0
Doulton, Miss	5	0	0
Doulton, Mrs.	1	1	0
Down, T.	0	5	0
Doyne, Miss B.	1	0	0
Drapers' Company	105	0	0
Dresden, Miss	5	5	0
Drew, John	2	2	0
Drewitt, O. Drewitt	10	0	0
Drost, K.	1	1	0
Drummond, Hon. F.	5	5	0
Drummond, Capt.	2	0	0
Duckworth, Wm.	5	5	0
Duckworth, Mrs.	1	1	0
Ducie, Earl of	30	0	0
Dugdale, Miss R. E.	5	0	0
Dugdale, Mrs.	5	0	0
Du Godman, F.	50	0	0
Duncombe, G. T. Peirse	6	6	0
Dundee Horticultural Association	1	1	0
Dunlop, Miss	2	0	0
Dunstan, M.	0	10	6
Durham, Mrs.	5	0	0
Dutton, A. F.	1	1	0
Dyke, W.	3	3	0
Dykes, A. H.	1	1	0
Earle, Mrs. C. W.	2	2	0
Earp, Wm.	0	12	6
East Anglian Hort. Club	2	2	0
Ebbs, Alfred B.	5	0	0
Ebrington, Viscountess	1	1	0
Eddy, J. Ray	10	0	0
Eddy, Miss	0	10	0
Edelsten, H., M.D.	1	1	0
Edlmann, C. C.	2	0	0
Edwards, E.	2	2	0
Edwards, Mrs. Lloyd	1	1	0
Edwards, Mrs. R.	5	5	0
Edwards, Rev. P. P.	1	1	0
Edwards-Moss, Sir John	5	5	0
Eley, Mrs.	15	0	0
Elliott, E. M.	2	2	0
Elliott, Mrs. F. A.	1	0	0
Ellis, C. J.	0	10	0
Ellis, Hon. Chas.	100	0	0
Ellis, Mrs. Welbore	1	1	0
Ellis, W. H.	1	1	0
Elwes, H. J.	1000	0	0
Elwes, H. T.	1	1	0
Emmott, W. B.	1	1	0
Engleheart, Rev. G. H.	5	5	0
English, J.	2	2	0
Epps, J., Jr.	1	1	0
Erskine, Mrs. K.	10	0	0
Esling, H.	1	1	0
Evans, Thomas	1	1	0
Eversfield, E.	10	10	0
Eyre, Rev. G. F.	1	1	0
Fairbridge, Miss	0	5	0
Farrer, Sir Wm.	50	0	0
Feiling, C. L. H.	10	10	0
Fenning, Jas.	1	1	0
Fenwick, E. Guy	3	3	0
Fenwick, G. A.	10	0	0
Fenwick, M.	2	2	0
Fenwick, N. P.	1	1	0
Ficklin, Mrs.	1	1	0
Fielder, C. R.	1	1	0
Fildes, Miss	1	0	0

	£	s.	d.
Finch, Wm.	1	1	0
Fisher, Mrs.	1	1	0
Fisher, J. H.	5	0	0
Fitzwilliam, Countess	5	0	0
Fletcher, Chas. E.	2	2	0
Fletcher, J. C. B.	10	10	0
Fletcher, R. G.	2	2	0
Fletcher, W. H. B.	10	10	0
Flight, F. W.	5	5	0
Floersheim, L.	5	5	0
Foljambe, Mrs.	0	5	0
Forbes, John	2	2	0
Forbes, Mrs. J.	5	0	0
Forster, Miss Y.	10	0	0
Fort, A. D.	1	1	0
Forwood, W. F.	5	5	0
Foster, Mrs.	2	2	0
Foster, Miss E. B.	2	2	0
Foster, Sir Michael	5	0	0
Fowler, J. Gurney	500	0	0
Fowler, Miss L. M.	5	0	0
Fox, Francis	2	2	0
Fox, F. F.	1	1	0
Fox, G. H.	10	0	0
Fox, W. St. J.	2	2	0
Francis, F. S.	2	2	0
Francis, T. Musgrave	2	2	c
Franklin, Mrs.	2	2	0
Franks, Mrs.	1	1	0
Fraser, John F.	5	5	0
Fraser, J.	2	2	0
Freelove, Col.	1	1	0
Freelove, Mrs.	0	10	6
Freeman, Chas.	10	10	0
Freeman, F. F.	5	0	0
Freemantle, Guy	2	0	0
Fremlin, R. H.	25	0	0
Fromow, W., & Sons	2	2	0
Fry, F. J.	5	0	0
Fyfe, Wm.	1	1	0
Gabriel, John T.	105	0	0
Gamble, J. S.	1	1	0
Gardiner, John	5	0	0
Gardner, J.	0	10	6
Gardner, John	1	1	0
Garratt, W.	1	1	0
Garrett, Mrs.	1	1	0
Garrod, Maj.-Gen. C.	1	1	0
Gascoigne, Mrs. T.	1	0	0
Gaskell, H.	1	0	0
Gaussen, Mrs.	1	1	0
Geall, John H.	1	0	0
Geiselbrecht, J. C.	5	5	0
Gensel, G.	1	1	0
Gibbs, A. E.	2	2	0
Gibson, T. G.	1	0	0
Gibson, G. & Co.	2	0	0
Giles, U. P.	5	5	0
Gill, Mrs. A.	0	10	0
Gilmour, Lt.-Col. Gordon	5	0	0
Gladstone, Sir J. R.	5	0	0
Gladstone, Miss C.	1	1	0
Gledstanes, F. G.	2	2	0
Gleeson, M.	2	2	0
Glehn, Mrs. E. Von	1	1	0
Glyn, Lady	1	1	0
Goad, A.	1	1	0
Godfrey, C.	1	1	0
Godfrey, W. J.	1	1	0
Godlee, J. Lister	2	2	0
Godseff, Joseph	5	0	0
Goldsmith, O.	0	5	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Gooch, T. S.	2	2	0
Goodacre, J. H.	1	1	0
Goodacre, Mrs.	1	1	0
Goodfellow, J.	0	10	6
Goodwin, A. R.	1	1	0
Goodwin, D. P.	1	0	0
Goodwyn, Mrs.	1	1	0
Goodyear, E.	2	2	0
Gordon Clarke, Major	1	1	0
Gordon, Robt.	50	0	0
Gordon-Lennox, Lady A.	1	1	0
Grace, Mrs.	2	2	0
Grant, Lady McPher.	1	0	0
Grant, Spencer W.	2	2	0
Grantham, Lady	1	1	0
Graves, Stephen	2	0	0
Gray, Thos.	1	1	0
Greaves, Benj.	1	1	0
Green, Herbert	25	0	0
Green, John (Hobbies)	25	0	0
Greenwood, H. J.	5	5	0
Greg, Mrs. M. S.	1	0	0
Gregory, George	10	10	0
Grey, Countess	2	2	0
Grey, Lady	2	10	0
Grey, Sir Edward	2	10	0
Grice, J. T.	2	2	0
Grier, R. M.	0	10	6
Grieve, Mrs.	1	1	0
Griffith, D. C.	1	1	0
Grimshaw, J. S.	10	0	0
Grimston, E. E.	1	1	0
Grote-Joyce, Mrs.	5	0	0
Guest, Lady T.	1	1	0
Guildford, Miss	0	10	0
Gull, Sir Wm. Cameron	5	0	0
Gullick, W. F.	0	2	6
Gumbleton, W. E.	50	0	0
Gunn, W. C.	1	1	0
Gwilliam, A. L.	0	10	0
Hadley, Miss D.	0	10	6
Haig, E. W.	1	1	0
Hales, W.	1	1	0
Hall, A. T.	1	1	0
Hall, H. Ernst	2	2	0
Hall, Mrs.	0	10	0
Hall, Mrs. E. S.	5	5	0
Hall, P. H.	1	1	0
Hall, Rev. H.	1	1	0
Hamilton, Duchess of	5	5	0
Hammersley, A. C.	5	5	0
Hammond, Geo.	2	2	0
Hampton, Miss	1	0	0
Hanbury, F. J.	2	2	0
Hanbury, George	5	5	0
Handcock, Mr.	1	1	0
Handley, Edwin	2	2	0
Hannen, Miss	0	2	6
Hardcastle, Miss A.	2	0	0
Hare, Sholto H.	10	0	0
Harewood, Countess of	1	0	0
Harman, T. R.	21	0	0
Harris, Mrs. G.	1	0	0
Harris, Rev. J. M.	0	10	6
Harrison, Lady	1	1	0
Harrison, Sidney	5	5	0
Harrison & Sons	5	5	0
Harrison, T. F.	10	10	0
Hartland, W. B.	2	2	0
Hartley, H.	1	1	0
Hartree, C.	2	2	0

	£	s.	d.
Hartshorne, A. F.	1	1	0
Harvey, E. D. L.	2	2	0
Haselhurst, E.	1	1	0
Hatchard, Mrs.	2	2	0
Hawker, H. G.	1	1	0
Hawker, W.	1	1	0
Hawkins, Rev. R. M.	1	1	0
Hawson, W. G.	1	1	0
Hay, Miss H. L.	2	0	0
Haynes, H.	5	5	0
Hazelton, E. F.	1	0	0
Headlam, Rev. A. C.	2	2	0
Heal, John	1	1	0
Hebeler, H. A.	5	5	0
Heilbut, S.	5	5	0
Henderson, Sir A.	10	10	0
Henslow, Rev. G.	1	1	0
Henty, Miss	1	0	0
Herbert, Mrs. Arnold	2	2	0
Herbert, S.	3	3	0
Herbst, H.	21	0	0
Herschel, Sir Wm.	1	1	0
Hewett, W. H.	1	1	0
Hewitson, J. R.	1	0	0
Heywood, Miss H.	1	0	0
Hicks, Alfred	1	1	0
Hicks, W.	0	5	0
Hill, Daniel	4	4	0
Hill, Edwin	2	2	0
Hill, F.	2	2	0
Hilliar, Hy.	5	0	0
Hillier, E., & Sons	2	2	0
Hilton, R. R. P.	1	1	0
Hinckes, Ralph	1	0	0
Hoare, J. Rolls	21	0	0
Hoare, Mrs.	0	5	0
Hoare, Mrs. J. Rolls	10	0	0
Hodgson, E. T.	1	1	0
Hodgson, F. C.	2	2	0
Hodgson, Matt.	5	0	0
Hodgson, Miss M.	0	10	0
Hoffman, Mrs.	1	1	0
Hoffman, R.	10	0	0
Hogbin, P.	1	1	0
Hogg, R. Milligan	105	0	0
Holborn, Mrs.	5	5	0
Holden, Mrs.	1	1	0
Holford, Capt. G. L.	500	0	0
Hollingworth, T. S.	2	0	0
Homewood, Mrs.	0	10	0
Homfray, G.	5	0	0
Hood, Dr. D.	3	3	0
Hooley, P. W.	1	1	0
Hooper, C. H.	1	1	0
Hopkins, John	2	2	0
Hopkins, Miss	0	10	6
Horan, Matthew	5	0	0
Horne, Mrs.	2	2	0
Horsley, E.	0	2	6
Horticultural Club	21	0	0
Horton, W. P.	5	0	0
Hoskyns, A. P.	1	1	0
Houghton, F.	1	1	0
Houghton, Wm.	10	10	0
Houlder, Alf. H.	10	10	0
Howard, J.	1	1	0
Howe, Wm.	1	1	0
Howell, J. B.	5	0	0
Howes, J. G.	10	0	0
Hudson, James	10	0	0
Hudson, Miss	0	10	0
Humphrey, Fk. W.	1	1	0
Hunt, Geo.	1	1	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Hurnard, S. F.	2	0	0
Hurst, C. C.	5	0	0
Hutchinson, W. H.	5	0	0
Hutton, Miss K.	1	1	0
Iceton, W.	4	4	0
Ilchester, Earl of	300	0	0
Ince, Surg.-Major J.	5	5	0
Ingham, Miss E.	1	1	0
Innes, Mrs. A.	1	1	0
Iveagh, Lord	100	0	0
Jackson, J. Flower	2	2	0
Jackson, R. E.	1	1	0
Jackson, S. F.	5	5	0
James, W. J.	2	2	0
Jannoch, T.	1	1	0
Jaques, John	1	1	0
Jardine, Mrs.	1	1	0
Jefferies, W. J.	5	0	0
Jekyll, Miss G.	5	5	0
Jenkins, E. H.	2	2	0
Jennings, J.	2	2	0
Jeremy, Mrs. A.	1	0	0
Joad, Mrs.	5	0	0
Johnson, E.	3	3	0
Johnson, E. H.	1	1	0
Johnson, F. P.	1	1	0
Johnson, J. M.	1	1	0
Johnston, Miss	1	1	0
Jonas, Hy.	3	0	0
Jones, H. J.	20	0	0
Jones, Miss F. M.	1	0	0
Jones, W.	0	10	6
Joyce, Miss A.	1	1	0
J. W. P.	1	1	8
Kay, Peter E.	10	10	0
Kaye, Mrs.	1	1	0
Keates, Mrs. J.	1	0	0
Kelk, Sir John W.	25	0	0
Kelly, Rev. E. E.	0	2	6
Kelvin, Lady	5	0	0
Kelway, Wm.	10	10	0
Kemble, H.	5	0	0
Kemble, Mrs.	1	1	0
Kemp, Mrs. J. E.	1	1	0
Kent, Geo.	1	0	0
Kenyon-Slaney, Lady	1	0	0
Ker, R. Wilson	25	0	0
Kerr, Hugh	5	5	0
Kerridge, A. A.	1	0	0
Kerrison, Mrs.	5	5	0
Kessler, Mrs. G.	2	0	0
Keyser, Chas. E.	21	0	0
Kilgour, F.	1	1	0
Killik, Mrs.	2	2	0
King, E.	1	1	0
King, E. Dawson	0	10	6
King, E. Powell	0	10	0
King, J. K., & Sons	2	2	0
King, Miss	1	1	0
King, Rev. F. Meade	3	0	0
Kinleside, Rev. R.	5	0	0
Kinnear, T. J.	1	1	0
Kinnell & Co.	10	10	0
Knight, H.	1	1	0
Knight, John	2	2	0
Knowles, T. Foster	105	0	0
Knowles, P. O.	1	1	0
Knox, Mrs. V.	1	1	0
Konig, F. A.	20	0	0

	£	s.	d.
Kurtz, A. J.	1	1	0
Lacon, Mrs. S.	1	1	0
Lacy, Mrs. de Lacy	1	0	0
Laing, Wm.	2	2	0
Lambe, Mrs.	0	10	0
Lambert, F. D.	10	10	0
Landale, Mrs. A. K.	5	5	0
Lane, F. Q.	10	0	0
Lane, Col. C. T.	2	2	0
Lane, Wm.	1	1	0
Lange, G.	5	0	0
Langford, Mrs.	1	0	0
Langton-Fetherston, Mrs.	1	0	0
Lansdell, J.	0	5	0
Lascelles, Rev. E.	1	1	0
Latham, W. B.	3	3	0
Latham, M. K.	0	5	0
Lawrence, Mrs. Aubrey	5	0	0
Lawrence, Sir Trevor	500	0	0
Lawrence, Miss M.	50	0	0
Lawrence, The Misses	20	0	0
Laxton Bros.	5	5	0
Laycock, J. F.	1	1	0
Lea, Richard	1	1	0
Lee, Mrs. E. D.	1	1	0
Lee, G.	1	1	0
Lee, Miss Yate	0	5	0
Leech, R. B.	5	5	0
Leete, Norman	5	5	0
Legge, C. E.	1	1	0
Legh, Hon. Major	1	0	0
Leman, G. C.	2	2	0
Leonard, Miss	1	1	0
Leslie-Melville, A. H.	5	5	0
Lester, T.	1	1	0
Le Sueur, C.	1	1	0
Letts, C.	5	0	0
Lewis, Mrs. Hornby	5	5	0
Lewis, Miss	5	5	0
Lewis, E. J.	2	2	0
Lewis, G.	1	1	0
Lidderdale, F. F.	1	1	0
Lilford, Lady	5	5	0
Lindley, Miss J.	25	0	0
Lindley, Lord	21	0	0
Lindsay, R.	2	2	0
Lindsay, Mrs.	1	1	0
Line, T. C.	1	1	0
Liston-Foulis, R. J.	1	1	0
Litchfield, T. G.	1	1	0
Littledale, Miss	0	5	0
Llangattock, Lord	100	0	0
Llewellyn, Miss M.	1	1	0
Llewellyn, Sir John	105	0	0
Lloyd, Arthur	105	0	0
Lloyd, F. G.	105	0	0
Lloyd, Frank	105	0	0
Lock, Miss	1	1	0
Lockhart, A. W.	5	5	0
Loder, Sir Edmund	200	0	0
Loder, Gerald	26	5	0
Logan, Mrs.	0	10	0
London & County Bank Directors	10	10	0
Londoner	1	1	0
Long, Miss	0	5	0
Longfield, Lt.-Col.	10	10	0
Longmire, F.	0	10	6
Lonsdale, Hon. Mrs. Heywood	5	5	0
Lonsdale, Miss	1	1	0
Lothian, M. J.	10	10	0
Low, Hugh & Co.	52	10	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Low, E. V.	26	5	0
Low, Sir H.	1	1	0
Low, Stuart H.	26	5	0
Lowe, Joseph	5	0	0
Lowis, N.	0	10	6
Lowndes-Salmon, W. A.	0	10	0
Luard, Major	1	1	0
Lubrose Paint Co.	2	2	0
Lucas, C. J.	100	0	0
Lucas, C. Phipps	3	3	0
Lucking, W. J.	2	2	0
Lunn, Rev. C.	0	7	6
Lye, R.	0	5	0
Lyell, A. H.	1	1	0
Lynch, Irwin	1	0	0
Lyndon, Arnold	1	1	0
Macartney, Miss	0	10	6
Macdonald, F. W.	2	2	0
Mackellar, A.	2	2	0
Mackenzie & Moncur	25	0	0
Mackinnon, J.	10	0	0
Mackmurdo, Mrs.	1	1	0
Mackrell, J.	5	5	0
Macmillan, G. A.	10	0	0
Magor, E. S. P.	1	1	0
Maillard, Mrs.	1	1	0
Maitland, W. J.	2	2	0
Mallett, J.	5	0	0
Mangles, H. A.	1	0	0
Mangles, Miss C.	1	1	0
Mann, H. H.	1	1	0
Mantell, J.	2	2	0
Manvell, G. S.	1	1	0
Marindin, Mrs.	1	1	0
Markendale, R. S.	1	1	0
Marsh, G. R.	1	1	0
Marshall, G. A.	5	5	0
Marshall, Mrs.	2	2	0
Marshall, Mrs.	1	1	0
Martin, H. A.	5	5	0
Martin-White, J.	2	2	0
Martin, H. J. W.	1	1	0
Martin, Miss	1	1	0
Martin, Miss M.	0	2	6
Martineau, A. M.	1	1	0
Mason, Lady Evelyn	20	0	0
Mason, H. J.	3	3	0
Mason, Miss	1	0	0
Masters, Dr.	7	7	0
Matthew, A.	1	1	0
Matthey, Laurence	1	1	0
Maull, G. T.	1	1	0
Maw, A. T.	0	5	0
Mawley, Edw.	5	0	0
May, H. B.	52	10	0
May, Frank	10	10	0
Mayhew, Mrs.	5	0	0
Mayne, J.	0	10	6
Mayo, C. H.	0	10	6
McBean, J. & A. A.	10	10	0
McCallan, Edw.	10	10	0
McClean, Mrs.	2	2	0
McDonald, A. J.	0	5	0
McGaw, Mrs.	10	0	0
McLachlan, R.	15	15	0
McLeod, J. F.	2	2	0
McTier, F.	1	1	0
Medway, Lord	5	0	0
Meinertzhagen, Mrs.	1	1	0
Melchers, C. E.	3	3	0
Mellish, Miss	20	0	0

	£	s.	d.
Mercers' Company	26	5	0
Meredith, Ven. Rev. Thos.	1	0	0
Messel, L.	21	0	0
Metcalfe, Mrs	2	2	0
Metcalfe, A. W.	1	1	0
Meysey-Thompson, Miss	0	10	0
Mildred, Mrs.	1	1	0
Mill, Miss E.	2	2	0
Miller, Rev. J. Norman	1	1	0
Miller, Mrs.	1	1	0
Milman, Rev. Canon	1	1	0
Milner, Mrs.	1	1	0
Milner, R.	1	1	0
Mitchell, A. C.	5	0	0
Mitchell, W.	5	0	0
Mitchell, W.	0	10	0
Molyneux, E.	1	1	0
Monro, Geo.	52	10	0
Moon, Miss S. E.	1	1	0
Moor, Rev. Gerald	1	1	0
Moore, G. F.	10	10	0
Moore, C. W. B.	3	3	0
Moore, F. W., V.M.H.	2	2	0
Moore, J. M.	1	1	0
Moore, C. T.	1	1	0
Moore, T. Y.	0	10	0
Moore-Gwyn, J. E.	2	2	0
Morgan, Pierpont	1000	0	0
Morgan, Mrs. Hickman	10	0	0
Morley, Lord	3	0	0
Morris, Sydney	50	0	0
Morris, Sir D.	5	5	0
Morrish, R. J.	1	1	0
Morrison, Mrs.	1	0	0
Mortimer, S.	5	0	0
Mortimer, Mrs.	1	1	0
Mortlock, Mrs.	1	1	0
Morton, R.	5	5	0
Moss, A.	1	1	0
Mount, George	5	0	0
Mueller, Hugo	10	0	0
Muhm, Miss	1	1	0
Muirhead, Mrs.	1	1	0
Munro, Miss E.	0	10	6
Murray, Col. Wyndham, M.P.	2	2	0
Murton, Sir Walter	3	3	0
Musgrave, Lady	1	1	0
Myers, W. H.	10	10	0
National Chrysan. Soc.	5	5	0
Nat. Rose Soc.	25	0	0
Neal, W. E.	0	10	6
Neame, J. A.	1	1	0
Neighbour, J.	0	10	6
Nettlefold, Mrs.	5	0	0
Neville, Lady Dorothy	1	0	0
Newall, H. F.	3	3	0
Newington, Dr. A.	1	1	0
Newman, Mrs.	1	1	0
Newman, T. P.	2	2	0
Newman, W. J.	1	1	0
Nicholson, Geo.	2	2	0
Nicholson, J.	2	2	0
Nicholson, Miss	1	1	0
Nix, Arthur P.	5	0	0
Nix, C. G. A.	21	0	0
Nix, J. A.	10	0	0
Nix, Miss A. L.	1	1	0
Noel, Ernest	5	5	0
Norfolk and Norwich	1	1	0
Norman, F. W.	1	1	0
Norman, George	1	1	0
Norman, Mrs. A. J.	5	0	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Norris, Lady	1	1	0
Notcutt, R. C	2	2	0
Nott, J.	1	1	0
Nutting & Sons	50	0	0
O'Brien, James	1	1	0
Odell, J. W.	1	0	0
O'esterley, E.	1	1	0
Ogilvie, F. M.	5	0	0
Ohlson, F. R.	1	1	0
Oldham, J. B.	1	1	0
Oliver, Mrs.	5	0	0
One Brick	0	10	6
Orpen, Osmond G.	2	2	0
Osman & Co.	2	2	0
Owen, Francis	1	0	0
Owen-Jones, Major-General	1	1	0
Padday, W. C. S.	2	2	0
Padwick, Mrs.	1	1	0
Page, C. Carter	20	0	0
Page-Roberts, Rev. F.	1	1	0
Page, Samuel P.	5	5	0
Page, W. H.	2	2	0
Pain, F. H.	1	1	0
Palmer, G. W., M.P.	30	0	0
Palmer, Mrs. Cleeves	2	2	0
Palmer, Mrs. Golding	2	0	0
Palmer, W.	0	10	0
Palmer, W. Howard	5	0	0
Parker, Mrs. C.	10	0	0
Parker, J. W.	5	5	0
Parkes-Smith, T.	1	1	0
Parkin, John	2	2	0
Parlby, Mrs. G. H.	1	0	0
Parr, Hy.	1	1	0
Parr, J. C.	10	10	0
Pars, A. C.	1	1	0
Pascoe, The Misses	5	0	0
Paul & Son	50	0	0
Paulin, Wm. Thos.	25	0	0
Paulson, W.	0	10	6
Pauwels, T.	3	10	0
Pawle, F. C.	25	0	0
Payn, Howard	1	1	0
Payne, Mrs.	0	5	0
Payne, Wm.	25	0	0
P. C. H. E.	1	0	0
Peace, G. H.	1	1	0
Pears, Andrew	5	5	0
Pearks, H.	1	0	0
Pearse, I. N. Hart-Smith	1	1	0
Pearson, J. R., & Sons	10	10	0
Pearson, J. Duncan	1	1	0
Pearson, Sir Weetman D., Bt.	21	0	0
Peed, John, & Son	25	0	0
Pelham-Clinton, Lord	5	0	0
Pelly, Dowager Lady	0	10	6
Perkins, F.	2	2	0
Perrins, C. W. D.	5	0	0
Perry, Amos	10	0	0
Perry, Mrs.	1	0	0
Petersen, F. W. V.	5	0	0
Peto, Sir Henry	2	2	0
Petts, A.	1	1	0
Philbrick, Miss	1	1	0
Phillimore, Lady	0	5	0
Phillips & Taylor	1	1	0
Phillips, Chas.	1	1	0
Phillips, Lady Faudel	5	5	0
Phillips, Lionel	25	0	0
Phillips, Mrs.	2	0	0

	£	s.	d.
Phippen, Mrs. J.	1	1	0
Piesse, Miss E. M.	1	1	0
Piggott, W.	3	0	0
Pike, L. G.	2	0	0
Pike, Miss	3	3	0
Pilkington, Mrs. R.	5	0	0
Pinches, John	1	1	0
Pipe, Miss H.	1	1	0
Piper, G. W.	1	0	0
Pitt, H. T.	26	5	0
Platt, Chas.	0	10	6
Pole-Carew, Mr. & Mrs.	1	1	0
Pollard, Miss Grace	0	5	0
Pollett, H. M.	1	1	0
Pool, Mrs. Batten	1	0	0
Pope & Co.	2	2	0
Pope & Sons	5	5	0
Pope, John	5	5	0
Pope, W.	2	2	0
Potter, J. Wilson	21	0	0
Potter, Richard	10	10	0
Powell, C. B.	5	5	0
Powell, R. C.	1	1	0
Powell, T. W.	2	2	0
Power, H.	1	1	0
Pownall, G. H.	5	0	0
Prater, H.	1	0	0
Price, James	1	1	0
Price, Mrs.	1	1	0
Price, M. W.	5	0	0
Prichard, M.	1	10	0
Prince, Geo.	5	5	0
Prior, D., & Sons	5	5	0
Probyn, Sir Dighton	1	1	0
Protheroe & Morris	26	5	0
Pryor, Miss K.	5	5	0
Pulham & Son	3	3	0
Pullar, Sir Robert	10	0	0
Pyne, George	2	2	0
Quinsey, Miss	2	0	0
Radford, F. W. A.	1	1	0
Radnor, Countess of	5	5	0
Ralli, Pantia	50	0	0
Ramsey, Capt. J.	2	0	0
Ransom, A.	1	1	0
Ransom, F.	1	1	0
Ransom, W.	5	0	0
Raphael, G. C.	200	0	0
Raphael, W.	21	0	0
Rashleigh, E. S.	10	10	0
Rawlings, E.	5	5	0
Reamsbottom & Co.	1	1	0
Redesdale, Lord	100	0	0
Rehder, Frank A.	5	5	0
Reid, Capt. S.	2	2	0
Reid, Mrs.	2	2	0
Reiss, Mrs. Hy.	5	0	0
Reuthe, G.	1	1	0
Rhodes, Col.	0	5	0
Rhodes, Miss L.	1	1	0
Ricardo, F.	1	1	0
Richards, G. H. (XLALL)	25	0	0
Richardson, C. G.	1	1	0
Richardson, C. G., jun	5	5	0
Richardson, H.	1	1	0
Richardson, Miss H.	1	1	0
Riddick, R. F.	1	1	0
Rigden, Wm.	10	10	0
Rigg, Thomas	1	1	0
Riley, John	1	0	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Rivers, Thos., & Sons	50	0	0
Roach, H. W.	2	2	0
Robbins, B. R.	5	0	0
Roberts, Dr. H.	5	0	0
Roberts, G. H.	0	2	6
Roberts, J.	3	3	0
Roberts, J.	1	1	0
Roberts, Lady	5	0	0
Roberts, Miss	1	1	0
Roberts, N.	1	1	0
Roberts, William	1	1	0
Robertson, G. C.	7	0	0
Robinson, Miss	1	1	0
Robinson, Rev. F. J.	1	0	0
Robinson, W.	1	0	0
Robson, John	2	2	0
Rochester, Dean of	5	0	0
Rochford, T., & Sons, Ltd.	52	10	0
Roebling, C. G.	52	10	0
Rogers, J. Innes	2	2	0
Rogers & Son, W. H	2	2	0
Rogers, R. B.	1	0	0
Rogers, J. A.	0	5	0
Rolls, G. H.	1	1	0
Roozen, A., & Son	5	5	0
Roscoe, Lady	5	0	0
Ross, Chas.	1	1	0
Rotch, Miss E. M.	1	1	0
Rothschild, Leopold de	525	0	0
Rothschild, Lord	1,050	0	0
Rothschild, Miss Alice	150	0	0
Rottenburg, P.	1	1	0
Rotton, Sir J. F.	5	5	0
Roupell, W.	2	2	0
Routh, Mrs. C.	0	5	0
Routh, Miss	0	5	0
Rowcliffe, Mrs. E. L.	1	1	0
Rowley, Hon. Mrs.	1	0	0
Rowley, H.	0	10	0
Royds, Col., M.P.	10	10	0
Royds, Mrs.	0	10	0
Rucker, Jas. M.	10	10	0
Rucker, Misses	10	10	0
Rudd, C. D.	100	0	0
Rumball, A.	0	10	6
Russell, A. Gordon	1	1	0
Russell, C. M.	1	1	0
Russell, J. C.	1	1	0
Russell, W. J.	2	2	0
Rutherford, J., M.P	25	0	0
Ryder, E.	1	1	0
Sales, Col. T. H.	5	5	0
Salomons, Leopold	52	10	0
Salt, E.	3	3	0
Salt, Lady	1	1	0
Salt, The Misses	1	1	0
Salter, C. J.	0	10	0
Samuel, Lady	2	2	0
Samuells, Miss	0	5	0
Sandeman, Col. J. G.	5	0	0
Sander, F., & Co.	105	0	0
Sanderson, Finlay	3	0	0
Sanderson, Harold	1	1	0
Sanderson, J.	1	1	0
Sands, S. H.	4	4	0
Saunders, F. R.	1	1	0
Saunders, G. S.	1	1	0
Saunders, Mrs. Carr	1	1	0
Savage, Dr.	5	0	0
Savile, Col. A. R.	1	1	0
Savory, Rev. E.	2	2	0

	£	s.	d.
Schlusser, F.	1	1	0
Schlusser, F. (the late)	10	10	0
Schlusser, Miss A. A.	3	3	0
Schneider, G.	1	1	0
Schreiber, C. S.	1	1	0
Schroder, Bruno	52	10	0
Schröder, The Baron	5,000	0	0
Schroder, W. von	1	1	0
Schuster, Rev. P.	1	1	0
Scott, Mrs. G.	1	1	0
Scott, J. C.	1	1	0
Seabrook, W.	1	1	0
Seaman, Mrs.	1	1	0
Searle, S. W.	1	1	0
Seaton, D.	0	10	0
Seden, John	1	1	0
Sedgwick, Tom	2	2	0
Sharp, W. E.	1	1	0
Sharpe, Frederic	1	0	0
Sharpin, E. Colby	2	2	0
Shaw, W. T.	5	5	0
Shepheard, B.	5	5	0
Sheppard, Mrs.	1	1	0
Sheppard, Mrs. E. B.	0	10	6
Sherbrooke, Viscountess	1	0	0
Sherriff, Mrs.	1	0	3
Sherwood, N. N.	1000	0	0
Shipley, A.	2	2	0
Shipley, Mrs.	1	0	0
Shirley, Rev. W.	0	5	0
Shuter, W.	10	10	0
Sibthorp, C. C.	5	0	0
Sich, Mrs. A.	2	2	0
Sillem, Miss A.	0	10	6
Skilbeck, G. T.	5	0	0
Skipwith, Mrs	1	1	0
Skinners' Company	52	10	0
Slocock, W. C.	10	10	0
Simmon, H. W.	1	1	0
Simmonds, J. D.	1	0	0
Simons, Mrs.	1	0	0
Slater, Joseph	1	1	0
Slim, E. J.	1	1	0
Smith, A. Murray	2	2	0
Smail, Mrs.	1	1	0
Smith & Ebbs, Ltd.	25	0	0
Smith-Barry, Rt. Hon. A.	50	0	0
Smith, Hon. Mrs. Murray	3	0	0
Smith, James	5	5	0
Smith, John	1	0	0
Smith, Martin R.	105	0	0
Smith, Mrs. Alderson	1	0	0
Smith, Nigel M.	10	0	0
Smith, T. Dorrien	10	10	0
Smith, Thomas	105	0	0
Smith, William	2	2	0
Smyth, H. G.	2	2	0
Smyth, Lady	2	2	0
Sneyd, Miss	0	10	0
Snowden, F.	2	2	0
Somers, Miss E.	5	0	0
Somerset, Duchess of	3	0	0
Somerset, R. G. H.	1	1	0
Somes, Mrs.	5	5	0
Speer, Capt.	1	1	0
Spicer, E. S.	0	10	6
Spencer, W.	2	2	0
Spooner, S., & Sons	3	3	0
Spragge, Lt.-Col., D.S.O.	1	1	0
Spratt, Mrs.	1	1	0
Squarey, Mrs.	0	10	0
Stansfeld, Mrs.	1	1	0

DONATIONS TO THE HALL—*continued*

	£	s.	d.
Stanyforth, Mrs.	2	2	0
Stearns, E. F.	1	1	0
Steinkopff, E.	200	0	0
Stephens, J. W.	2	2	0
Stephenson, Clarke, Major	20	0	0
Stern, E. D.	25	0	0
Stern, Mrs.	5	5	0
Stewart, H. G. Murray	2	2	0
Stirling, Sir Jas.	5	5	0
Stokes, F.	1	1	0
Stone, Mrs. Kate	1	1	0
Stone, R. E. T.	5	5	0
Storrie and Storrie	2	2	0
Straker, Mrs.	3	3	0
Strange, J. T.	2	2	0
Strike, William	1	1	0
Stuart, C. Esme	5	0	0
Stuart, John	1	1	0
Stuart, Mrs. Stirling	1	1	0
Stuttaford, W. F.	2	2	0
Sulivan, Miss	25	0	0
Sutherland, Dr. G. S.	20	0	0
Sutherland, Duchess of	1	0	0
Sutton, Arthur W.	1000	0	0
Sweet, Chas.	1	1	0
Sweet, James	52	10	0
Swetenham, Mrs.	1	0	0
Sydenham, Robt.	25	0	0
Sykes, Henry	2	2	0
Sykes, Mrs. Hardcastle	2	2	0
Symondson, S. V.	2	2	0
Tanner, H.	1	1	0
Tanner, R.	1	1	0
Tapper, F.	0	10	6
Tate, Alfred	100	0	0
Tate, Lady	500	0	0
Taviner, H. R.	1	1	0
Taviner, P.	1	1	0
Tayler, Mrs. E. M.	1	0	0
Tayler, Will	2	0	0
Taylor, Miss E.	1	1	0
Taylor, John E.	5	0	0
Taylor, Thos.	4	4	0
Temple, Mrs.	2	2	0
Thudichum, L. M.	0	10	6
Tennant, Hon. Mrs.	1	1	0
Tennant, Lady	25	0	0
Thomas, E. E.	1	1	0
Thomas, Mrs. Haig	2	2	0
Thomas, Lieut-Colonel Evan	1	1	0
Thomas, Joseph	1	0	0
Thomas, Owen	2	2	0
Thomassett, B. C.	5	5	0
Thompson, Mrs. Yates	10	0	0
Thompson, Wm.	10	10	0
Thomson, Mrs.	0	10	6
Thomson & Sons, Ltd.	1	1	0
Thomson, Mrs. M.	10	0	0
Thorpe, E. F.	2	2	0
Thornycroft, Lady	0	10	0
Thwaites, Mr. and Mrs.	10	10	0
Tiarks, H. F.	200	0	0
Tidswell, R. H.	10	0	0
Tidy, W.	0	5	0
Tien, Mrs. H.	1	1	0
Till, E. D.	1	1	0
Tillard, Rev. J.	1	1	0
Timmis, Mrs.	2	2	0
Tinsley, F.	1	1	0
Todd, R. A.	1	1	0
Tolson, Miss M.	1	0	0

	£	s.	d.
Toope, Chas.	2	2	0
Torrens, Capt. A.	5	0	0
Torrens, Mrs.	5	0	0
Townshend, Hon. Mrs.	1	1	0
Tracy, H. A.	20	0	0
Treble, John	1	1	0
Trench, Colonel Hon. Le Poer	5	0	0
Trevelyan, Lady	2	0	0
Trier, E.	0	5	0
Trollope, Mrs. G. H.	1	1	0
Trotter, E.	1	1	0
Tucker, Duncan	2	2	0
Tudway, C. C.	2	0	0
Tufnell-Tyrrell, Mrs.	0	10	6
Tulk, Mrs.	5	5	0
Turnbull, T. S.	2	2	0
Turner, R. D.	5	0	0
Turton, T.	1	1	0
Twynam, Colonel E. J. L.	25	0	0
Underwood, F. J.	1	1	0
Unger, A.	1	1	0
Unite, J.	5	5	0
Upton, A. R.	5	0	0
Upton, J. J.	2	0	0
Usherwood, Rev. T. E.	1	1	0
Varley, A. F.	1	1	0
Vaughan, R. C.	1	1	0
Veitch, Harry J.	105	0	0
Veitch, Jas., & Sons, Ltd.	250	0	0
Veitch Memorial Trustees	52	10	0
Veitch, Mrs. Harry J.	52	10	0
Veitch, R., & Son	10	10	0
Ventry, Lord	5	5	0
V. H. J.	2	12	6
Verschoyle, R.	5	0	0
Vert, J.	1	1	0
Vickery, J. Collard	2	2	0
Villiars, Miss Stuart	0	5	0
Vinden, E. L.	1	1	0
Vines, Prof. S. H.	5	0	0
Vulliamy, J.	2	2	0
Vulliamy, Mrs.	1	1	0
Waddingham, T. J.	2	0	0
Waggett, John	2	2	0
Wagstaff, J. H.	0	10	6
Wakeley, C.	1	1	0
Wakeman-Newport, Mrs.	5	5	0
Waldo-Sibthorpe, M. R.	5	0	0
Walker, Major-Gen. A. L.	1	1	0
Walker, A. O.	2	2	0
Walker, Mrs. F.	2	2	0
Walker, F. J.	5	0	0
Walker, J. (Ham)	10	10	0
Walker, Rev. John	1	0	0
Walker, T.	1	1	0
Walker, V. E.	5	0	0
Walker, Walter C.	25	0	0
Wallace & Co.	10	10	0
Wallis, Dr. P.	1	1	0
Wallis, W. E.	1	1	0
Walter, Mrs. F.	5	0	0
Walters, Thomas	2	2	0
Walters, T.	1	1	0
Wantage, The Lady	100	0	0
Ward, Inett	5	5	0
Ward, J. P.	1	1	0
Ward, Mrs. A. W.	1	1	0
Warde, Mrs. H. L.	1	1	0
Ware, W. T.	10	10	0

DONATIONS TO THE HALL—*continued.*

	£	s.	d.
Ware and Dist. Hort. Soc. ...	1	1	0
Waring, S J.	52	10	0
Waring, Miss	1	1	0
Warne, G. F. S....	10	0	0
Warren, John	20	0	0
Warrender, Hugh	1	1	0
Warton, Mrs. R.	5	5	0
Warwick, Countess of	10	0	0
Warwick, Miss	1	1	0
Waterer, Anthony	100	0	0
Waterer, J., and Sons	10	0	0
Waterfield, Miss	1	1	0
Watkins, C. S. C.	0	10	6
Watson, Mrs.	2	2	0
Watson, W.	1	1	0
Watson, Jas.	1	1	0
Watt, J. W.	1	1	0
Watts, E. C.	0	10	6
Watts, E. A.	0	10	6
Watts, Mrs. M.	0	10	0
Waugh, Geo.	1	1	0
Way, Rev. J. P....	1	1	0
Weatherley, Mrs.	2	2	0
Webb, Miss	2	2	0
Weber, Mrs.	5	0	0
Weber, Sir Hermann	2	2	0
Weeks & Co.	10	10	0
Weeks, W.	5	5	0
Weeks, H. J.	1	1	0
Welch, Miss J.	2	2	0
Welch, William...	1	1	0
Welchman, Mrs.	5	0	0
Weller, Major A. T.	5	5	0
Wellesley, Francis	10	10	0
Wells, W. & Co.	2	2	0
Wells, W.	1	1	0
Wells, Miss	0	10	6
Wernher, J.	100	0	0
West, F.	1	1	0
West, J. T.	1	1	0
Weston, J.	5	5	0
Whall, J. Snow	1	1	0
Whalley, W.	0	10	0
Wheatley, S. W.	1	1	0
Wheeler, Miss Cornelius ...	0	10	6
Wheeley, W. H.	2	2	0
Whitaker, Mrs. W.	2	2	0
Whitaker, Mrs.	2	0	0
White, E. A. D.	1	1	0
White, Mrs.	1	1	0
White, Mrs. Towry	1	1	0
White, Rev. J. N.	1	1	0
Whitehead, Lady	1	1	0
Whitelaw, A.	5	0	0
Whitelaw, W.	0	10	6
Whitelegg, G. G.	0	10	0
Whiteley, William	5	5	0
Wickham, Rev. C. T.	1	1	0
Wicks, James	1	1	0
Wigan, Sir Fredk.	250	0	0
Wigan, A. L.	21	0	0
Wilbraham, Miss	2	2	0
Wild, C. K.	2	2	0
Wilkinson, Miss F. R.... ..	3	3	0
Wilks, Rev. W....	25	0	0
Willard, J.	1	1	0
Willcocks, J. W.	0	10	0
Williams, J. C.	100	0	0

	£	s.	d.
Williams Memorial Trustees ...	10	10	0
Williams, Percy...	10	0	0
Williams, Miss	5	0	0
Williams, P. D....	5	0	0
Williams, F. Hue	6	6	0
Williams, W. B.	1	0	0
Williams, Miss R.	0	10	6
Williams, Miss R. A.	0	10	0
Willmott, Miss	100	0	0
Wills, Mrs. W. A.	3	3	0
Wilson, Mrs.	5	0	0
Wilson, Mrs. J. W.	2	2	0
Wilson, W. R.	2	2	0
Wilson, G. N.	1	1	0
Wilson, A. M.	1	1	0
Wilson, G. A.	1	1	0
Wilson, Mrs. C....	1	1	0
Wilson, Mrs. F. K.	1	1	0
Wilson, J. W.	0	10	6
Wilson, J. W.	0	10	6
Wilson, H. B.	0	5	0
Wimsett, J. W.	5	5	0
Windover, T.	1	1	0
Winn, C....	5	5	0
Winter, J. N.	1	1	0
Witts, Mrs. F. R. V.	1	1	0
Witty, J. H.	1	1	0
Woakes, E.	3	3	0
Wood, Miss	5	5	0
Wood, Jas. G.	1	1	0
Woodbridge, C....	2	2	c
Woodhouse, Mrs.	1	1	0
Woods, James	1	1	0
Woodward, Geo.	1	1	0
Woolff, W. R.	0	10	6
Woolford, J.	1	1	0
Woollatt, F. A.	1	1	0
Wootten, J. C.	3	3	0
Wootton, E. J.	1	1	0
Wren, Miss	0	10	6
Wright, T. Beresford	5	0	0
Wright, A.	1	1	0
Wright, A. W. G.	1	1	0
Wright, J.	5	0	0
Wright, Miss	1	1	0
Wright, W. P.	1	1	0
Wrigley, O. O.	25	0	0
Wyburn, Miss	1	1	0
Wyndham, Mrs. Campbell ...	2	2	0
Wyndham, H.	1	1	0
Wynford, Lord	5	0	0
Wythes, G.	1	1	0
Wythes, Mrs.	1	1	0
Yamanaka, R.	2	2	0
Yarborough, Earl of	10	0	0
Yates, Miss	0	10	6
Yates, Samuel	5	5	0
Yeld, Geo.	1	1	0
Yeoman, J. P.	10	0	0
Yool, Mrs. H	1	1	0
Young, C. A.	1	0	0
Young, John V....	1	1	0
Young, Lt.-Col. H. R. ...	1	1	0
Zurhorst, C. C.	0	10	6
Zurhorst, F. W....	1	1	0
Zwilgmeyer, Mrs.	5	0	0

OBSERVATIONS ON INDIAN PRIMULAS.

By Sir George Watt, C.I.E., M.B., C.M., LL.D.

[Read before the Horticultural Club, October 4.]

Within the past few years remarkable progress has been made, both by botanists and cultivators, in the discovery and production of new forms of *Primula.* There are now known to exist close on two hundred species, besides many cultivated hybrids and sports of great beauty. Roughly speaking, they may be said to be distributed within three great centres: namely, Europe, India, and China. Each of these chief centres possesses on an average about fifty species, and the balance of the total mentioned may be taken as made up by America, Central Asia, Africa, and Japan. They inhabit the temperate and arctic regions of the northern hemisphere, practically only one species—*P. magellanica*—being found in the southern hemisphere. This circumstance is perhaps the most remarkable feature manifested by the genus, but there are others equally impressive. *P. magellanica,* for example, has two great centres (New Mexico and Patagonia), separated by five thousand miles in which no trace of that plant can be discovered. But *P. farinosa* has the widest distribution of all the species, since it practically occurs in every important Primula area throughout the northern hemisphere, and yet in its diversified and wide distribution it manifests but the very slightest modification either in form or in size. Of the Indian species all without exception are confined to the Himalaya and adjacent mountains that form the North-Eastern, Northern, and North-Western frontier of India, from Burma and Assam to Kashmir and Baluchistan. None occur on the mountains of Central and Southern India, though in point of climate, soil, and associated plants they might fairly well have been looked for in these regions. So again a few species are practically met with all along the mountainous frontier of India, while others are exceedingly local. A few forms are very variable; others seem, like *P. farinosa,* remarkably constant. But Sikkim may without hesitation be pronounced the headquarters of the Indian Primroses, and many species are found in that country that would appear to occur nowhere else. The forms that spread eastward from Sikkim to Assam, Burma, and Manipur are seen to belong to an assemblage that attains its greatest development in Southern China, more especially in the mountains of the province of Yunnan. On the other hand, the types that spread westward from Sikkim to Nepal, Kumaon, Garhwal, Chamba, and Kashmir, are forms that reappear in Afghanistan, Persia, Central Asia, Turkestan, and Europe.

It may be here remarked that the Himalayas trend northward as they pass from east to west. Hence

1. Kashmir lies between 33° and 36° north latitude.
2. Kumaon and Bashahr lie between 29° and 31° north latitude.
3. Nepal between 28° and 30° north latitude.
4. Sikkim and Bhutan between 27° and 28° north latitude.

What influence this may have has not as yet been ascertained, but it is curious that the number of the species greatly multiplies as we pass E.S.E. And what is more curious still, this property, whatever it be, seems to continue to increase in value until Yunnan, a province of S.W. China, becomes a new centre of Primula life and one even greater than that of Sikkim.

5. Yunnan may be said to lie between 23° and 27° north latitude, thus entirely to the south of Sikkim, the link of connection being

6. Manipur and the Shan States, between 24° and 26° north latitude.

We have this remarkable genus, which is dispersed along the great mountainous backbone of the world, evolving into at least two great types, as it is diffused from the Eastern Himalaya. Some years ago a paper of mine on *Primula* was published in the Linnean Society's "Journal." Since then I have seen cause to modify my views very greatly, and the progress made, both in India and China, has practically antiquated anything written so long ago as 1881. In my paper, however, I hinted at a classification, based on the vernation, or method of folding and packing of the leaves within the bud. This, I admit, is a distinction that botanists are not likely to appreciate very much, since it can with difficulty be detected in dried specimens. But I am addressing gentlemen who are familiar with the cultivated Primulas, and I make bold to think they may not object to a character that can be seen readily enough in the live plant. Every one is familiar with the fact that in the common English Primrose and Cowslip the two margins of the young leaves are rolled up inwards towards the midrib on the under surface of the leaf. Equally familiar is the fact that in the Auricula or "Dusty Miller" the one margin of the leaf is rolled on the upper surface and within the opposite margin. The former condition is denominated "revolute" and the latter "convolute." They are conditions very largely characteristic of two of the most important assemblages of Primroses in the world, namely the Indian and the European. But while Europe possesses both types, no example of a convolute Primrose has hitherto been met with in India, or, I believe, in China. There is, however, a third condition of vernation seen in *Primula*, namely "conduplicate." The leaves in this condition are simply closed together, the upper surface of the right-hand side of the blade being brought into contact with the left, like the closing of the pages of a book. Now this condition prevails in Africa (Abyssinia more especially) and is met with in two Indian species. And what is somewhat remarkable, conduplicate vernation is usually present in Primulas that love a warm dry climate. The best-known examples of this series are *Primula floribunda* of India and *P. verticillata* of Abyssinia. In passing it may be observed that a hybrid recently appeared at Kew between these two plants which has been much appreciated by cultivators.

I now desire to invite your attention to one or two other structural features of *Primula* that would seem to me to aid in a natural classification of the species, and thus afford useful hints for cultivation. In many species, whether the leaves be revolute, convolute, or conduplicate in bud, the flowers, when borne on a scape, are either *sessile* or *pedicellate*. The former gives origin to capitate (fig. 69), and the latter to umbellate forms (figs. 71, 72, 73). As the result of a fairly extensive study of Primroses, I have come to put much value on these characters, more in fact than on the shape of the flowers or even of the fruits. Primroses are spring flowers as a rule, and in consequence their attendant insects are comparatively few. The absence of a fair assortment of the agents of fertilisation might easily be assumed to originate extreme and direct adaptations; hence a few thousand feet in altitude, still further lessening the supply of insects, might easily be accepted as producing many so-called Alpine species that have depended for their separate recognition on their possessing a differently shaped or differently coloured flower from that of another plant, with almost identical leaves, seen at lower altitudes. But while it is by no means an uncommon circumstance for an umbellate species to produce solitary flowers (fig. 73, *a'*)—that is, flowers borne on a simple axillary peduncle—the Alpine conditions of capitate species are, as a rule, but dwarfed states and are rarely solitary-flowered, so, conversely, in the luxuriant conditions they never become verticillate. I would next mention that the *nature of the bracts* is most valuable in classification. In the capitate forms there is a bract for each flower, but they are variously assorted in an involucre and are of different sizes. In the umbellate forms the bracts are mostly arranged in a 1-seriate whorl (fig. 72). So again many Primroses have obovate-spathulate *leaves* that gradually taper into winged or sheathing bases, but have no true stalks (fig. 69). Others have more or less rotund leaves, borne on pronounced leaf-stalks (fig. 73, D and E). I put considerable value on the *shape of the leaf*, when taken in conjunction with the vernation, the pedicels, and the bracts.

I trust, gentlemen, you are not impatient with me for going into such details, but they have a practical bearing. I am not aware of any hybrid having been made between capitate and pedicellate species, or between typical linear-oblong and rotund-leaved forms. If I be correct, therefore, in that assumption, the science of hybridisation would give (and I believe it always gives) useful hints for the final determination or delineation of doubtful species. In other words, I take it that crosses are as a rule more readily accomplished between allied than remote species. This at least is my apology for furnishing the classification of the Indian Primroses that I now desire to place before you.

Classification of the Indian Primulas.

A. Leaves revolute in vernation.

(*a*) *Flowers sessile* (*capitate*). (*When solitary the capitulate character is presumed to be indicated by the position of the bract outside the calyx.*)

Section 1 : *Denticulata* (fig. 69).—*Leaves* thick, usually rugose and glabrous (very rarely puberulous), oblong, spathulate, serrate, and mealy. *Inflorescence* capitate, the flowers being relatively small and mostly erect, sessile or nearly so, inserted on the top of a swollen peduncle, but in number from one to many. *Corolla*, tube narrow subcylindrical, lobes bifid. *Bracts* one to each flower, the outermost gibbous, but they do not form a 1-seriate whorl, nor are they retained in an attitude parallel to each other, but when the flowers are solitary the bracts are usually very large (see *P. muscoides*).

* *North-West Himalayan Forms.*

1 (6*). *P. denticulata*, Smith (fig. 69, A & B); Afghanistan, Kashmir to Sikkim, Bhutan, Khasia and Shan hills.

2 (7). *P. farinosa*, Linn.; Western Tibet and Chamba, 12–17,000 feet. (Is allied to but distinct from *P. magellanica*.)

3. *P. Heydei*, Watt; Western Tibet and Chamba, 12–14,000 feet. (Creeps by means of stolones and has a distinct peduncle.)

4. *P. minutissima*, Jacquem. (fig. 69, C); Baltistan, Kashmir to Kumaon, 12–16,000 feet.

** *Eastern and Central Himalayan Forms.*

5 (1). *P. capitata*, Hook.; Sikkim and Bhutan 12–15,000 feet. (An East-Himalayan species closely allied to and possibly only an alpine state of *P. denticulata*.)

6 (1). *P. erosa*, Wall.; Kumaon and Bhutan; not seen in Sikkim. (A form of *P. denticulata* with very large thin erose leaves.)

7 (2). *P. bellidifolia*, King; Sikkim, 13,000 feet. (Might almost be spoken of as a large condition of *P. farinosa*.)

8. *P. glabra*, Klatt (fig. 69, D); Sikkim, 13–15,000 feet.

9. *P. pusilla*, Wall.; Nepal and Sikkim, 13–16,000 feet. (Bracts leafy, glandular, mouth of corolla densely woolly.)

10. *P. sapphirina*, Hook. f.; Sikkim, 13–15,000 feet.

11. *P. muscoides*, Hook. f.; Sikkim, 15,000 feet.

Section 2 : *Soldanelloides* (fig. 70).—*Leaves* thin, softly pilose linear obovate-spathulate, often suddenly cuneate to a winged petiole, deeply and irregularly serrate on upper two thirds of length, never mealy. *Inflorescence* capitate, but mostly with few or even solitary flowers, which are quite sessile and deflexed or nodding. *Corolla* large, almost convolvulate in shape; petals usually emarginate and toothed. *Calyx* forming conspicuous masses, short but broad, almost campanulate, with blunt teeth that are generally serrulate on the margin. *Bracts*, one to each flower, very small and inconspicuous, but when the flowers are numerous they form a distinct involucre.

* *North-West Himalyan Forms.*

12 (14). *P. Reidii*, Duthie; Chamba 12,000 feet. (Probably only a robust N.W.H. form of *P. uniflora*.)

** *Central and Eastern Himalayan Forms.*

13. *P. Wattii*, King (fig. 70, C); Sikkim.

14 (12). *P. uniflora*, Klatt (fig. 70, B); Sikkim, 13–15,000 feet.

15. *P. soldanelloides*, Watt (fig. 70, A); Sikkim, 13–15,000 feet.

(*b*) *Flowers pedunculate* (*umbellate*).

Section 3 : *Rosea* (fig. 71).—*Leaves* linear-ovate, acute, tapering somewhat suddenly (especially the later foliage) into winged petioles, often sharply toothed, smooth shining green, glabrous, scarcely mealy. *Inflorescence* umbellate, few-flowered, never verticillate; scapes much longer than the leaves, especially when in fruit. *Corolla*, tube long, straight, relatively wide, and expanding very gradually towards the naked throat; lobes distinctly emarginate or even bifid. *Bracts* few, parallel to each other, erect, forming a 1-seriate whorl, and gibbous or even spurred below (fig. 71, D).

* Numbers shown within brackets denote closely allied or doubtfully distinct species.

* *North-West Himalayan and Western Tibet Forms.*

16. *P. rosea*, Royle (fig. 71, A); Kullu and Chamba to Kashmir, 12–14,000 feet.
17. *P. Harrissii*, sp. nov.; Chitral, 8–11,000 feet.
18. *P. elliptica*, Royle; Kashmir to Ladak, 8–12,000 feet.
19. *P. hazarica*, Duthie; Hazara.

20 (21). *P. sibirica*, Jacq. (fig. 71, B & C); Zanskar to Lahul, 13–15,000 feet. (A smaller plant than *P. involucrata*, and with pink flowers.)

** *Central and Eastern Himalayan and Tibetan Forms.*

21 (20). *P. involucrata*, Wall.; Kashmir to Sikkim, 12–15,000 feet.

22. *P. tibetica*, Watt; Kumaon, Tibet, to Sikkim frontier, 15–17,000 feet.
23. *P. concinna*, Watt.; Sikkim, Tibetan passes, 15–17,000 feet.

Section 4 : *Purpurea* (fig. 72).—*Leaves* thick, smooth, usually quite glabrous, shining, more or less mealy on the under surface only or all over, lanceolate to obovate-spathulate or even ovate-cordate, midrib flattened, expanded and veined on the surface, extending along the blade and forming a winged petiole, a large sheath or a stem-embracing scale, leaves thus frequently borne on a distinct though winged petiole, mostly serrulate on the top half of the blade. *Inflorescence* umbellate (that is to say, attached to the common peduncle by pedicels), rarely solitary, more often verticillate; scape much longer than the leaves, swollen at the extremity where the *bracts* form a more or less 1-seriate whorl, not dilated below, but sometimes connate around the pedicels, occasionally almost awl-shaped. Flowers yellow, purple, or blue, usually numerous, but occasionally few or solitary. *Corolla*, tube expanding within the throat, mouth obstructed, often annulate and lobes entire, or emarginate or even crenate-serrate.

* *North-West Himalayan Forms.*

† *Petals entire or only faintly emarginate: throat constricted but not annulated.*

24 (25). *P. purpurea*, Royle (fig. 72, A & B); Tibet, Lahul to Kumaon, 10–14,000 feet. (A very varialbe plant, but in its normal conditions quite distinct from *P. Stuartii*; fruit linear erect, exceeding the calyx; flowers purple.)

25 (24). *P. Moorcroftiana*, Wall.; Kumaon and Kullu, 16,000 feet. (Fruit often one inch long and more than twice the calyx; flowers purple. Though a very different-looking plant, is generally treated as a variety of *purpurea*.) (Fig. 72, C.)

26. *P. Inayati*, Duthie; Hazara, 4,500 feet.
27. *P. Stuartii*, Wall.; Tibet, Kashmir, and Chamba, also Sikkim, 12–14,000 feet. (Fruit linear, about same length as the calyx; flowers yellow, perfumed.)
28. *P. Traillii*, sp. nov.; Kullu, 16,000 feet. (Fruit globular, contained within the calyx; flowers pale blue.)

** *Central and Eastern Himalayan Forms.*

29. *P. sikkimensis*, Hook.; Sikkim, in wet places, 11–15,000 feet. (Fruit globose; flowers lemon-yellow, delicately perfumed.)

†† *Petals distinctly emarginate and often crenate-serrate; throat constricted and obstructed with hairs, or furnished with a distinct annulus.*

30. *P. prolifera*, Wall.; Khasia and Naga hills, in running water, 8,000 feet. (Capsule globose: flowers yellow. Allied to, but distinct from, the Javan *P. imperialis* and also *P. sikkimensis* and *P. Traillii*.)

31 (32). *P. elongata*, Watt; Sikkim, 12–13,000 feet. (Closely allied to *P. obtusifolia*.)

32 (31.) *P. obtusifolia*, Royle ; Kunawar, Kumaon, Sikkim, and Bhutan.

It is by no means certain that we have correctly identified *P. obtusifolia*, Royle, and possibly two or more very distinct plants have been placed under it :—

Var. *Roylei, Fl. Brit. Ind.*, Sundakfu, Sikkim, a purple-flowered plant at 10–12,000 feet, and a yellow condition at Yangpung at 15,000 feet. But if this be correct it is curious that while the purple-flowered forms have a strong metallic smell that causes headache if much inhaled, the yellow states have a soft delicate odour and are much like *P. sikkimensis* and *P. prolifera*. It is often seen with solitary axillary flowers and with or without umbellate scapes on the same root.

33. *P. Tanneri*, King; Sikkim, 14,000 feet. (This is the plant to which I gave the MS. name of *P. Balfouri* and issued specimens under that name before I knew of its having been described: it seems also to be *P. obtusifolia*, var. *Griffithii* of the Fl. Brit. Ind. Flowers pale lavender-blue.)

34 (35). *P. Kingii*, Watt; Sikkim. (Flowers dark purple or claret-coloured; fruits globose.)

35 (34). *P. Gammieana*, King; Sikkim, 14,000 feet; also Yatung, Tibet. (Is possibly only a form of *P. Kingii*.)

36 (37). *P. Dickieana*, Watt; Sikkim, Lachen, 10–13,000 feet. (Flowers yellow, pubescent, not perfumed.)

37 (36). *P. Pantlingii*, King; Sikkim. (Probably = *P. Dickieana*.)

38. *P. Elwesiana*, King; Sikkim, 12,000 feet. (Flowers large, solitary, purple, softly pubescent.)

39. *P. tenella*, King; Chumbi Valley, Sikkim, 13,000 feet. (Flowers solitary, large, bluish-white, glabrous; bract outside the calyx, and flower thus sessile.)

Section 5: Petiolaris (fig. 73).—*Leaves*, originally spathulate but becoming ovate, elliptic to rotund, and more or less cordate, deeply and sharply serrate or lobed at least on upper half, suddenly constricted into a distinct petiole (which in the early foliage may be broadly winged), usually mealy, especially the scales, certain species quite glabrous, others puberulous or even tomentose. *Inflorescence* solitary or few-flowered and umbellate; scape as long as the leaves or a little longer. *Corolla* tube most frequently not much longer than the calyx, lobes emarginate or toothed. *Bracts* forming a 1-seriate involucre, but never thickened nor gibbous below.

**North-West Himalayan Forms.*

† *Leaves glabrous, spathulate to ovate rotund, sheaths often prominent (except P. Stirtoniana, which has the young leaves sometimes glandularly puberulous).*

40 (43, 44, 45). *P. petiolaris*, Wall. (fig. 73, A and C); Simla to Kumaon (var. *scapigera* in Bhutan), Sikkim and Yatung, Tibet. var. *Edgeworthii* has rotund leaves on long petioles. 8–10,000 feet.

41 (51). *P. Clarkei*, Watt; Kashmir, 7,000 feet.

42. *P. reptans*, Hook. f.; Kashmir, 15,000 feet.

*** Central and Eastern Himalayan Forms.*

43 (40). *P. nana*, Wall.; Sikkim, 11–13,000 feet. (A dwarf plant with flowers very small and leaves thin in texture and erose, otherwise *P. petiolaris*; it flowers late in autumn.)

44 (40). *P. Stirtoniana*, Watt (fig. 73, B); Sikkim, Kanglanamo, 14 16,000 feet.

45 (40). *P. Hookeri*, Watt; Sikkim, 12,000 feet.

46 (47). *P. Dyeriana*, sp. nov.; Sikkim, Nepal, 13,000 feet. (Collected by Mr. Hartless.)

47 (46). *P. pulchra*, Watt; Sikkim, Jongri, 12–14,000 feet.

†† *Leaves usually puberulous or tomentose, rotund, and possessed of distinct petioles.*

48. *P. reticulata*, Wall.; Nepal and Sikkim, 11–15,000 feet. (This in some respects recalls *P. sikkimensis* and is also glabrous.)

49. *P. rotundifolia*, Wall.; Kashmir to Sikkim, 11–13,000 feet. (Almost glabrous.)

50. *P. Gambleiana*, Watt; Sikkim, Jongri, 14,000 feet. (Almost glabrous.)

51 (41). *P. filipes*, Watt; Bhutan on rocks, 5–6,000 feet.

52. *P. Forbesii*, Franch.; Shan States, Burma, 3,000 feet.

53. *P. Listeri*, King; Sikkim to Manipur in bamboo jungles, 10,000 in former, and 7,000 to 8,000 feet in latter.

54. *P. vaginata*, Watt; Sikkim, 10,000 feet.

55. *P. mollis*, Hook.; Bhutan. (A near ally of *P. cortusoides* and *P. sinensis*.)

56. *P. geraniifolia*, Hook.; Chumbi Valley, Sikkim, 10,000 feet. (A near ally of the European and Siberian *P. cortusoides*.)

B. LEAVES CONDUPLICATE IN VERNATION.

Section 6: *Floribunda* (fig. 74).—*Leaves* glandular pubescent, sometimes mealy, obovate-spathulate to elliptic obtuse, narrowed into a winged petiole, coarsely and irregularly toothed. *Inflorescence* umbellate and verticillate. *Corolla* yellow, tube long, lobes obcordate, small. *Bracts* few, large, leafy.

57. *P. floribunda*, Wall. (fig. 74, A and B); Kumaon to Kashmir and Afghanistan, 1,500 to 6,000 feet. (Allied to the Arabian and Abyssinian *P. verticillata* and *P. sinensis*.)

58. *P. Lacei*, Hemsl. et Watt (fig. 74, C); Yorkhan, Baluchistan, 4,000 feet.

I do not advance that classification as absolutely final. Indeed, there are here and there objections to it, and consequently it is possible that with a more careful and extended study of the splendid collections of Chinese species, recently to hand, it may be found desirable to form one or two additional sections and to carry to these a few of the Sikkim forms, such as *P. Elwesiana* and *tenella*. But I believe future research is likely to confirm the desirability of some such classification as I have indicated. It is in strict accord with the obvious affinities of the plants one to the other, and, I am convinced, is likely to afford useful indications of the lines along which cultivation and hybridisation in the future may be found most profitable. It will, for example, be seen that the panorama of Indian forms commences with plants having the leaves thick, rugose, glabrous, oblong-spathulate, mealy, and passes to those with the leaves rotund, distinctly stalked, and often pilose or tomentose. Parallel with these gradually expanding leaf conditions, we have the flowers capitate, then becoming more and more stalked, until they are completely umbellate and finally verticillate. In both conditions we meet with single-flowered states, and these are determined as capitate or umbellate according to the position of the bracts, but only when that characteristic is taken in conjunction with the nature of the leaf.

If the bract occurs immediately outside the calyx, the plant may be accepted as belonging to the capitate series, more especially if the leaves are spathulate and rugose. It may also be noted that I have referred each section to geographical groups. There are a few species that occur here and there throughout the entire Primula area of India. Others are much more local. The climate of the N.W. Himalaya being very different from that of the East, it will be found that the species of the N.W. will succeed better as a rule in Europe than those from the E. Himalaya. Partly on that account, but also in order to mark the existence of two great Indian centres, I have assorted the Primulas of India within each of the sections into (1) the N.W. Himalayan and (2) Central and Eastern Himalayan forms. And in passing I would observe that I have given each of my sections the name of the Indian species that is most characteristic of it. It might have been of more universal acceptation had I employed the names of the European wild or better-known cultivated forms, but I desired to concentrate attention on India as far as possible and hence have chosen Indian names for my sections.

With your permission, gentlemen, I will now discuss the more striking examples of each of the sections formed by me, and at the same time mention a few of the European species that will be found to fall into these.

1. **Denticulata** (fig. 69).—This is the most cosmopolitan assemblage of all. *P. farinosa*, which is perhaps better known in Europe than the Indian *P. denticulata*, is fully characteristic of the series and is its English indigenous representative—the Bird's-eye Primrose. The flowers in all the members of the series are sessile, purple to bright sapphire-blue in colour, and have narrow funnel-shaped tubes. The head of flowers is surrounded by a many-seriated involucre of bracts, the outermost more or less gibbous at the base, but not spurred.

They frequent gritty soils on grassy hillsides, or, in the case of the smaller species, moss-clad surfaces of rocks and overhanging banks, and thus appear like veritable sapphires set in green. But they grow singly, or, if clustered, rarely more than two or three are found in the clumps, one plant large and the others small. They seem to be annual or biennial, when met with on land that during winter is covered with snow. When seen in woods they choose open glades and are associated with species of Anemone, Delphinium, and Ranunculus, &c., and are then perennial. The N.W. Himalayan examples are *P. denticulata*, *P. farinosa*, *P. Heydei*, and *P. minutissima*—the last-mentioned has heads of one to three sessile flowers, while *P. Heydei* produces creeping stolones and very distinct scapes. The East-Himalayan forms are *P. capitata*, *P. erosa*, *P. bellidifolia*, *P. glabra*, *P. pusilla*, *P. sapphirina*, and *P. muscoides*, the last being possibly the smallest Primrose in the world.

The most abundant species is doubtless *P. denticulata*. At altitudes of from 7,000 to 13,000 feet this is often extremely abundant. Within its lower altitudes, say 7,000 to 9,000 feet, I have seen miles of country, from March to May or June, literally rendered blue with its lovely heads of flowers. In its higher altitudes, from 10,000 to 12,000 feet, it may be got in flower as late as August. In spring the flowers appear before the leaves, but are braced up by their large rufous-coloured scales, and a few young erect leaves. But though I have looked many and many a time, I never once came across either an umbellate or a single-flowered example, nor could I discover an instance where the leaves showed the slightest tendency to become petiolate. It is not uncommon, amid a mass of plants rising to as much as a foot in height, to find dwarf states—perfect in every detail and in full flower, the whole plant not exceeding $1\frac{1}{2}$ inches in height. *P. denticulata* in fact, except in stature, varies

FIG. 69. – SECTION 1: DENTICULATA.
A, P. denticulata, *Sm.*; B, Alpine condition; C, P. minutissima, *Jacquem.*; D, P. glabra, *Klatt*, var. myosotiflora, *Watt*.

remarkably little. In its lower altitudes the flowers are smaller and borne on short stalks and are usually more numerous. In its alpine conditions it has larger and fewer flowers, and the whole plant becomes stunted. The flowers are often also deeper coloured, or there is an albino condition in which the petals become almost white and the annulus around its mouth orange instead of lemon-yellow. In Sikkim I observed that the calyx had longer teeth than seen in the Simla form, and that the mouth of the corolla was also greenish-yellow. I am satisfied other botanists will confirm me in these observations, hence I think we are justified in putting faith in the characters mentioned as being closely associated with the life of at least this particular species. But when I add that all the species of my section *denticulata* manifest a remarkable constancy, then I think the further conviction may be accepted—namely, that they form a natural and useful assemblage. The word "useful" reminds me that in Bashahr the flowers of *P. denticulata* are regularly eaten in salad, and the powder of the roots is held to be of value in killing leeches. Professor Balfour informs me that in its many forms (*alba, rosea, purpurea, cashmeriana, maxima,* &c.) it is luxuriant and sows itself freely in Edinburgh.

Space will not permit me to discuss the extensive assemblage of minute species that fall into this position. The earliest known, and I believe the only one hitherto successfully grown in Europe, is *P. minutissima.* This is a North-West form, being found from Kashmir to Garhwal and Kumaon. I first made acquaintance with it while struggling with the final ascent of the Sauch pass at 15,000 feet. Snow lay on the ground here and there, filling all the lower undulations, but on the exposed surfaces I was delighted to find our little friend sparkling alongside of an equally minute yellow-flowered Ranunculaceous plant. This gave me the opportunity of resting on the steepest parts of the ascent without having to admit to my stalwart coolies that I needed repeated rests. The whole plant does not exceed an inch in height, but its beautiful purple-blue flowers with yellow throats (occasionally completely white) are fully half an inch in length. Occasionally they are solitary, more often two or three are placed on the extremity of an extremely short peduncle, the flowers being sessile within the involucre of bracts. Sometimes it is seen to throw out runners, but usually two or three of the tiny little plants form a small cluster. *P. Heydei* is a slightly larger species with coarsely pinnately serrate leaves and creeping stems, with long ascending scapes that bear small heads of beautiful blue flowers; Duthie found it in Baltistan. In many herbaria this species has been confused with *P. minutissima*, but the universal presence of the scape should obviate such an error.

These, then, are the types of the North-West Himalayan capitate species, but there is an Eastern group that must now be mentioned. The best known example doubtless is *P. capitata.* This is closely allied to *P. denticulata*, but is easily recognised and preserves its distinctive features when cultivated. The scape (which appears with the fully formed leaves, not before, as in *P. denticulata*) rises to a height of a foot or more and bears a head of dark blue narrow bell-shaped flowers, the outermost whorls of which are pendant. It occurs in Sikkim at altitudes of 12–15,000 feet and in situations very similar to those chosen by *P. denticulata*, only usually a couple of thousand feet higher. Professor Balfour informs me that it flowers and seeds well in the Edinburgh Botanic Gardens. Duthie collected (in W. Nepal, at an altitude of 11–12,000 feet) what I take to be either a new species or an Alpine state of *P. capitata*. This seems a delightful little plant, at present too imperfectly known to allow of more than the affirmation that it is certainly not *P. pusilla*, to which species it has been referred.

P. erosa is also an Eastern form that is even less deserving of an independent position than *capitata*. It has large thin, sharply toothed, and often puberulous leaves, and many small flowers on short pedicels. It occurs at lower elevations usually than *P. denticulata*, and so far has been recorded as met with in Kumaon and Bhutan only at altitudes of from 4,500 to 9,000 feet. It is of no interest from the standpoint of cultivation, since it is not a very pretty species.

P. bellidifolia is the Eastern representative of *P. farinosa* and has leaves almost tomentose. *P. glabra* and *P. pusilla* are very much like each other, except that the latter is hairy and the mouth of the corolla completely obstructed by a woolly mass. It has been repeatedly collected. I found it in August 1881 in Sikkim, on the slopes above Jongri, 14–15,000 feet. It has since then been secured by Elwes and others, while Hobson has extended its area to Yatung in Eastern Tibet. Professor Balfour writes me that they have this year raised *P. glabra* from seed obtained from Calcutta.

P. sapphirina is perhaps the most beautiful of the capitate Primulas of India. The whole plant does not exceed two inches in height, but the little heads of flowers have been most fittingly accepted as justifying the name *sapphirina*. It was originally collected by Sir J. D. Hooker in Sikkim and has since been found by one or two other collectors, and it flowered in Kew Gardens in May 1887. Recently it has been found by Hobson in Yatung in Tibet. *P. muscoides* is a densely tufted species and apparently the smallest of all Primulas. It is found in Sikkim at altitudes of 15,000 feet. In some respects it is much like *P. minutissima*, and is in fact the Eastern representative of that species, but it is much smaller and has the petals very much more deeply bifid.

Before leaving the *denticulata* series I may repeat that they are perhaps the least liable to vary of all the Indian species. Alpine examples are simply dwarfed states and never assume the condition of having solitary, exceptionally large flowers. In fact it would seem as if the tendency were to vary in lower rather than higher altitudes, and by increasing the number and reducing the size of the flowers.

In conclusion I may mention that the well-known European *P. auriculata* doubtless belongs to this series, though the flowers of the capitulum (like those of *P. erosa*) are often shortly stalked. Its long-leaved variety much resembles *P. capitata*. *P. algida* is exceedingly like the Indian form of *P. farinosa*, and *P. capitellata*, Boiss., is not very unlike *P. bellidifolia*. So also *P. cernua*, Franch. (from Yunnan), might be characterised as a small condition of *P. capitata*, possessing the pilose leaves of *P. bellidifolia* and the pendant flowers of *P. capitata*. Lastly, *P. Viali*, Delavay, also from Yunnan, is perhaps the most aberrant of all

Primroses, in that the sessile flowers are crowded on greatly elongated spikes.

2. **Soldanelloides** (fig. 70).—This is one of the rarest and at the same time most charming series of Indian Primulas. They are at first sight as dissimilar to the other capitate species as could well be imagined. Their soft, hairy, deeply toothed leaves, large inflated calyx, and deflexed flowers might have been expected to suggest a position for them near to *P. mollis* and *P. geraniifolia*. But a closer inspection reveals many peculiarities that justify their association with the other capitate forms. The leaves are distinctly obovate-spathulate, never rotund-petiolate. *P. capitata* has the flowers on the circumference of the head deflexed, *P. bellidifolia* has the leaves softly pilose, and *P. sapphirina* is very much like a diminutive *P. soldanelloides*. The transition from the *denticulata* into the *soldanelloides* series is, therefore, perfectly natural and in no way disturbs the theory of affinities based on the shape of the leaf, nature of inflorescence, peculiarities of the flower, and the condition of the bracts.

I gave the name *Soldanelloides* as suggestive of their deflexed and nodding flowers. I might have called them *Cyclamenoides*, for the inverted attitude of the flower is perhaps more familiar in the Cyclamen. The name *Soldanella* seemed to me, however, to have the additional advantage of calling to mind their large convolvulately shaped corollas. In fact, for the size of the plant, the flowers in these Primroses are exceptionally large and delightfully varied in colour. *P. Reidii* is pale yellow, *P. Wattii* dark purple, *P. uniflora* pink to pale lilac, and *P. soldanelloides* pure white. Until Mr. Duthie had the good fortune to discover *P. Reidii* in Kumaon, and Mr. Lace to re-discover it in Chamba State, all the members of the section were supposed to be confined to Alpine Sikkim. None of them occur much below 13,000 feet in altitude, and they are all remarkably scarce plants. There do not appear to be any Primulas in Europe that could be referred to this section; and what is more surprising still, none have as yet been found in China.

I have never had the good fortune to come across any of these charming plants, so I cannot tell you of their habitats. But I believe a rich field for the production of delightful Primroses awaits the enterprise of whoever may successfully introduce two or more of these plants into cultivation and cross-breed them. The ease with which, I understand, *P. Reidii* has been cultivated recently in Edinburgh as a pot plant, bespeaks a hopeful future for its associates. It has not as yet been established out of doors. By the by, *P. uniflora* has frequently two or three flowers, one usually fully formed and the other or others apetalous. *P. soldanelloides* seems to me perhaps the most beautiful species of the series, though I am well pleased with the lovely plant with which my friend Sir George King did me the honour to associate my name.

3. **Rosea** (fig. 71).—This might be spoken of as essentially a N.W. Himalayan group. Four species are found within the country lying between Kullu, Chamba, Hazara, Kashmir, Chitral, and Western Tibet; two are met with here and there from the extreme Western to the Eastern Himalaya, and one is confined to Sikkim. The most ready eye-mark for the members of this section is the much-elongated few-flowered umbellate scape, the pedicels of which are embraced by a 1-seriate involucre of ascending (parallel)

bracts that are spurred at the base (fig. 71, D)—the spurred Primulas they might be called. The flowers appear before the leaves, and the scape and pedicels usually elongate to double their length with the ripening of the fruit (C). There is no more natural or more easily recognised group than this. The flowers are fairly large and brightly coloured,—a peculiarity well exemplified in *P. rosea* itself (fig. 71, A). The corolla tube is long, narrow, gradually expanding near the throat; and the mouth, though usually of a paler colour than the limbs, is not furnished with an annulus.

But I must hasten to observe that *P. concinna* and *P. tibetica* (especially the former), though placed by me in this group, should probably be transferred to a section by themselves and possibly along with *P. tenella*. I leave them here as a provisional matter. Their removal would very nearly make the section be confined to the Western Himalaya and Western Tibet. *P. tibetica* has the characteristic spurred bracts of the series, but the bracts in *P. concinna*, like those in *P. hazarica*, are thickened below, but not, I believe, spurred. With an Indian distribution so strikingly Western, one would naturally look for Central Asiatic if not European species. And in this we are not disappointed, for there are several, and one, *P. egaliksensis*, occurs in Greenland. *P. longiflora* takes its name from its very long straight corolla tube—a character upon which I have laid some stress in defining the section. But of all the members of this series *P. sibirica*, Jacq. (fig. 71, B), with its more robust East-Himalayan form, *P. involucrata*, may be said to occur on all the Alpine Himalaya from West Tibet to Kashmir and Sikkim, and is distributed through North and Central Asia to Europe, North and Arctic America. It, in fact, has nearly as wide a distribution as *P. farinosa*, and indeed these two plants would appear to have been often confused the one with the other, though the capitate condition of the one and the umbellate form of the other should have instantly rendered such ambiguity impossible even had the spurred bract of *sibirica* been overlooked.

All the more characteristic members of this series frequent damp situations and grow singly, though often in more or less compact patches: that is to say, a few yards may be literally covered with a particular species, though ordinarily they do not form aggregated clumps. Professor Balfour informs me that this species (*P. sibirica*) has many varieties, tall and short, dark and light, large-flowered and small-flowered, and that all are easily grown in Edinburgh, and that it flowers and sows itself freely. *P. sibirica* is invariably met with as a solitary plant, and seems to manifest the elongation of the scape with the growth of the associated vegetation to a remarkable extent, the mature plant becoming a single scape 6 to 8 inches in height, and a rosette of withered leaves lying on the ground. In Edinburgh *P. involucrata* has proved a good hardy species, and flowers and seeds freely in the open.

Most of the species of spurred Primulas frequent sandy and gritty deposits, such as the tongues of soft soil that accompany the rivulets draining from ice. I can think of nothing more surprisingly beautiful than a bed of *P. rosea* brought suddenly to view through a cleft in the terminal tongue of ice. Its rich delicate rose-purple sparkles against the background of ice, in a way that defies the jeweller's art or the beauty of the most expensive gems.

Fig. 70. Section 2: Soldanelloides.
a. P. soldanelloides, *Watt*; b. P. uniflora, *Klatt*; c. P. Wattii, *King*.

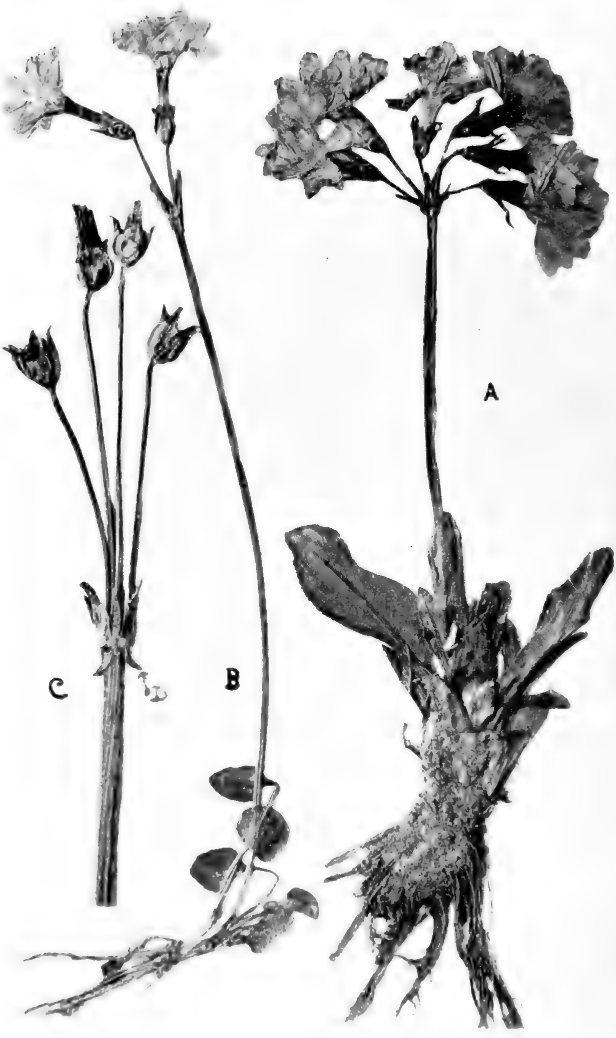


FIG. 71.— SECTION 3: ROSEA.

A, P. rosea, *Royle*; B, P. sibirica, *Jacq.*; C, Greatly elongated fruiting condition of B; D, Spurred bracts.

FIG. 72.—SECTION 4: PURPUREA.

A, P. purpurea, *Royle*; B, Fruiting umbel of A; C, Alpine condition of var. Moorcroftiana, *Watt*.

P. elliptica is a very similar species, except that the flowers are purple, not rose-pink. *P. Harrissii* is an undescribed species collected by Dr, Harriss in Chitral, and might be described as an intermediate form between *rosea* and *elliptica*, but with the rich rose-pink flowers of *rosea*. The specimens of it seen by me are in the Edinburgh Herbarium. *P. hazarica* is distinctly a near relative of *P. elliptica*.

P. concinna, though I have spoken of it as possibly an interloper among the spurred Primulas, has been well named *concinna* and would be an ornament to any collection of Primroses. The whole plant is not more than one inch in size, but it grows in rounded cushion-like masses amid the ice, stones, and sand of the moraine. I came across it on the Kanglanamao pass in Sikkim, at an altitude of close on 17,000 feet. Its delicate scape of rose-purple flowers, with their notched coronas of yellow, might truly be described as constituting one of the most lovely members of this charming genus. I can well recollect my feelings of delight when I found a chaotic moraine besparkled with these graceful tiny flowers: they brought to mind one of my boyhood triumphs—the discovery in the far North of Scotland of *P. scotica*.

But, gentlemen, from what I have said of the spurred Primulas you may have inferred that to grow them successfully it is essential that they should be allowed to flower within the short space of early spring. For the rest of the year they have as a rule to be protected from extreme heat, and the best possible thing to do is to plant them on a sandy bank near running water. Water preserves a more uniform temperature than either earth or air. The aquatic plants of Bengal are in consequence far nearer to the corresponding European types than are the plants grown on the margins of the tanks. Conversely, therefore, plants that require much water will bear translation from one climatic region to another better than plants that grow on dry soils. Lastly it may be added *P. Bornmülleri* is perhaps the giant member of this section.

4. **Purpurea** (fig. 72).—In point of number of forms this is the most important section. There are some fifteen known species, with, under some of these, numerous varieties. It is perhaps the most characteristically Indian group of all. But the name *purpurea* is perhaps not so fully representative as could have been desired. It is one of the oldest descriptive names, but one that has been perhaps more obscured by conflicting opinions than any other that might have been chosen. In point of colour of flowers, yellow is very much more prevalent than purple, and many of the species possess both yellow and purple states or varieties. Then again as to the position assigned to the section, it might have been placed as No. 5 instead of No. 4, thus bringing *petiolaris* or petiolate-leaved forms into juxtaposition with the *rosea* series, which have often somewhat petiolate leaves. So again the inflorescence of the *purpurea* group is very frequently verticillate, a condition that becomes general, if not universal, in the sixth section—*floribunda*.

The central feature of the *purpurea* series may be said to be the glabrous mealy obovate-spathulate leaves, with their greatly expanded midrib forming a sheathing petiole. Flowers large, mostly yellow, or purple or blue. Corolla tube long, erect, inflated in the throat. The purple flowers are either odourless or possess a heavy metallic smell, while the yellow-flowered species have invariably a delicate sweet and refreshing odour. It is a little more difficult to define this assemblage than some of the others, but once seen it is easily enough recognised. The bracts are numerous, never gibbous, but in the outermost whorl are often more or less united together.

The species may be referred to two geographical groups, and these very nearly correspond to two sections that may be formed according to the shape and condition of the corolla :—

(1) *Petals entire or faintly emarginate*; *throat constricted but not annulated.* 1. *P. purpurea*, Royle, proper, and the variety or species known as *Moorcroftiana* ; 2, *P. Stuartii*, Wall. ; 3, *P. Inayati*, Duthie ; 4, *P. Traillii*, sp. nov. ; and 5, *P. sikkimensis*, Hook.

(2) *Petals distinctly emarginate and often crenate-serrate* ; *throat constricted and obstructed with hairs or by a distinct annulus.* 6, *P. prolifera*, Wall. ; 7, *P. elongata*, Watt ; 8, *P. obtusifolia*, Royle, and its variety *Roylei* ; 9, *P. Tanneri*, King ; 10, *P. Kingii*, Watt ; 11, *P. Gammieana*, King ; 12, *P. Dickieana*, Watt ; 13, *P. Pantlingii*, King ; 14, *P. Elwesiana*, King ; and 15, *P. tenella*, King.

Of this long list only four can be claimed for the North-West Himalaya (but these are exceedingly characteristic and often very prevalent), two are dispersed into the Central Himalaya, and one finds its way to Sikkim. All the others are East-Himalayan forms and constitute a series by themselves, easily separated from the North-West Himalayan group and one which attains its greatest development in South China. It would occupy far too much of your time to attempt, however briefly, a discussion of all the species indicated. I must content myself therefore with a few of the more striking examples.

Wallich was apparently the earliest botanist who studied these plants, and he named one of them after Dr. Stuart of the Punjab. Unfortunately, the sheet that is now accepted as Wallich's type (No. 606) bears two plants, one *P. purpurea*, Royle, and the other *P. Stuartii*, Wall. proper. Stuart's own specimen, now preserved in the Edinburgh Herbarium, contains three very distinct plants. It has in consequence become customary to speak of the forms indicated as different species : Royle having been assumed to have picked out one of the two Wallichian plants and given it a separate name, thus left the other to be *P. Stuartii* proper. There would be no great harm in admitting that view, and the names have for many years been so accepted. Unfortunately some botanists regard Royle's plant as at most but a variety, so that, if that opinion be adopted, the specific name for both, of necessity, becomes *P. Stuartii.* From practical considerations I am not disposed to attach much importance to whether two Primroses, long accepted as separate species, which are easily recognisable from each other and have never, so far as is known, been produced under cultivation from the selfsame seed, should have the dignity of specific or only of varietal positions assigned to them. But this much may be advanced in support of specific values, viz. that the European and Asiatic parallel series, namely *P. nivalis* and its numerous allies, have been for the most part accepted as species. In the present instance a still stronger argument, however, presents itself, namely in the fact that *P. Stuartii* is nearly if not quite as difficult to separate from *P. sikkimensis*, *P. elongata*, and even *P. reticulata*, as from *P. purpurea*. In fact, if the foliage only be examined, to the list of species separable with difficulty from *P. Stuartii* would have to be added *P. Traillii* and *P. prolifera*. *P. Traillii* has pale blue flowers, *P. purpurea* purple flowers, but all the others have lemon-yellow flowers, and even *P. obtusifolia* has both purple and yellow flowers. Indeed, luxuriant specimens of the yellow-flowered condition of *P. obtusifolia* can with difficulty be separated from the *Stuartii-sikkimensis* series. The yellow-flowered Primroses of India constitute, therefore, a most perplexingly difficult group. In fact, they can alone be isolated one from the other by relative qualities.

P. purpurea, Royle. Leaves obovate-spathulate, almost entire. Flowers purple, forming compact umbels; capsules often twice the length of the calyx. Found on exposed hillsides, seeking the shade of overhanging banks and preferring rich mouldy soils. Duthie collected in Hazara a yellow-flowered form of this plant which is very different from *P. Stuartii* and has the protruding capsules of *P. purpurea*.

P. Stuartii, Wall. Differs from *purpurea* in the leaves being minutely serrate. It is usually found in much wetter situations, preferring in fact, like *P. sikkimensis* and *P. prolifera*, watercourses. Flowers lemon-yellow on long spreading pedicels; capsules the length of the calyx. The Cambridge Botanic Gardens are supposed to have grown it in 1887, but their specimen in the Kew Herbarium seems to me to be rather a yellow-flowered form of *P. obtusifolia*.

P. sikkimensis, Hook. Leaves tapering into a winged petiole; coarsely serrate. Fruits globose, shorter than the calyx. Frequents marshy situations. *P. serratifolia*, Franch., from Yunnan, is probably only a form of *P. sikkimensis*.

P. Traillii, sp. nov. Leaves elliptic-spathulate, distinctly wing-petiolate. Flowers verticillate, pale blue; carpels contained within the calyx. Found under shade of rocks in dry situations at great altitudes.

P. Inayati, Duthie. A Hazara plant, found at low altitudes (4,500 feet), which is possibly intermediate between *P. sikkimensis* and *P. prolifera*. The scapes are shorter than the leaves, and the fruits contained within the calyx.

P. prolifera, Wall. Leaves very large, obovate-spathulate, not petiolate. Flowers small, many, verticillate and yellow; capsules globose (allied to *P. imperialis*, but quite distinct). It is found in marshes or on the banks of streams, at altitudes of 8,000 feet.

P. reticulata, Wall. Leaves with a distinct petiole, bearing an oblong cordate blade; scape much elongated. Flowers relatively small, yellow. Fruits globose. Found in marshy places.

It will thus be seen that if the characters that separate *P. purpurea* from *P. Stuartii* be not recognised, all the above species (except perhaps *P. reticulata*, which does not belong to this section) would very possibly have to be treated as varieties of one and the same species.

Professor Balfour writes me that they have had under cultivation several of these species, and one plant raised in that garden I believe must be accepted as a cross between *P. Stuartii* and *P. sikkimensis*. The last-mentioned (*P. sikkimensis*), he tells me, is best grown as a biennial, when it flowers and fruits profusely. It will live and flower for several years, but for successful cultivation a short life is preferable. It is a most profuse grower in the open air.

Of *P. obtusifolia* the Professor writes that it is a fine hardy species, but not very free; perhaps we have not given it much attention. This occurs in India on grassy hillsides, and where met with is exceedingly plentiful. In Sikkim I found miles of country literally covered with it, and its strong metallic smell was so overpowering that I and most of my party got severe headaches. A little higher we came on a yellow-flowered form of the same plant that had a delicate perfume.

P. elongata was originally collected by Sir J. D. Hooker. It has since been gathered by Jaffrey, Pantling, and others, at altitudes of 11–13,000 feet. Sufficient material has thus come to light to justify its separation from *P. obtusifolia.* It flowers in June and has the leaves of *sikkimensis,* but with greatly elongated corolla tubes. The flowers are very delicate, the petals thin, glabrous, and veined.

A plant that I take to be possibly a form of *P. elongata* was found by me in Sikkim. It has large pendulous flesh-coloured flowers, the petals being thick and woolly in texture. It has the most delicate perfume of any plant I ever came across. It is not as yet named, is but imperfectly represented in herbaria, and may prove a good new species.

P. Traillii has been mentioned by me already, but I may say a few more words about it. I found it in Upper Kullu in 1894, at altitudes of 15–17,000 feet. It was in flower and ripe fruit in October, so I presume it has at least two flowering seasons—spring and autumn. It was found under the shade of large rocks growing in a dry, soft, powdery soil. The leaves were as much as twelve to eighteen inches long, very like those of *P. imperialis,* but the flowers were pale blue. I regard it as a perfectly good and new species, and have proposed to name it in honour of the Rev. J. Traill of Jaipur. The seed I collected of it was mixed with the only other Primula found in Kullu during that expedition, namely *P. involucrata,* on account of the necessity that existed to economise my collecting materials. On the mixed seed reaching Europe it was found that only *P. involucrata* germinated, and this got talked of as *P. Traillii*—thus a laugh was turned against me. The botanical specimens that I brought away with me show, however, that I was unfortunate in my seed, but that the plant was a genuine find, and one which cultivators will much appreciate when it is ultimately successfully introduced.

Its nearest Indian affinity is with *P. prolifera,* a species found in the Khasia and Naga hills at much lower altitudes (8,000 feet), growing in damp places and producing yellow flowers. But it is much closer to *P. japonica,* except that in that species the flowers are much larger and dark purple.

P. prolifera is a delightful low-level species, frequenting water-courses. It has been collected in Sikkim at 12,000 feet. Has been long known to be found in the Khasia hills at 4–6,000 feet, but in 1897 I extended its area to the Naga hills (altitude 7,500 feet). The plant collected by Griffith in Bhutan I believe to be distinct, and closer to *P. imperialis* than *P. prolifera.*

P. Tanneri, King, was another find of mine in Sikkim, which had

Fig. 73. Section 5: Petiolaris.

A, P. petiolaris, *Wall.*; B, P. Stirtoniana, *Watt* alpine form; C, P. petiolaris, *Wall*, also *a'* showing flowers solitary; D, P. Listeri, *King*, leaf to show full petiolate condition; E, P. mollis, *Hook.*, leaf to show full petiolate condition.

been collected previously, but confused with *P. obtusifolia*, var. *Griffithii.* It is a good species found in Rhododendron glades and possessed of very beautiful pale lavender-coloured flowers.

P. Kingii, Watt, is a lovely plant met with in Sikkim. It has leaves shaped as in some forms of *P. purpurea,* only smaller, thicker, and almost leathery in texture. Flowers usually pendent, and of such a dark claret colour that they are almost black. This species, I believe, would be much admired were it introduced into cultivation. I found it in full flower at 14,000 feet, and most collectors have done the same, the result being that we have not as yet got the seed. It has been collected in Tibet by Hobson. *P. Gammieana,* King, I believe to be at most a variety of this species, and still another allied form, *P. amethystina,* Franch., has come from Yunnan.

P. Elwesiana, King, is perhaps the most striking Primula of Sikkim. It occurs at altitudes of 12,000 feet. It has large, solitary, deflexed flowers, borne on much-elongated, thickened, and pilose peduncles, destitute of bracts. It is the representative of a Chinese group of great beauty, of which *P. vincæflora* and *Delavayi* of Franchet are superb examples. These have recently been procured from the mountains of Yunnan, and may yet with further study be found to constitute a subgenus. They recall in some respects *Bryocarpum.*

Perhaps the best-known cultivated example of a Primrose belonging to this section would be *P. nivalis,* Pall., especially the var. *turkestanica.* It is found in Turkestan and Persia, and thus keeps up the character of this assemblage, being strongly N.W. Himalayan. The form of *P. nivalis* collected at St. Matthew Island during the British Behring Sea Commission still further preserves this peculiarity. It might be described as closely allied to variety *Moorcroftiana.* And, as if to confirm the reduction of *P. Stuartii to P. purpurea,* there is a yellow-flowered form of *P. nivalis* that has been described by Regel as var. *Bayerni.* The Altai form of *P. nivalis* corresponds closely with the leathery-leaved form of the Indian condition, for which at one time I proposed the name *P. plantaginea*—a smaller plant, with narrower leaves than *P. Moorcroftiana.*

5. **Petiolaris** (fig. 73).—This in more senses than one may be described as the most sportive assemblage of Indian Primulas. The species thrown together under it are not only found to vary freely, according to soil, exposure, altitude, &c., in which met with, but they obey the dictates of cultivation almost instantly. The central feature that separates the group may be said to be the presence of a distinct petiole in place of the spathulate-cuneate sheathing base of the leaf met with in the majority of the species placed in the other sections of this classification. The name *petiolaris* at once suggests that peculiarity, but, strangely enough, it has been given to the species of the assemblage that is least petiolate, namely *P. petiolaris.* There have been described in the "Flora of British India" seven varieties of that species, but with a very little stretch of imagination that number might easily be doubled. In three of these varieties the leaves are usually obovate-spathulate-sessile, but occasionally a rotund leaf borne on a long naked petiole may be found. In the other varieties, petiolate leaves are universally present, along with spathulate sessile

leaves, and in one form, that called *Edgeworthii*, the heart of the plant consists of a compact rosette of small sessile leaves, while placed on the circumference are many very large ovate-elliptic leaves, borne on petioles 3 to 6 inches long. Lastly, the flowers may be solitary axillary, or crowded within the axils, on either an exceedingly short or a greatly elongated common stalk(fig. 73, *a'*). One variety, *scapigera*, has a whorl of petiolate, perfectly formed, but minute leaves, in place of the bracts, surrounding the umbel of long pedicels. Among the spathulate-sessile-leaved forms, one which Wallich named *nana* has linear-oblong sharply toothed (erose) leaves, and usually large solitary flowers. From this form the transition is almost imperceptible into *P. Stirtoniana* and *P. Hookeri*. These might in fact be viewed as Alpine states but for one circumstance, namely, that while the mouth of the flower in *P. petiolaris* is open and never obstructed by an annulus, both these Alpine plants have the throat constricted by a distinct annulus. Whether this is only a special sexual adaptation to facilitate fertilisation or is a specific structural peculiarity, I cannot at present say. I have accordingly retained them as species, but *P. petiolaris* varies so remarkably that it would be no great stretch of imagination to uphold the forms mentioned as only alpine states of the protean species *P. petiolaris*.

In point of colour of flower there is less variability than in shape of flower, form of leaf, and degree of mealiness. The alpine states have as a rule much larger flowers than those of lower altitudes. And what is more surprising still, while the low-level forms are seen to originate large clumps, within crevices of rocks in damp situations or even under the spray of waterfalls, the alpine forms prefer the shade of bamboo or pine. They invariably form large clumps, often a foot or more in diameter, and are seen very frequently as one mass of bright rose-purple to pale lilac flowers with yellow throats. But there is still another circumstance that I think it is well to mention. The whole of the clumps in one neighbourhood flower simultaneously and have repeated flushings throughout the year. On April 20 I passed along the Toungloo range in Sikkim when *P. petiolaris* was a blaze of flowers (fig. 73, A). I returned twenty days later along the same path and could not discover a single flower. I have collected it in flower from March to September, though it is best in May and June.

But, gentlemen, I have gone into these details with *P. petiolaris* because I think it is a much-neglected beautiful species. It sports almost too freely, is perennial, and easily grown if liberally supplied with water or planted alongside of limestone rocks. I have another reason: it is very largely representative of the series with which I am at present dealing. To understand them fully, however, it is desirable that I should classify the *petiolaris* section a little more in detail. There may be said to be two great subsections :—

1. Leaves glabrous or nearly so, and ovate-spathulate to subrotund, sheathing. The species are *P. petiolaris* in all its forms, also *P. Stirtoniana* and *P. Hookeri*. Then a special group that have large sheaths on an erect stem, viz. *P. pulchra* and *P. Dyeriana*. Lastly two plants, *P. Clarkei* and *P. reptans*, that I place here because of their being glabrous N.W. Himalayan forms, but they might otherwise more naturally be assigned positions in the set that follows.

2. Leaves puberulous or tomentose, rotund, and possessed of distinct petioles. The examples are *P. reticulata*, *P. rotundifolia*, *P. Gambleiana*, *P. Forbesii*, *P. Listeri*, *P. vaginata*, *P. mollis*, and *P. geraniifolia*.

I desire to bring before you only the more striking facts of the classification with a view to establishing general principles that I think may be of practical value. No single character in the above diagnostic separation would by itself be of any real value, but when taken in the aggregate they are of great assistance. For example, were we to simplify the above into glabrous and puberulous forms we should instantly meet with numerous stumbling-blocks. I need but mention that *P. reticulata*, *P. rotundifolia*, and *P. Gambleiana* are often almost glabrous. So again leaves spathulate and leaves petiolate would be useless characters by themselves, since, as I have just said, both conditions may be met with on one and the same plant. Still again, flowers solitary or flowers umbellate would be quite misleading, since both these conditions may be seen on the same root. But when we speak of umbellate Primroses with pilose rotund petiolate leaves, we indicate a readily recognisable and perfectly natural series, a series that embraces many of the most charming cultivated plants that exist. I need but mention the Chinese Primrose, with its endless varieties and races, and the urticating *P. obconica*, to instantly bring to your minds plants that would fall into this position. I am on dangerous ground, however, when I venture to speculate, before an assembly of practical men, as to what has been done or cannot be done by hybridisation. I feel that I am, however, safe in saying that it would be most surprising to learn that *P. sinensis* had been successfully crossed with *P. farinosa* or even with *P. petiolaris*.

In Kashmir, Mr. C. B. Clarke collected the plant that now bears his name. It is the most Western member of what I should like to call the Indian *sinensis* series, but it is not pilose-tomentose. In Sikkim, Manipur, and the Naga hills *P. Listeri* occurs, in Bhutan *P. filipes*, and in the Shan States *P. Forbesii*—a species suspiciously like some of the hairy forms of *Androsace*. These all possess subrotund, cordate, pilose-tomentose leaves. The inflorescence is a lax-flowered umbel (often verticillate) with long spreading pedicels, and the calyx loose campanulate with broad teeth. That description may have again called to mind *P. obconica*, and it is undoubtedly a close ally of the series. Fortunately, none of our Indian examples have, however, the evil reputation of that plant, but *P. Listeri* has a most remarkable smell that brings to mind the odour of *Geranium Robertianum*.

From these, the transition passes (possibly through *P. vaginata*) easily enough to *P. mollis* and *P. geraniifolia*. And these little-known but charming Indian species at once suggest the European *P. cortusoides*, the Turkestan *P. Kaufmanni*, as also the Chinese *P. sinensis*. In fact, some of the verticillate forms of *sinensis* even, are suspiciously like hybrids with *P. mollis*.

This, then, is our specially Eastern series of Primroses. A few years ago hardly any of them were known. I believe I was the first to find *P. Listeri* in Sikkim. The year following I carried its habitat further to the East by finding it in Manipur and the Naga hills. It has since been found in Upper Burma, and I should not be surprised to learn that it had been collected in China, but it would astonish me very much indeed to hear of its being found in the North-West Himalaya. The story of *P. Listeri* is true of most if not all the other round-leaved hairy forms that have been recently discovered in Sikkim and Eastern Tibet. They are more Chinese than Indian plants, and accordingly Sikkim may be viewed as their most Western habitat.

But we have another rotund-leaved series of Primulas that is more Indian in character than those briefly indicated. The best example of this is *P. rotundifolia,* and other examples are *P. Gambleiana* and *P. reticulata.* But, as already mentioned, these are almost glabrous plants. I cannot detain you by going into details regarding them, but shall mention one or two facts. *P. rotundifolia* practically occurs throughout the Himalaya from Kashmir to Sikkim, at altitudes of 10,000 to 12,000 feet. It is fond of a rich peaty soil, being usually met with in dry shade, such as under shelving rocks in Rhododendron glades. It is a delightful plant, growing in fairly large clusters, each stem being embraced near the ground by large sulphurous scales. The under-surfaces of the leaves, as also the petioles, are coated with white farina. Petioles long, erect, the scapes nearly double the height of the leaves, becoming from 6 to 9 inches in height, and bearing two whorls of bright purple-pink flowers with strongly marked yellow throats, and faintly but sweetly perfumed. Professor Balfour writes me that they have had it growing in Edinburgh for the past couple of years. It grows freely in pots, and promises to be an acquisition.

Its nearest ally, *P. Gambleiana,* occurs at slightly higher altitudes, but is confined to Sikkim. It is a superb species, found growing almost epiphytically on banks of damp moss. Flowers large, purple-pink with yellow throats, constricted and annulated.

P. reticulata is the link of connection with the *purpurea* series of Primulas. It is in fact much like a small form of *P. sikkimensis,* with distinctly petiolate oblong cordate leaves, the scape relatively much elongated, the corolla tubes narrow, much-exserted mouth, not annulated, and the fruit ovoid, contained within the calyx. Professor Balfour informs me that in the Edinburgh Botanic Gardens they have not made much use of this plant. It has been grown for years, and is as easy of cultivation as *P. sikkimensis.*

But I have said enough. I have established fairly satisfactorily the existence of a Sikkim series of round-leaved puberulous Primroses that becomes still further elaborated in the mountains of Southern and South-Western China. I have also indicated an Indian series of glabrous rotund-leaved species. It is significant how persistently the presence or absence of hairs on the leaves points to their origin. Given a glabrous Indian Primrose, and I should almost from that circumstance alone hazard the opinion that it had most probably come from the N.W. Himalaya. If this is a mere coincidence it is one that runs parallel with many others. The peculiarity suggested may of course be indicative of climatic influence, but, whatever its cause, it in many cases denotes forms that may be grown successfully out of doors in England, whereas the hairy species almost invariably require glass.

6. **Floribunda** (fig. 74).—There is very little to say regarding this

Fig. 74.—Section 6: Floribunda.

A, P. floribunda, *Wall.* var. bracteata, *Watt*: *a'*, verticillate inflorescence; B, P. floribunda, *Wall.*, higher eastern altitude condition; C, P. Lacei, *Hemsl. et Watt.*

group further than has been already observed. They have the leaves conduplicate in vernation. They would appear to be the warm temperate Primulas, and to be more African and Arabian than Indian. In passing it may be observed that in the classification of geographical areas pursued at Kew, a portion of India is placed along with North Africa and the Orient, namely Baluchistan and Afghanistan. That is the very region where the Primulas of this section attain their highest development. *P. floribunda* occurs in clefts on damp rocks from Kumaon to Simla and Kashmir, at altitudes from 3,500 to 6,000 feet. In its area, however, the altitude is gradually lowered on passing westward, until in the Northern Panjab it occurs almost at the level of the plains. And what is perhaps more significant still, with the depression of altitude, the plant becomes larger, more robust, quite glabrous, often mealy, and the bracts foliaceous. General Sir J. Macdonald sent me many years ago samples of this plant from the Khyber Pass. These, in my opinion, break down the separation of *P. verticillata*—the Abyssinian member of this series—from *P. floribunda*, You are all aware, gentlemen, that a hybrid plant appeared some years ago at Kew, between these two species. This has since been produced by many Primula cultivators, and much has been said regarding the extraordinary improvement thereby effected, the hybrid being in some respects superior to either of its ancestors. The leaves are large, glabrous, and copiously coated with white farina. These facts but confirm the observations to which I have endeavoured to invite your attention. The two plants are closely allied: hence hybridisation, in my opinion, becomes natural and easy. And the new form followed the tendency of becoming more luxuriant under altered circumstances, exactly as *P. floribunda* does naturally in India on passing westward to lower altitudes (*conf.* fig. 74, A, with B).

Recently my friend Mr. J. H. Lace made a delightful discovery in Quetta of a new species belonging to the *floribunda* section which has now been named *P. Lacei.* This has a suffruticose habit, and frequents shady places in limestone rocks. It is very much more beautiful than any other member of this group, its soft woolly leaves being in themselves very charming, but its flowers are very beautiful. For the size of the plant they are remarkably large, and of a delicate yellow colour.

I fear I must have trespassed sadly on your patience. But I have endeavoured to bring before your mind's eye a panorama of the Indian Primulas assorted under a new classification. The contention that I have tried all through to impress upon you is not the merits of that classification *per se.* It doubtless has many defects, but it seems to me to bring together plants that are related to each other. If this be so, we have the key to successful cultivation and to future hybridisation; for, while I believe anything possible, I am convinced that to be successful hybridisation should advance stage by stage with the closely allied forms before the more remote are attempted. And what is even more important, I am convinced that hybridisation should not only follow the guiding hand of systematic affinity, but be governed by observation of habitats and dispositions. *P. Traillii,* I have shown you, is structurally related to *P. prolifera,* but the one grows in the North-West Himalaya in dry soils under the shadow of rocks at altitudes of 15–17,000 feet, and the other in the extreme East, frequenting open marshy glades or the margins of streams at altitudes of 5,000 to 8,000 feet. I should hesitate to attempt the cross-fertilisation of these two plants, even though they are undoubtedly nearly allied species botanically. What is desired by hybridisation is improvement of the attractive features of a plant, and to that end I believe luxuriant growth is essential. It is therefore necessary to study the natural tendencies of life, quite as much so as to select plants which, when crossed, would produce a gocd combination of beautiful forms.

FAR EASTERN MAPLES.

By James H. Veitch.

Amongst hardy deciduous trees, few display a greater variety of form and habit than the Maple.

Some, such as *Acer macrophyllum*, *A. eriocarpum*, *A. neapolitanum*, and the common Sycamore, are rapid-growing trees suitable for growing in woods, whilst others, such as *A. monspessulanum*, *A. opulifolium*, and *A. Opalus*, are round-headed trees of a dwarfer stature; and many forms of *A. palmatum* and *A. japonicum* are but dwarf bushes.

Their geographical distribution is remarkable and of the widest, and few genera can boast of so many representatives in so many portions of the globe. Some are indigenous to Europe, and England can claim one species. The Mediterranean forms extend into Northern Africa on one side, and into the Levant on the other; Asia, from the Caucasus and the Himalaya to the Amoor river and Japan, has others, whilst China has now recently been found to be rich in species. North America boasts of several forms, but for the most part those of the eastern side of the continent differ from those of the western.

As a rule, each continent has its own forms, though the South European occur in Asia Minor and Northern Africa, some of the American species, notably *Acer Negundo*, are found in Japan, and several introduced from the last-named country to Europe are undoubtedly of Chinese origin. From an economic standpoint several species are of great value.

The present paper does not deal with the entire genus, but with those of China, Japan, and the neighbouring countries, many of which have already proved so valuable under cultivation in England.

It is becoming every year more evident that we owe much to the forests of Japan, more indeed than is realised by planters generally; and now that the results of the original plantings of the introductions of Charles Maries have had from twenty-five to thirty years to prove their value, it is permissible to speak somewhat definitely.

The accompanying illustrations certainly tend to show that, among the extensive flora of that mountainous and volcanic country, the Maples now in cultivation are quite as much at home in England as in their native forests, whilst those of the Chinese species now growing at Coombe Wood are hardly less promising.

That some Maples are apparently indigenous to all the Far East is undoubted, but as to the exact geographical distribution much has yet to be learnt.

Ten years before Maries reached Japan, the Editor of the "Gardeners' Chronicle" (in September 1868) drew the attention of planters to the wealth of material among the Maples for ornamental planting.

He wrote: "In this group there is variety enough, one would think, to please every one; some are trees, some are bushes; billowy masses of yellow flowers crowd the leafless sprays of some; leaves of gorgeous hues bedeck most of them in the autumn; streaks and bands of silvery-white adorn the back of one or two, and strange winged fruit belongs to all."

In the years which have elapsed since the above was written, new species and new forms have been introduced to the gardens of this country, and others from Manchuria and China, but recently named by Sargent, are proving distinct and interesting. In 1868 the value of these Eastern Maples was evident as far as Japan was concerned, and time has but confirmed the opinion. The new species from the Valley of the Yangtsze are no less promising.

The popularly known "Japanese Maples" are varieties of the two species *Acer palmatum* and *Acer japonicum*, the two most commonly cultivated by the Japanese, but there are many other species found in the woods which deserve to be better known and more frequently planted. These are described in the present paper, as well as some new introductions from Central China now undergoing trial at Coombe Wood, in Surrey.

Although over forty years have passed since my firm introduced the first batch of *Acer* (*polymorphum*) *palmatum* varieties, judging from the paucity of good specimens found in gardens, it does not appear that the many fine forms are sufficiently appreciated, due possibly to a mistaken idea that they are not hardy in this country, a fear justified when the plants were newly introduced, but now untenable.

The experience at Coombe Wood, and in many gardens in various parts of the country, has placed it beyond doubt that the Japanese Maples are hardy in Great Britain, although of slow growth.

They are also hardy in America and are grown in large quantities in the neighbourhood of New York and Boston, where the winters surpass in severity those experienced in these islands, and where also the bright sunshine of the summer months gives to the foliage a brilliance we cannot hope to rival. Not the least of the attractions of this great group are many of the forms of *Acer palmatum* and *A. japonicum*, low-growing round-headed bushes, or small trees with slender twiggy growths, almost entirely hidden by a wealth of foliage of the most variable form. Of colour they have a range such as no other class of deciduous trees possesses, from soft pale green, through golden-yellow to bright crimson, claret-red, and deep blackish-purple.

In the matter of culture the Japanese Maples are by no means exacting, given a soil sufficiently deep to afford a sure supply of moisture during periods of drought, and a position sheltered from the north and east winds, always liable to injure the tender foliage in spring and spoil the symmetry of the tree by breaking or checking the growth of the branches.

Some of the varieties with finely cut foliage are eminently suited to pot culture, and in early spring their delicate frond-like leaves are an admirable contrast to flowering plants; but it is by no means necessary to restrict their culture to pots and glass-houses, as they are as much at home and quite as hardy as the broad-leaved forms in the open garden. The very dwarf varieties are admirable subjects for rockeries.

Where colour schemes in foliage are attempted, the various forms of

FIG. 75.—ACER CARPINIFOLIUM (*Sieb. and Zucc.*).
Growing at Coombe Wood, Surrey. Height, 12 feet; diameter of head, 9 feet.

Japanese Maples are invaluable, and clumps of one kind, or two or three varieties with colours harmoniously blended, afford a very pleasing feature in early spring, enduring longer than our most persistent flowering shrubs. But it is not only the garden that has benefited by the introduction of Maples from the Far East, as some of the species are large-leaved strong-growing trees, which, although they do not reach the dimensions of their Western relatives, are worthy of a place amongst our native park and woodland trees. Among such are *Acer distylum*, a simple-leaved species, *A. rufinerve*, a tree of rapid growth, in habit like a Sycamore; *A. Miyabei*, of comparatively recent introduction; *A. carpinifolium*, the Hornbeam-leaved Maple; *A. diabolicum*, with very large leaves; and *A. nikoense*, a trifoliate-leaved species which assumes in autumn a brilliant crimson hue.

Before referring to the new Chinese species sent by Wilson, I will briefly enumerate the Maples from Japan already in cultivation, and which it will be seen from the illustrations are worthy of more attention than they have hitherto received.

Acer argutum is a very pretty species, with neat foliage of a bright and tender green. The leaves are 5-lobed, with biserrate margins and acute lobes; the upper surface is reticulated and the under side strongly veined; the petiole is red, as is also the wood of the previous year's growth. A fully developed leaf measures 4½ to 5 inches in length and 4 inches in breadth at the extreme points.

A native of the alpine woods in the provinces of Senano and Nambu, Japan, it was introduced to this country through Maries.

Acer carpinifolium, rare in Japanese forests, is a most distinct Maple with leaves like those of the Hornbeam, and when not in fruit closely resembling that plant. The leaves vary somewhat in shape, being sometimes obovate and at others ovate with an acuminate apex and biserrate margins. When fully developed they measure 4½ inches in length by 2 inches in breadth, and are rather shortly stalked. The upper surface is glabrous, but the principal veins are hairy on the under surface. The wings of the fruit are divergent and slightly drooping, many-nerved, and the cells are flat. It was introduced to this country through Charles Maries, and a specimen at Coombe Wood is now over 12 feet in height. (Fig. 75.)

Acer capillipes is a rare plant in this country. It has leaves resembling in outline those of *A. tegmentosum*, and forms a bush some 10 to 12 feet in height in its native home. The autumn tint of the leaves is purplish-brown suffused with ochreous-yellow along the principal veins.

Acer cissifolium, otherwise known as *Negundo cissifolium*, is an elegant species with trifoliate leaves, the Japanese representative of the North American *Acer Negundo*, or Box Elder.

Acer cratægifolium was introduced from the mountainous regions of Japan, and first distributed about the year 1881, and is another of the introductions for which we are indebted to Maries.

The leaves of this species, as its name implies, bear a strong resemblance to some of the larger-leaved forms of *Cratægus*, and are of a deep bright green colour. They measure about three inches in length, and are unequally 3- to 5-lobed, with the edge much notched.

The tree is of slender growth, and of somewhat variable habit, attaining usually a height of about 20 feet. In its most attractive form it has a strong resemblance to a small Lombardy Poplar, though the growth is often more spreading. The bark on the young shoots and the foot-stalks of the leaves is reddish, as also are the leaves when first produced. The "keys" are borne in drooping racemes; the wings are small and widely spreading.

A very pretty form of *Acer cratægifolium*, to which the varietal name *Veitchii* has been given, has leaves which resemble the type in shape but have a pretty white and rose variegation. The variegation takes the form of irregular blotches, and differs in extent on different leaves, but is usually more pronounced on the young growths. As a companion to the type species it is interesting.

Acer diabolicum, also known in gardens as *Acer pulchrum*, is a very large-leaved Maple, introduced to cultivation in 1881 through the late Charles Maries, and is not unlike the Sycamore. It has the largest leaves of all the Japanese species, and in this respect rivals *Acer macrophyllum* of California. As a tree for the park or woodland, as well as for the garden, it is suitable.

The leaves are 5-lobed, and the subdivisions are again deeply and coarsely serrate. The "keys" are produced in racemes, following yellowish flowers; the wings are drooping and the fruit hairy. Two hornlike processes, the remains of the stigmas, project from the centre of the fruit, and are supposed to have suggested the specific name.

The young wood and leaf-stalks are hairy, and tufts of hairs occupy the axils of the principal veins on the under surface of the leaf.

Another fine species which was also one of Maries's introductions is *Acer distylum*, a simple undivided-leaved species of distinct appearance, which is perfectly hardy in this country. A good specimen now growing at Coombe Wood has reached a height of 18 feet, with a head of branches 21 feet in diameter. (Fig. 76.)

The leaves are heart-shaped in outline, $5\frac{1}{2}$ inches long by $4\frac{3}{4}$ inches broad, deep, rich, shining green on the upper surface, paler beneath, with a serrate margin and sharp-pointed apex.

The erect racemes of "keys," which are freely produced on the plant at Coombe Wood, are a conspicuous feature of the tree during summer; their pale green colour showing strongly against the dark green of the leaves.

Acer Ginnala, a native of Amurland, was formerly considered a variety of *A. tataricum*, but is now accorded specific rank.

The tree is of small size, graceful in habit, and the leaves, triangular in outline, are prettily cut and lobed, and assume in autumn the most brilliant red tint. On this account alone it deserves a place in every collection. A form with smaller leaves than the type, known as *Semenovii*, is slender, and very graceful.

Acer japonicum, the type species, is a beautiful Japanese tree which attains in its native country a height of 20 feet. The leaves are of a light green tint in early spring, deepening as they mature to a deeper shade. The flowers appear in May and are of a deep purplish-red colour, contrasting in an admirable manner with the pale hue of the young leaves.

FIG. 76.—ACER DISTYLUM (*Sieb. and Zucc.*).
Growing at Coombe Wood, Surrey.
Height, 18 feet; diameter of head, 21 feet.

Fig. 178. Acer japonicum [illegible] var. [illegible]

Growing at Coombe Wood, Surrey. Height 14 feet, diameter 23 feet.

FIG. 79. ACER JAPONICUM (*Thunb.*), var. MICROPHYLLUM (*Hort. Veitch*).
Growing at Coombe Wood, Surrey.
Height, 12 feet; diameter of head, 11 feet.

The many forms of this fine species are very ornamental, and all are worthy of cultivation in this country. Among the best are:

A. japonicum aureum, distinguished from the type by having leaves of a soft pale yellow with rose-coloured foot-stalks and nerves; they are palmately divided into 10–12 lobes, fan-shaped in outline, and entirely glabrous on the upper surface. The under side is hairy and tufts of hair occur in the axils of the primary and secondary veins.

It is a remarkably handsome plant, seldom exceeding the size of a shrub, and admirably adapted for planting in borders, where it should be contrasted with some dark foliage to enhance the brightness of its own golden-coloured leaves.

A. japonicum laciniatum differs from the type in having its leaves deeply cut into lobes, which are again divided in a pinnatifid manner, giving a Fern-like appearance to the foliage. In autumn a rich claret-purple tint is assumed, relieved at the tips by yellow. (Fig. 77.)

Acer japonicum vitifolium is a very handsome form, which produces such a wealth of fanlike leaves that the branches are entirely hidden during the period of growth.

The sharp points of the leaf-lobes give the foliage a general resemblance to some species of *Vitis*, but the ten to twelve lobes into which they are divided are never found in a Vine. A fully developed leaf-blade measures from 4½ to 5 inches from the base to the tip, and has a finely serrate margin. In autumn the tints assumed vary from terra-cotta-yellow with a suffusion of deep claret-purple. The young wood is reddish-purple, deepening to almost black. The wings of the "keys" are reddish when young and widely separated.

A robust specimen at Coombe Wood, 14 feet in height, has a spread of branches measuring 20 feet in diameter. (Fig. 78.)

A. japonicum microphyllum has leaves like those of the type, but of smaller size; they are of a bright green colour and entirely glabrous except in the axils of the principal veins on the under surface.

The "keys" are produced plentifully, and are remarkable for standing erect on the tree and not drooping as these usually do.

A specimen plant at Coombe Wood measures 12 feet in height, with a spread of branches 11 feet in diameter. (Fig. 79.)

The fine *Acer Miyabei* was discovered in the northern island of Japan by Professor Miyabe, the accomplished botanist attached to the Agricultural College at Sapporo, and is of comparatively recent introduction to this country. It bears some resemblance to the Norway Maple in habit, and makes a medium-sized tree, 30 to 40 feet in height, with the spreading branches forming a round-topped head.

The leaves are 5-lobed, 4 to 5 inches in diameter, with sinuate margins, the upper and under surfaces hairy, especially along the veins.

The petiole is from 5 to 7 inches in length and grooved along the upper side. The lobed leaves give the tree a graceful appearance, and their bright green colour is of a less sombre hue than that of the Norway Maple, which it otherwise resembles. The "keys" are produced in a drooping corymb; the cells are flat and covered with a short tomentum; the wings widely divergent and almost straight. A specimen at Coombe

Wood is 15 feet in height with a spread of branches 14 feet in diameter. (Fig. 80.)

In *Acer nikoense* we have a beautiful and remarkable Maple, noteworthy for its hairy trifoliate leaves, and for the brilliant tints which these assume in autumn.

It is a rare tree in Japan, and although it bears the name of the lovely district from which it was first imported, it is only occasionally met with there.

The trifoliate leaves are hairy on both surfaces, and the petioles and young wood are thickly covered with hairs. When first produced the leaves are of a reddish-bronze hue, changing as they mature to a deep pea-green above and a distinctly glaucous hue beneath.

The leaflets are of oblong shape, with serrate margins; the largest lobe measures 4 inches in length by 2 in breadth, and the lower pair 3 inches in length by $1\frac{1}{2}$ in breadth.

In autumn, especially in the south and west of England, as also in Japan, they assume the most brilliant scarlet tint, and, in the view of Sargent, are not surpassed in beauty by those of any other tree in Japan. The "keys" are produced in drooping racemes; they consist of two very prominent cells, which are thickly coated with hair, and two rather broad spreading wings, which are strongly veined and slightly drooping.

A specimen at Coombe Wood measures 23 feet in height, and has a spread of branches 28 feet in diameter. (Fig. 81.)

The type species, *Acer palmatum*, of which there are so very many forms, is a small compact tree with five-pointed leaves, of a bright lively green, and numerous small branches, which are almost entirely hidden by the wealth of foliage the tree produces.

There is a remarkably handsome specimen at Coombe Wood, probably the largest in this country, 25 feet in height, with a diameter of 26 feet, a glorious block of green in perfect health.

According to Loudon, who figured it in his "Encyclopædia of Trees and Shrubs," it was introduced to this country in 1820. The leaves are small, yellowish-green in colour when first produced, changing to a deeper tint when mature, divided into five pointed lobes and serrated along the margin. The petiole is from 1 to $1\frac{1}{2}$ inches in length, and is coloured red where exposed to the light.

The foliage is produced in the form of layers or strata, and is so luxuriant that almost all the branches are obscured during summer; but, though so densely leaved, the finely pointed foliage and cheerful green hue give the tree a light and graceful appearance. It assumes a bright red hue in the autumn. (Fig. 82.)

The numerous forms of *Acer palmatum* may be roughly classed into three divisions, though these tend to merge into each other: (1) the *palmatum* group, with five-lobed leaves resembling more or less those of the type; (2) the *septemlobum* group, with leaves fan-shaped and usually of seven divisions; and (3) the *dissectum* group, with deeply cleft leaves, the subdivisions being usually again much serrated.

The varieties in each division are many, and most of them are worthy of cultivation where suitable situations can be found, and there are very

FIG. 80.—ACER MIYABEI (*Maxim.*).
Growing at Coombe Wood, Surrey.
Height, 15 feet; diameter of head, 14 feet.

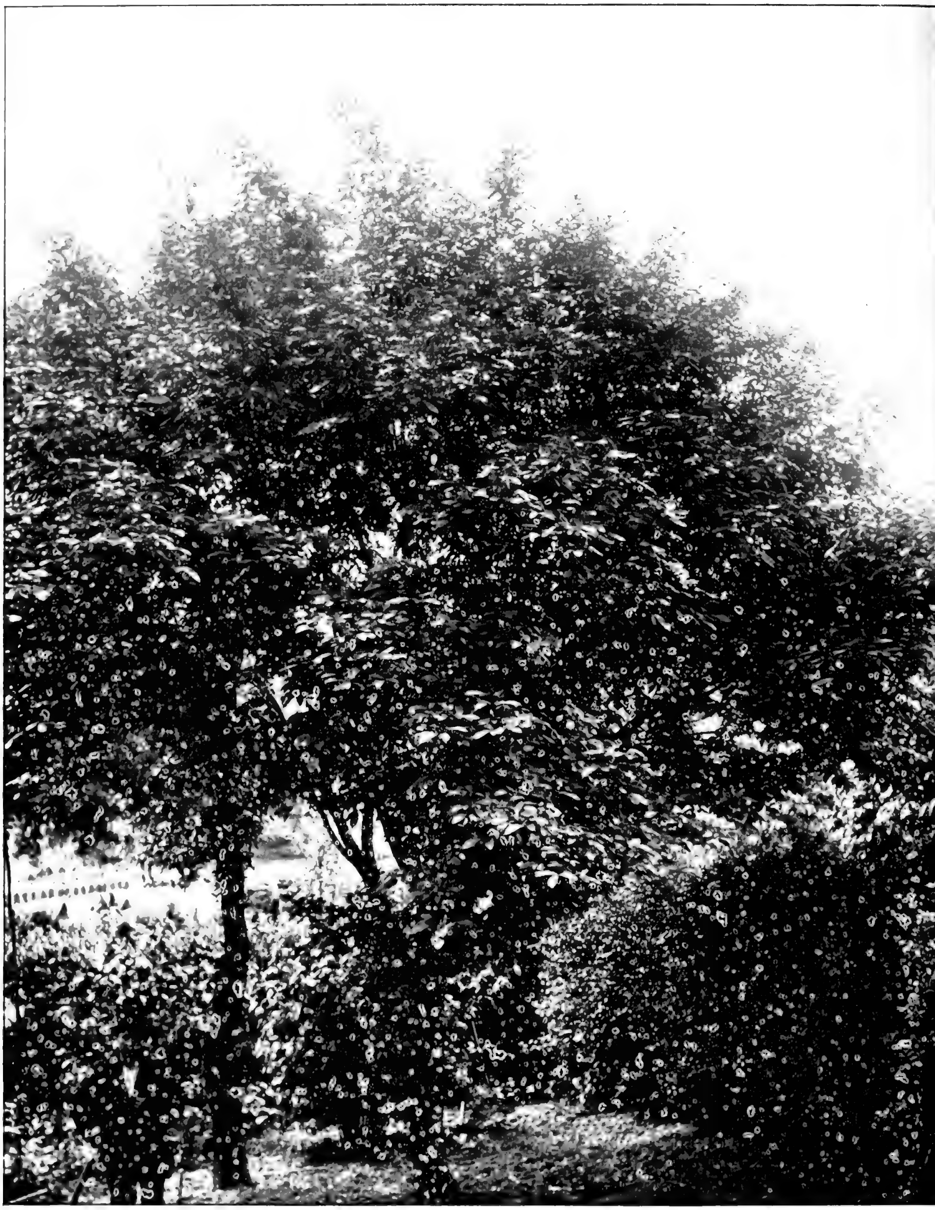


FIG. 81.—ACER NIKOENSE (*Maxim.*).
Growing at Coombe Wood, Surrey.
Height, 23 feet; diameter, 28 feet.

FIG. 82.—ACER PALMATUM (*Thunb.*).
Growing at Coombe Wood, Surrey. Height, 25 feet; diameter, 26 feet.

FIG. 83. ACER PALMATUM (*Thunb.*), var. ATROPURPUREUM (*Hort.*).

few spots where one or other of the many forms could not be planted to advantage.

At the head of the *palmatum* group the two handsome forms *sanguineum* and *atropurpureum* undoubtedly stand; there is nothing at all approaching their elegant highly coloured foliage among deciduous trees. Seen at a short distance the foliage is not only dazzling in colour, but also exceedingly neat, and, seen from afar when lit up by the sun's rays, it scintillates among the other shrubs like a ruby.

The two forms are close to each other in general appearance, but *sanguineum* may be distinguished from *atropurpureum* by having red bark on its young wood and a green under surface to its leaves.

In the neighbourhood of New York and Boston these two forms are grown in large quantities, and develop remarkably brilliant tints under the bright sunshine of American summers.

One of the finest specimens of *A. palmatum sanguineum* is growing in the gardens at Eastnor Castle, Ledbury, Herefordshire, and a very fine piece of *A. palmatum atropurpureum* is in a garden at Sunningdale, Berks. (Fig. 83.)

A charming little variety, quite one of the gems of the series, is that named *corallina*, rarely seen, as it is difficult to propagate and rarely procurable. This year at Coombe Wood the early spring foliage was exceptionally brilliant, and had at a distance the appearance of an Indian Azalea. The leaves are very small, five-lobed, of a rosy-crimson when first produced, changing to a pale mottled green suffused with rose in the summer: a charming subject as a rock-garden plant, of dwarf and compact growth, it would remain many years in one spot before it became too large.

A. palmatum ampelopsifolium is an elegant form with gracefully arched branches and leaves resembling those of the Virginian Creeper, but smaller and more delicate in texture, in colour a deep crimson, becoming darker as the season advances.

Its great value is as a foreground plant, on account of its graceful habit of growth and the bright colour of its leaves. *A. palmatum aureum* has its leaves cut into five deep lobes, and is more or less blotched with deep golden-yellow.

The form of *palmatum* called *involutum* is a small-leaved variety with the margins curiously infolded. The young shoots have a crimson-brown shining bark, and the leaves, which have comparatively long reddish footstalks, are cut into five linear sharp-pointed green lobes, the longest of which is not much more than an inch in length. A variegated form has distinct rose-coloured margins to the young leaves.

Acer palmatum ribesifolium has from five- to seven-lobed leaves, which are notched along the margin, like those of a Currant, hence the varietal name. They are dark green in colour and glabrous, and the plant is dwarf and very compact in habit.

A. palmatum roseo-marginatum is a very distinct and attractive form, with prettily variegated foliage. The leaves are divided into leaflets, three to five in number, light green in colour, marked along the margin with a narrow irregular band of rose-colour or white.

The second division of the *palmatum* group comprises those varieties with seven-lobed leaves, of which *A. palmatum septemlobum* is the type. This variety is a handsome Maple resembling *palmatum* in appearance, but the leaves are larger and divided into seven instead of five points. (Fig. 84.)

When first produced the leaves are of a reddish hue, changing when mature to a bright green, and in autumn to a rich amber-yellow or sometimes a crimson hue. There is a good specimen at Coombe Wood, measuring 10 feet in height and 14 in diameter, well furnished to the base with branches and foliage.

The form *elegans* is a more ornamental variety than *septemlobum*, from which it differs in having the lobes of the leaves more deeply serrate, and, when first expanded, margined with delicate rose. The mature leaves also are of a softer and lighter shade of green.

There is also a form of *elegans*, known as *purpureum*, which differs in having its deeply cut leaves coloured deep purplish-crimson, which become suffused with greenish-black as they mature: a particularly handsome plant when well grown.

A. palmatum septemlobum rufescens is a seven-lobed form, cut almost to the base of the leaf-blade into sharply pointed leaflets, which are biserrate along the margins. When first produced these are of a pale green hue, and they change to dark green with a reddish tinge as they mature.

Of the varieties composing the third division or *dissectum* group perhaps the best are *A. palmatum dissectum*, its form *ornatum*, and *A. palmatum palmatifidum*. (Fig. 85.)

The leaves of *A. palmatum dissectum* are very finely cut into an infinite variety of form, giving the foliage a distinctly Fern-like appearance. The young growths of this variety are long, slender, and pendulous, and, like the leaves, are of a deep crimson hue, especially in early summer.

The subvariety *A. palmatum ornatum* has leaves which are even more finely and elegantly divided than *dissectum*, and of a brighter crimson hue.

A. palmatum palmatifidum resembles *dissectum* in the form and lobing of its leaves, but is distinct from that variety in the colour of its foliage, which is of a light cheerful green changing to amber-yellow in autumn.

A more suitable companion to *dissectum* or its variety *ornatum* could not be found.

Two other useful forms of the *dissectum* group are *decompositum* and *linearilobum*, both worthy of culture.

In *A. palmatum dissectum decompositum* the bark of the young shoots is bright reddish-crimson, and the foliage a soft fulvous-green, forming a pleasing contrast to the more showy colour of the stems on which it is produced. Primarily divided into five lobes, the subdivisions of the leaves are again deeply cut into a variety of forms.

The form *linearilobum* has its leaves divided into long, narrow, slightly toothed lobes, which, when first developed, are of a decidedly reddish tinge, as are the shoots upon which they are produced; these become green with age, but retain the reddish tinge in the footstalks and margins.

Fig. 84.—Acer palmatum (*Thunb.*), var. septemlobum (*C. Koch*).
Growing at Coombe Wood, Surrey.
Height, 10 feet; diameter, 14 feet.

Fig. 83.—Acer palmatum (*Thunb.*), var. dissectum (*Hort.*).
Growing in a Berkshire Garden.
Height, 9 feet; diameter, 6 feet.

Acer pictum is a fine Maple, of which there are several variegated forms in cultivation, the best probably being *A. pictum tricolor.* A recently introduced green self-coloured variety of *Acer pictum* from China, named *Mono,* is fully described in a later part of this paper.

Acer rufinerve is a very handsome Japanese species, introduced through Maries and first distributed in 1881. It is indeed a beautiful tree, of rapid growth and perfectly hardy.

The leaves are fully 3 inches in length, slightly variable in form but usually 3-5 lobed, with a margin toothed and jagged. The nerves on the under surface are covered with a reddish tomentum when young, which is lost as the leaf reaches maturity, and the young shoots are covered with a bluish-grey glaucescence, forming a very remarkable and distinct characteristic.

The bark has the peculiar and pretty variegation characteristic of the Pennsylvanian *Acer striatum,* i.e. bright green striped with white.

A variety of *Acer rufinerve* is figured in the "Botanical Magazine," t. 5793, from material supplied by Mr. Standish, who exhibited it before the Royal Horticultural Society in May 1869. It has a regular margin of pure white round its leaves, from which circumstance it received the varietal name *albo-limbatum.* The "keys" are rather small, but are freely produced in drooping racemes, and just before they fall are coloured with a pleasing reddish tint. It is a handsome Maple and a charming companion to the type.

Another Japanese species, *Acer Sieboldianum,* sometimes known by the name of *Acer palmatum Kæmpferi,* commemorates the labours of Dr. Siebold, to whom we owe so much for his work among the plants of Japan, and their introduction to Europe.

The leaves are 7-lobed, with serrate margins; the flowers are yellow, and the wings of the "keys" widely divergent; the petioles and the pedicels of the flowers are thickly covered with hairs.

Other Japanese species sometimes met with and certainly worthy of attention are *A. tenellum,* an interesting species with small trilobed leaves of thin texture, and entire margins; *A. tataricum,* introduced in 1759, a native also of Central and Southern Russia, the Caucasus, Austria, and European Turkey, a small-growing tree with dark shining green leaves purple in autumn, and red-coloured fruit, very attractive during September and October; and *A. trinerve,* a Chinese species cultivated in Japan, with leaves more or less distinctly 3-lobed.

Of recent years few new Maples of beauty and interest have been available to British planters, but there is little doubt several species and forms among the rich collections recently made in Western China by Wilson will be appreciated and probably obtain a permanent footing in parks and gardens.

The arboreal flora of Central and Western China, which has been and is still being explored by this remarkably successful traveller, has proved rich in these trees.

Bretschneider, in his "History of the European Botanical Discoveries in China," enumerates some forty species as being recorded from that country, but many of them are also found in Japan and India, and are not endemic, and others, from their southern habitat, are too tender to cultivate in the open air in this country.

Specimens of thirty species and varieties were collected by Wilson, and several of these are now in cultivation at Coombe Wood. Among this collection are three species new to science and several unrecorded varieties.

Duplicate specimens were sent to Professor Sargent, of the Arnold Arboretum, Harvard University, Mass., U.S.A., and he kindly identified them. The Professor remarks *in lit.*: "Wilson seems to have been very successful indeed with the Maples, and altogether his collection is the most important and valuable that has been made by any one for many years."

The specimens now growing at Coombe Wood are necessarily seedlings, and, as Acers are proverbially variable in the seedling stage, it has been a somewhat difficult task to identify them, as the two important taxonomic characters—the flowers and fruit—are absent.

One of the most variable of the new Chinese species is *Acer Davidi*, so named by M. Franchet, to commemorate the labours of Père David, a French missionary in China, by whom it was discovered. Wilson met with it on the Kui mountains as a rare tree, attaining a height of about 50 feet.

The leaves vary much in size and degree of pubescence, sometimes reaching a length of 8 inches and a breadth of 5 inches. When first produced they are of a reddish-bronze tint, which changes later in the year to a deep rich shining green, with strongly marked veins of yellowish-green.

The fruit is borne in a drooping raceme; the cells of the "keys" are small and globular, and the wings, measuring $1\frac{1}{2}$ inches long by $\frac{1}{2}$ inch broad, are widely divergent. The bark is green striped with white—a valuable ornamental feature for winter effect.

An interesting fact concerning this species is that Maries sent it home from China some twenty-five years ago, and there is now at Coombe Wood an old stool from which plants have been layered for a number of years and distributed as "*Acer* sp. from N. China;" but, as it never flowered, botanists could not identify it.

It appears to be a strong grower and is apparently quite hardy. It has been planted in exposed situations and has withstood many winters uninjured. (Figs. 86, 90.)

Acer pictum var. *Mono* is a new Chinese variety that has made rapid progress from the seedling stage, and is now about six feet in height at Coombe Wood. It promises to become a handsome Maple, and from its rapid growth will doubtless be widely planted.

The leaves are from 3- to 5-lobed, with attenuated apices. The upper surface is shining green, and the under side is covered with a short pubescence which gives a velvety impression to the touch. The "keys" are freely produced in corymbs, the cells are horizontal, and the wings widely divergent, membranous, and strongly veined. (Figs. 87, 89.)

Acer sinense var. *concolor* is a new form of the species, with leaves green on both surfaces.

It is a handsome Maple, and, from its habit at Coombe Wood, promises

Fig. 86.—Acer Davidi (*Franch.*).]
A new species from Central China.
Seed sown January 16, 1902.

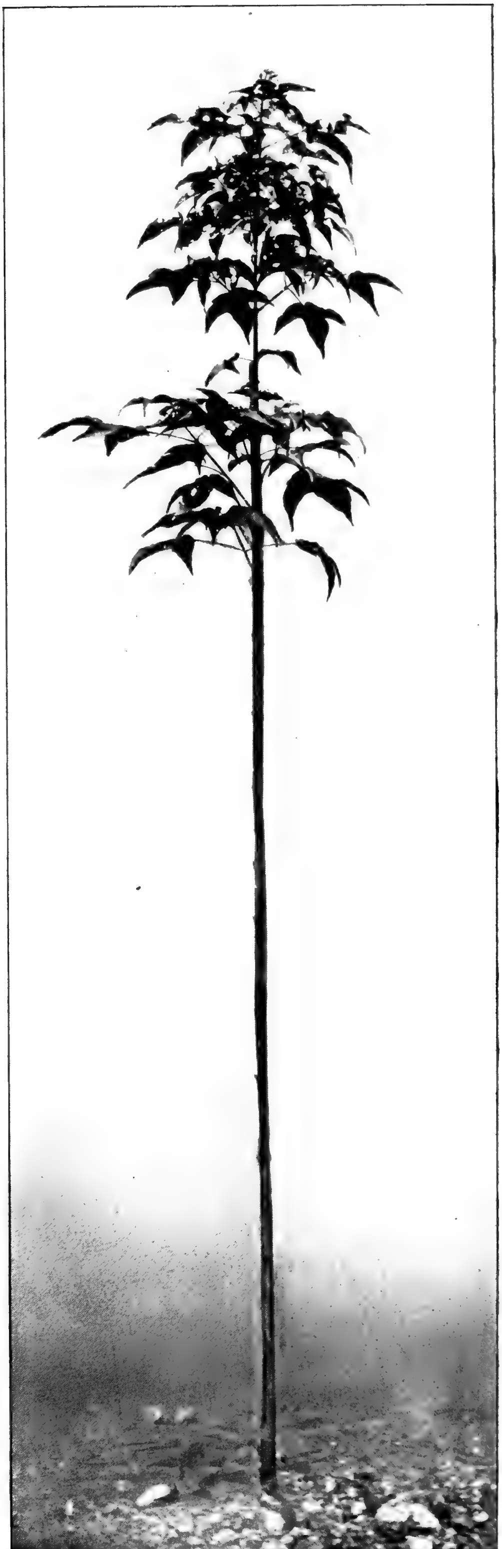


Fig. 87.—Acer pictum (*Thunb.*), var. Mono (*Maxim.*).
A new variety from China.
Seed sown February 21, 1901.

A A

Fig. 88.—Acer Francheti (*Pax*).

Fig. 89.—Acer pictum (*Thunb.*), var. Mono (*M*

Fig. 90.—Acer Davidi (*Franch.*).

Fig. 91.—Acer lævigatum (*Wall.*), var. Fargesii (*Rehd.*)

FIG. 92.—ACER SINENSE (*Pax*), var. CONCOLOR (*Pax*).
A new variety from Central China. Seed sown April 25, 1901.

Fig. 93.—Acer sutchuenense (*Franch.*).
A new species from China.
Seed sown November 22, 1900.

Fig. 94.—Acer tetramerum (*Pax*), var. lobulatum (*R*
A new variety from China.
Seed sown April 25, 1901.

to be of value. The leaves are somewhat like those of *Acer pictum*, 5-lobed, cordate at the base, with acuminate apices, reddish when first produced, and when mature a bright green. It was detected by Wilson in South Wushan, where it inhabits the sides of streams. (Fig. 92.)

An interesting little Maple is the form of the Indian *Acer lævigatum* called *Fargesii*.

It is dwarf and slow-growing, and looks rather tender, but at present has taken no harm in the open at Coombe Wood. On the mountains south of the Yangtsze, where it is an uncommon tree, it is said to attain a height of from 25 to 30 feet.

The leaves are leathery in texture, entire or slightly notched, and when first produced are of a bright crimson hue. Judging from the dried specimen collected in China, this form must be very handsome when in fruit, as the " keys," which are rather small but abundantly produced, are coloured bright crimson. The cells of the " keys " are globular in shape and horizontal; the wings are widely divergent. (Fig. 91.)

Acer Francheti is a species allied to *Acer villosum* of the Himalayas, from which it may be distinguished by its trilobed leaves, the small teeth on the margin, the simple inflorescence, &c.

It is common in the province of Hupeh, where it forms a handsome tree, varying in height from twelve to forty feet, and usually inhabiting the sides of streams.

The blade of the trilobed leaves measures about 5½ inches in length, and about the same in breadth, with irregularly serrate margins and an acuminate apex. The petiole is grooved along its length, pubescent, as is also the young wood; the leaf-blade is glabrous. The " keys " are very large, with strongly-nerved drooping and converging wings. Plants are now growing in the open at Coombe Wood. (Fig. 88.)

Acer sutchuenense is a trilobed species closely related to *A. Henryi* in the leaf, but with a different inflorescence. In *Acer Henryi* the flowers are borne in a long drooping raceme, but in *A. sutchuenense* they form globular heads, reminding one of the flowers of the Ivy. *Acer sutchuenense* was detected by Dr. Henry in Szechuen, close to the border of Hupeh, and was collected by Wilson in the last-named province.

It was first described by M. Franchet from specimens collected by Père Farges. (Figs. 93, 96.)

Another new variety among the Chinese seedlings is a form of *Acer tetramerum* (*A. betulifolium* of Maximowicz) called *lobulatum*.

It is a very graceful form, and at Coombe Wood is of fairly rapid growth, seedling plants having already reached a height of 8 feet.

The leaves are rather small, resembling those of a Birch, but with a margin cut into lobes, bright lively green in colour, and gracefully disposed on the branches.

For associating with the broad-leaved species or with our own native trees, the variety promises to be admirably adapted. (Figs. 94, 97.)

Acer oblongum is another species recently introduced from China. According to Loudon it was first sent to this country in 1824 from Nepal, but proved too delicate for cultivating in the open garden unless protected by a wall. It is a native of the temperate Himalayas from Kashmir to Sikkim, also of Hong Kong, Loochoo Islands, and Formosa, and grows in a diversity of climates. The species is variable, and possibly the form which Wilson sent from China may prove of hardier constitution than its Indian relative.

It is said to form a tree 20–40 feet in height, and to be common in the neighbourhood of Ichang in the Yangtsze Valley.

The leaves are evergreen and glabrous, of leathery texture, lance-shaped in outline, with entire or slightly toothed margin, and glaucous under surface. When the young leaves first appear in spring they are bright shining red, and particularly handsome. The fruits are freely produced in dense corymbs; they are of a buff-yellow colour, with drooping wings measuring $1\frac{1}{4}$ inches in length. The wood is brown thickly pitted with lenticels.

In the "Gardeners' Chronicle" for January 24, 1904, Dr. A. Henry enumerates four varieties of *oblongum*, which differ either in colour, or form of foliage, or size of fruit, from the typical species. (Fig. 95.)

Acer griseum, a beautiful species, the Chinese representative of the handsome *Acer nikoense*, is stated by Dr. Henry to form trees of large dimensions, and from Wilson's notes it appears that he found it ranging from 15 to 40 feet in height.

The young foliage is coloured in the spring, and the bark peels off in a manner similar to that of our common Silver Birch.

The dried specimens only show the young foliage, and the growing plants are not yet strong enough to produce normal well-developed leaves, but the leaves are clearly very large, measuring 8 inches long by 9 wide exclusive of the petiole. The fruits are also large, with prominent horizontal cells, and are densely tomentose; the wings are divergent, measuring over an inch long and $\frac{1}{2}$ inch broad. (Fig. 98.)

Acer lætum var. *tricaudatum* is a new form discovered by Wilson, with 3–5-lobed leaves, the lower pair of lobes being often obsolete. The apices of the lobes are acutely pointed, and the petiole is slender and bright rose-pink, forming an agreeable contrast to the dark green of the leaf-blade. The plant appears to be a compact grower, and promises to make an elegant, though small, tree. (Figs. 100, 102.)

Another form of a *lætum*, called *cultratum*, has distinctly 5-lobed leaves of a lively shining green colour, borne on rather a dwarf-growing plant. (Fig. 101.)

A very pretty Maple, which at present it is impossible to identify from the dried specimens, is growing at Coombe Wood under Wilson's seed number (831). It has 5-lobed leaves resembling those of an Aconite in appearance. The terminal lobe is four inches long by one inch broad; the other four lobes are smaller.

When first produced the leaves are of a delicate pale green, suffused with red towards the margins; as they mature they become bright green, retaining a reddish tint on the petioles. (Figs. 99, 103.)

The following is a complete list of the Maples collected in China by E. H. Wilson, as determined by Professor Sargeant of the Arnold Arboretum, Mass., U.S.A. Those marked with an asterisk are in cultivation at Coombe Wood:—

Acer betulifolium, Maxim. (*A. tetramerum*, Pax).
,, *cordatum*, Pax.

FIG. 95.—ACER OBLONGUM (*Wall.*).

FIG. 96.—ACER SUTCHUENENSE (*Franch.*).

FIG. 97.—ACER TETRAMERUM (*Pax*), var. LOBULATUM (*Rehd.*).

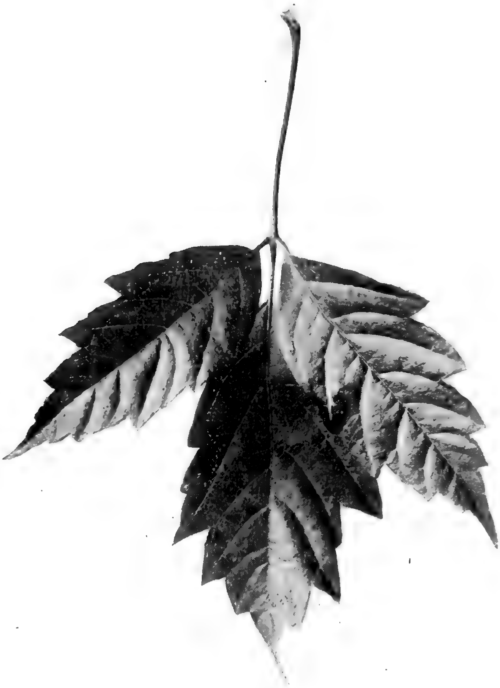


FIG. 98.—ACER GRISEUM (*Pax*).

FIG. 99.—ACER SP. ? (*Wilson's No.* 831).

Fig. 100.—Acer lætum (*C. A. Mey.*), var. tricaudatum (*Rehd.*). A new variety from China. Seed sown February 20, 1902.

Fig. 101.—Acer lætum (*C. A. Mey.*), var. cultratum (*Pax*).

Fig. 102.—Acer lætum (*C. A. Mey.*), var. tricaudatum (*Rehd.*).

Fig. 103.—Acer sp. ? (*Wilson's No.* 831).
Introduced from Central China. Seed sown April 25, 1901.

**Acer Davidi*, Franch.
,, *erianthum*, Schwerin.
,, *flabellatum*, Rehd., new species.
* ,, *Francheti*, Pax.
* ,, *griseum*, Pax.
,, *Henryi*, Pax.
* ,, *japonicum*, Thunb.
* ,, *lætum*, var. *tricaudatum*, Rehd., new var.
,, ,, var. *tomentosulum*, Rehd., new var.
* ,, ,, var. *cultratum*, Pax.
,, *lævigatum*, Wall.
* ,, ,, var. *Fargesii*, Rehd., new var.
,, *longipes*, Rehd., new species.
* ,, *nikoense*, Maxim.
* ,, *oblongum*, Wall.
,, *Oliverianum*, Pax.
* ,, *pictum* var. *Mono*, Maxim.
* ,, *sinense* var. *concolor*, Pax.
* ,, *sutchuenense*, Franch.
,, *tenellum*, Pax.
,, *tetramerum*, Pax.
* ,, ,, var. *lobulatum*, Rehd., new var.
,, *ukurunduense*, Trautv. and Meyer.
,, *urophyllum*, Maxim.
,, *Wilsoni*, Rehd., new species.

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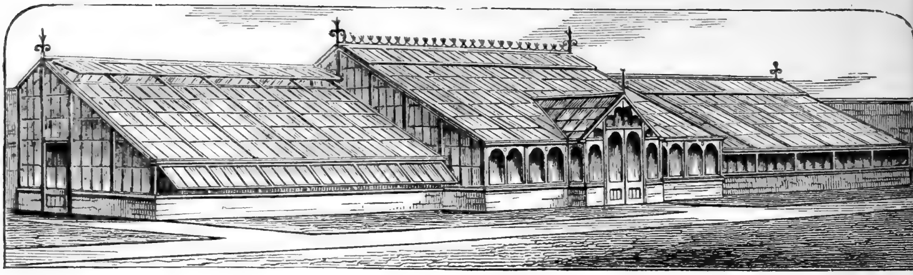

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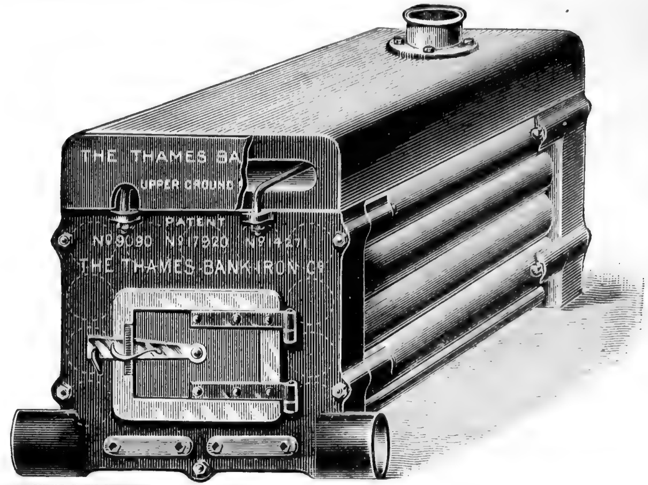

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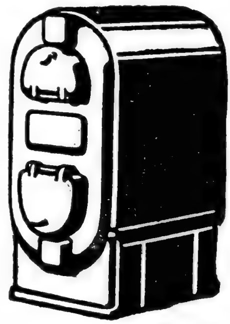

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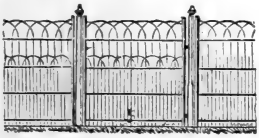

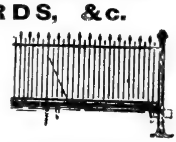

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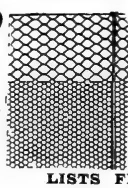

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IN THE PRESENT ISSUE.

VOL. XXIX. PARTS I. & II.

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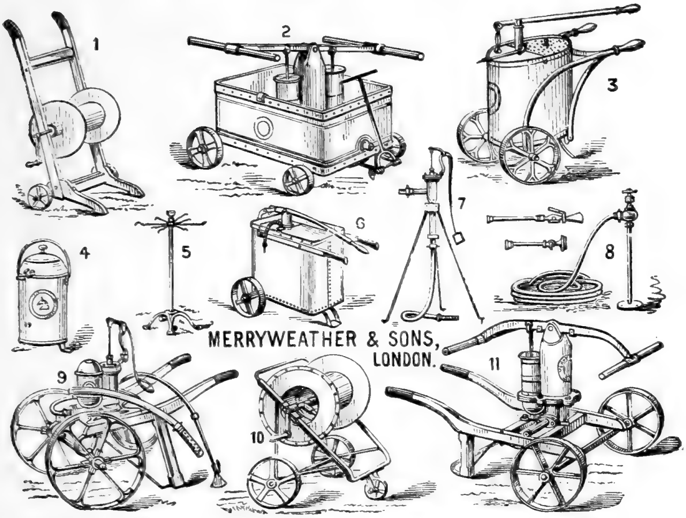

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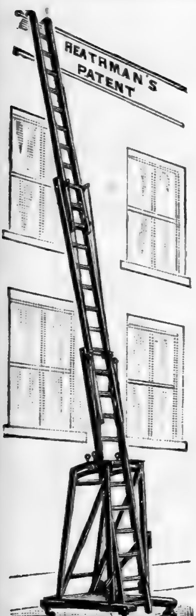

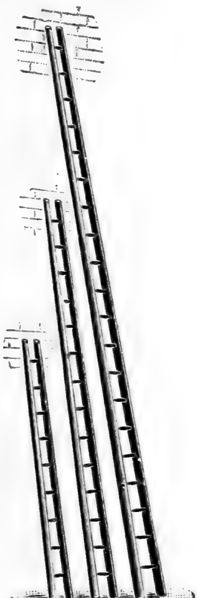

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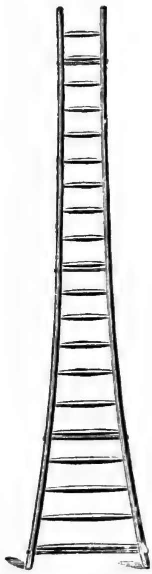

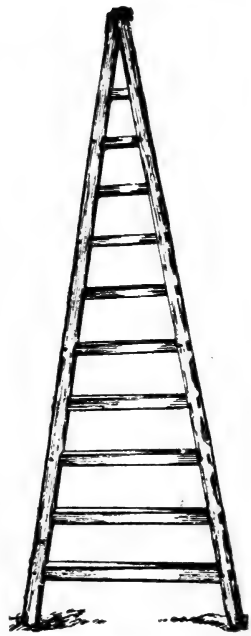

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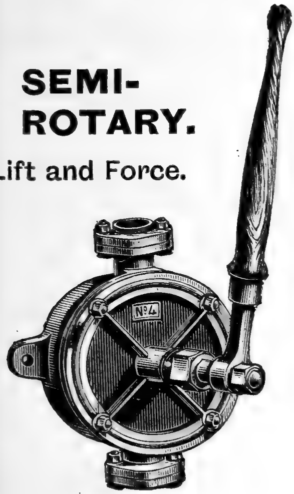

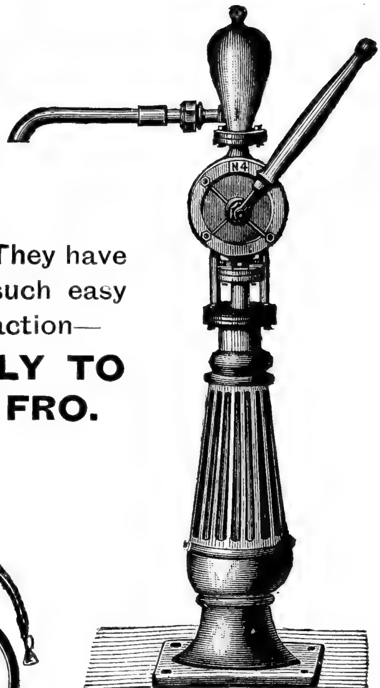

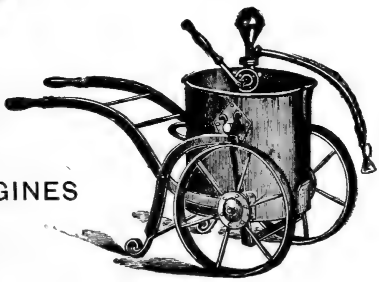

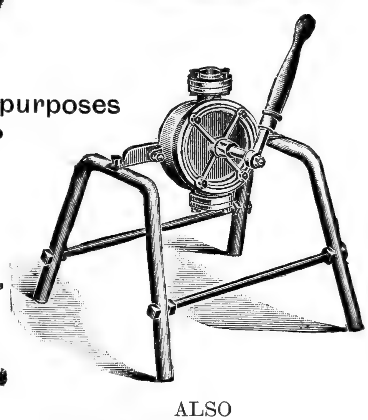

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"Science Siftings," October 24th, 1903

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—A. R.

London, May 31st, 1902.

" We used the Beetlecute with great success."—B.H.

St. John's, June 3rd, 1902.

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The Manor House, November 26th.

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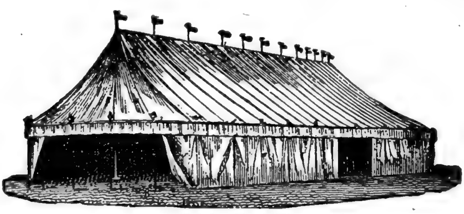

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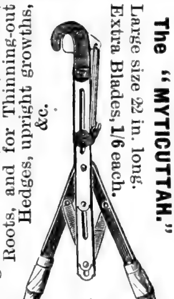

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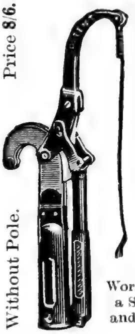

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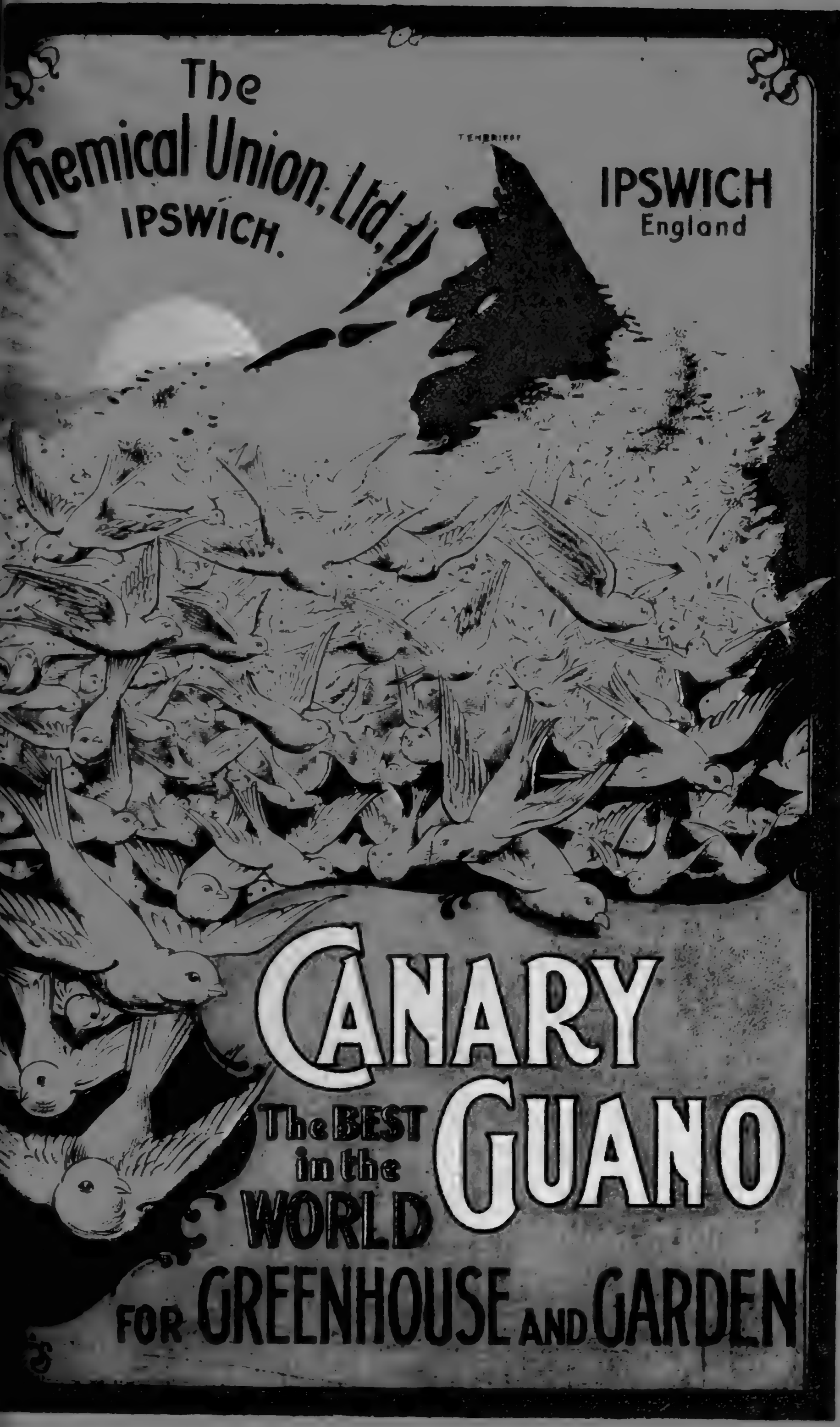
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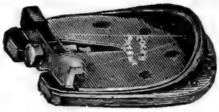

Fig. 1.

As used in the Royal Gardens at Buckingham Palace; Balmoral Castle; Kew; the Gardens of the Royal Botanic Societies, London and Edinburgh; the London County Council's Parks, the Principal Private Gardens, and by County Councils, Corporations, and the leading Cricket and Golf Clubs throughout the Kingdom.

Fig. 2.

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Mr. Troup (Head Gardener to HIS MAJESTY THE KING, Balmoral Castle) writes: "The Boots I had from you two years ago are as good as ever."

Mr. Burrell, Claremont Palace, Esher, writes: "They should command a very large sale."

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Mr. J. Hudson, V.M.H. (Gunnersbury House), writes: "They are excellent in every respect."

Mr. A. Wilson (Eridge Castle Gardens) writes: "They have answered splendidly."

Mr. C. Dixon (Holland House Gardens) writes: "A great improvement."

Mr. W. P. Bound (Gatton Park Gardens) writes: "They meet a long-felt want."

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For easily and quickly repairing patchy lawns. Made in 3 sizes.

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New and Rare Hardy Plants,

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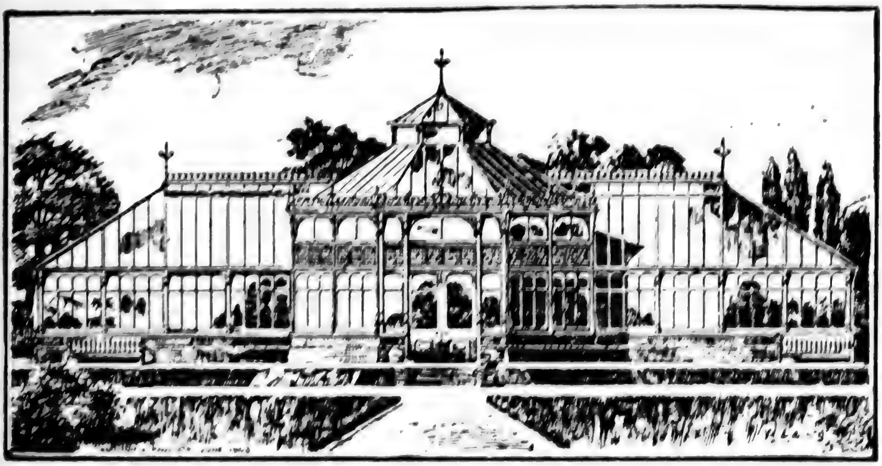

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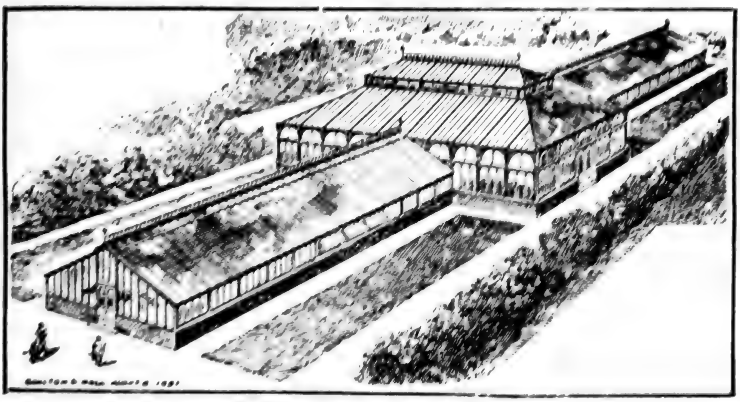

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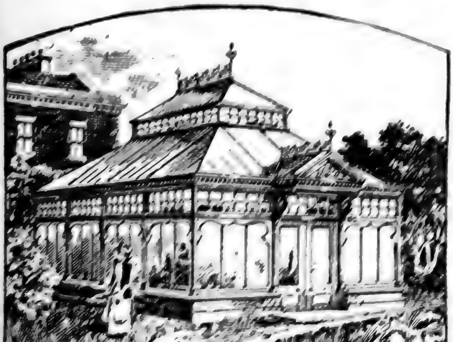

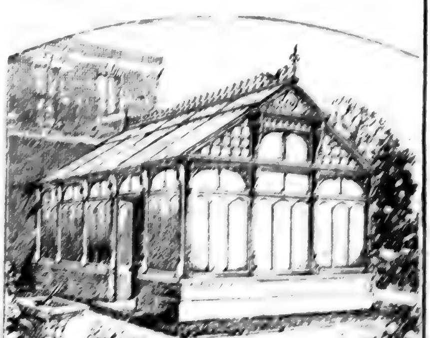

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Examinations in Horticulture, 1905.

THE ROYAL HORTICULTURAL SOCIETY will hold an Examination in Horticulture for Gardeners and others on Wednesday, April 12, and one for School Teachers in Cottage and Allotment Gardening on Wednesday, April 5, 1905.

A copy of the Syllabus, covering both Examinations, will be sent to any person on receipt of a stamped and directed envelope.

Questions set at the R.H.S. Examinations 1893–1904 may also be obtained at the Society's Offices, Vincent Square, Westminster. Price 1*s.* 6*d.*

Price (to Non-Fellows) 15s. DEC. 1905.

Vol. XXIX. Part 4.

THE JOURNAL OF THE Royal Horticultural Society

EDITED BY

The Rev. W. WILKS, M.A., Secretary.

CONTENTS.

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Entered at Stationers' Hall.]

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XXIX. 1905.

PART IV.

FUNGOID PESTS OF FOREST TREES.

By M. C. COOKE, M.A., LL.D., V.M.H., A.L.S.

WE have illustrated some of the most prominent pests of forest trees, but they are very numerous, and not of so much interest to horticulturists as other sections; hence we have not considered it incumbent upon us to enumerate other than those which are most likely to present themselves under ordinary circumstances. Those persons who are specially interested in forestry will not find our list by any means exhaustive, but simply suggestive, except in so far as regards the trees which surround, or are included in, large gardens and shrubberies.

OCHRY MAPLE SPOT.

Phyllosticta aceris (Sacc.), Pl. XIX. fig. 1.

The ordinary leaf-spots are not any considerable damage to forest trees, unless they are unusually plentiful; in any case they must be regarded as diseases. The common Maple is very subject to one which forms nearly circular bleached ochraceous spots on the leaves, over which are scattered the dot-like receptacles immersed in the tissues. The sporules, which are contained within these receptacles, are ovoid, and rather small ($5 \times 3\,\mu$) with two guttules, which are extruded from the receptacles through a minute orifice when mature.

The above species was first recorded for Italy, and in no other country except Britain.

It is almost impossible to suggest any remedy for these leaf-spots, since spraying is out of the question with objects of this size, although it may be adopted whilst the trees still remain as seedlings.

Sacc. Syll. iii. 61; *Grevillea*, xiv. 71.

Quite twenty other species of leaf-spot, caused by *Phyllosticta* and *Septoria*, have been recorded in different parts of the world on leaves of *Acer*.

Maple-Leaf Phlœospore.

Phlœospora aceris (Lib.), Pl. XIX. fig. 2

This parasite is found commonly on living leaves of *Acer campestre* and other species. It occurs upon small spots on the under surface of the leaves, and the pustules are destitute of any proper conceptacle, but are produced beneath the cuticle in special cavities or cells, and are of a brown colour. The conidia are long and straight ($22-28 \times 5\ \mu$) very distinctly divided by three transverse septa, extruded, when mature, from the orifice of the pustule in small pallid tendrils.

This was called *Septoria aceris* by Berkeley when the genus *Septoria* was imperfectly defined. Whilst the trees still remain shrubby it may be possible to pick off and destroy the affected leaves.

This species is known also in France, Italy, and Austria.

Sacc. Syll. iii. 3135 ; *Cooke, Hdbk.* No. 1300 ; *Grevillea,* xiv. 104.

Maple-Leaf Asteroma.

Asteroma aceris (Rob.).

Forming spots on both surfaces of the leaves of *Acer campestre.* The small perithecia are seated on very thin radiating brown fibrils, and contain minute continuous sporules.

Sacc. Syll. iii. 1234 ; *Grevillea,* xiv. p. 75, No. 444.

Maple-Twig Blight.

Septoglœum Hartigianum (Sacc.), Pl. XIX. fig. 3.

This parasite occurs on the living twigs of *Acer campestre,* and the year-old branches, especially those forming the crown, to the ultimate destruction of the tree. In the month of May the cuticle of the diseased shoots is split longitudinally, exposing the layer which bears the conidia.

The pustules are at first innate, then erumpent, loosely gregarious, oblong-linear, margined by the ruptured cuticle (1–2 mm. long). The stroma is white, bearing on its surface the crowded conidia which are ovate-oblong, with obtuse ends, almost straight, and typically two-septate ($42-36 \times 10-12\ \mu$). The threads which bear the conidia are cylindrical with an inflated base ($30-35 \times 6-7\ \mu$), colourless.

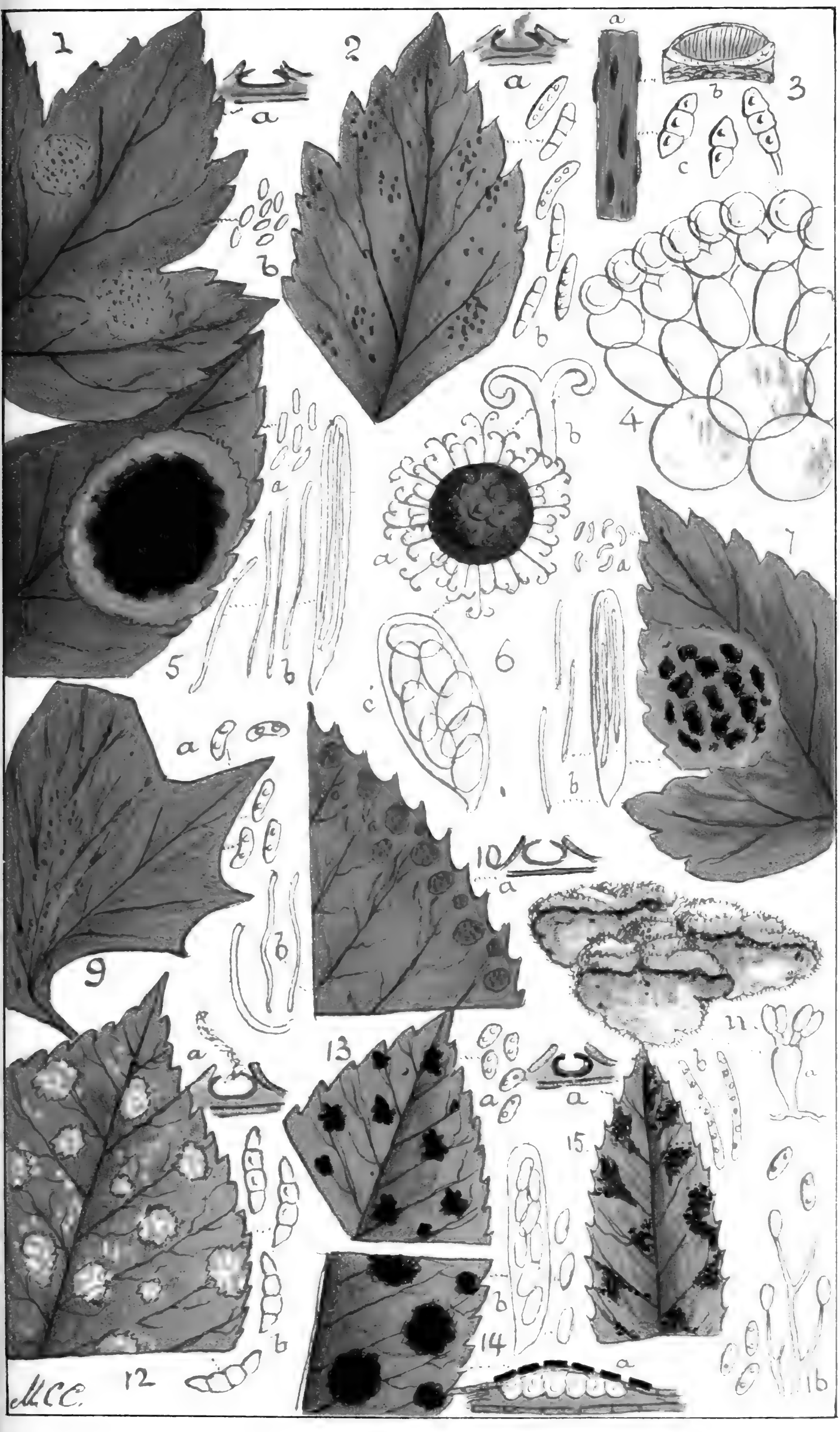
This fungus is really equivalent to what has been called Anthracnose, with septate conidia.

It is known also in Bavaria.

It is recommended to cut out the diseased shoots in the beginning of May.

Sacc. Syll. xi. 3745 ; *Mass. Dis. Pl.* 297 ; *Hart. & Som. Dis. Trees,* p. 141, fig. 80.

Another species (*Septoglœum acerinum*) on living leaves of *Acer campestre* is known in Italy, with curved trinucleate or biseptate conidia ($20 \times 4\ \mu$), and probably also in Belgium.



PESTS OF FOREST TREES.

Sycamore White Mould.

Botrytis deprædans (Cooke), Pl. XIX. fig. 4.

First discovered on living leaves of *Acer Pseudo-Platanus* in a damp wood. Several young trees had nearly every leaf affected, and the next year they were dead. Greyish spots were formed on the leaves, which were sometimes large and confluent. The threads were flexuous and septate, simple, crowned at the apex with elliptical basidia-like cells, ultimately two-lobed. The glomerules of conidia globose and compact. Conidia globose, 12 μ diam.

After the leaves had fallen to the ground, and lain for a short time, numerous minute black sclerotia were formed, the ultimate development of which was never ascertained.

Certainly a most destructive pest, but it does not appear to have been recognised elsewhere, at home or abroad. This parasite has never been thoroughly investigated, and, as it has occurred so seldom, there has been no opportunity for experiment on remedies.

Sacc. Syll. iv. 691 ; *Cooke, Journ. Q.M.C.* ii. 1885, p. 138, t. x. f. 4.

In damp years Maple seedlings are liable to destruction by a black mould, *Cercospora acerina.*

Hart. & Som. Dis. Trees, p. 135.

Sycamore-Leaf Blotch.

Rhytisma acerinum (Fr.), Pl. XIX. fig. 5.

The large black pitchy-looking blotches on the leaves of Sycamore and Maple are so common and so well known that they scarcely need description. Sometimes nearly every leaf on a tree is infected, and then considerable injury must be caused by preventing the leaves performing their proper functions.

Whilst still attached to the tree the fungus remains in its first stage. The patches are yellow when they first appear about June, soon changing to black and corrugated. Within this stroma are cells, or cavities, in which the conidia are produced, which are narrow and curved ($6–9 \times 1\ \mu$). In this stage it is known as *Melasmia acerina.*

After the leaves have fallen to the ground and passed the winter a second stage or condition is reached, in which the contents of the cells or cavities in the stroma are occupied by sporidia contained in asci. This is the true *Rhytisma* stage, and the sporidia are matured in the spring. These sporidia are needle-shaped ($60–80 \times 1\frac{1}{2}–2\frac{1}{2}\ \mu$) and uncoloured.

Known also in France, Germany, Belgium, Sweden, Finland, Italy, and North America.

So long as the leaves are permitted to remain on the ground, and perfect the fruit of the parasite, it will remain as a pest.

Sacc. Syll. iii. 3390, vii. 3083 ; *Mass. Pl. Dis.* 142, fig. 28 ; *Cooke, Hdbk.* No. 2279 ; *Grev. Sc. Cr. Fl.* t. 118, f. 1 ; *Hart. & Som. Dis. Trees,* p. 105, fig. 50.

Maple Mildew.

Uncinula aceris, Pl. XIX. fig. 6.

The Hedge Maple is apt to have its foliage nearly covered with the white mealy-looking mycelium of this pest, so that they seem to have been drenched with a thin coating of whitewash. This mycelium is creeping and at first superficial, and gives origin to the conidial form, or *Oidium*, the conidia of which, falling on the leaves, increase the mealy appearance. Later on the little dot-like globose conceptacles appear on the surface, as in the Pea mildew.

In this species the conceptacles are surrounded by a series of appendages which are either simple or forked, and hooked at the apex. These each enclose eight asci, which contain eight sporidia. A similar species is also common on Willows. This was formerly called *Uncinula bicornis*, but the name has been changed, during the craze after priority names, and to gratify the vanity of priority-hunters.

The species is recorded for the whole of Europe and Algeria.

Sulphur and lime is the recognised application.

Sacc. Syll. i. 27; *Cooke, M. F.* t. xi. f. 225–228; *Cooke, Hdbk.* No. 1914.

Another species, *Uncinula Tulasnei*, occurs in the Rhine Provinces, and *Uncinula circinata*, an American species, on Acer leaves, in the United States.

Maple-Leaf Blotch.

Rhytisma punctatum (W.), Pl. XIX. fig. 7.

This blotch resembles in many respects that of the Sycamore leaves, and occurs on the leaves of *Acer campestre*, *Pseudo-Platanus*, and *spicatum*. There are the same kind of yellow spots, caused by the mycelium, but the black scab, or crust, which appears on the surface is not one continuous black blotch, but consists of a number of closely crowded small frustules.

The early stage also prevails whilst the leaves are still attached to the tree, and the cells or cavities of the stroma enclose only conidia, which are sausage-shaped and small ($4–5 \times 1\ \mu$). This condition is known as *Melasmia punctata*.

The final stage, which only succeeds the wintering of the affected leaves upon the ground, in like manner produces clavate asci, which are narrowed at the tip, and enclose eight needle-shaped sporidia, which are blunt at the base, and pointed at the apex, collected in a parallel cluster or bundle ($35–40 \times 1\frac{1}{2}–2\ \mu$).

This parasite is recorded also in France, Belgium, Germany, Sweden, Italy, and North America, but is not so common as *Rhytisma acerinum*.

Sacc. Syll. iii. 3391, vii. 3084; *Mass. Pl. Dis.* p. 142, 378; *Cooke, Hdbk.* No. 2280.

White Root-Rot.

Dematophora necatrix.

Rosellinia necatrix (Pr. & Del.), Pl. XIV. fig. 20.

This scourge has also been called *Dematophora necatrix* (Hart.), and has occurred in its earlier stages in this country. It attacks Vines, Fruit Trees, Maples, Oaks, Beeches, and Conifers.

The mycelium spreads rapidly underground, attacking the rootlets of almost any plant with which it comes into contact, ultimately killing them. In trees the mycelium travelling upwards bursts through the bark as a fluffy snow-white mass. Minute sclerotia are formed in the diseased rootlets, which produce conidia upon dark-coloured hyphæ. The mycelium, at first white, at length becomes brownish, and produces pear-shaped swellings, which are reproductive.

The highest form of reproduction is rarely developed, and consists of large black perithecia, surrounded by bristly conidiophores, and enclosing asci containing eight dark brown sporidia.

The soil should be well drained, affected plants isolated by trenching around the roots. Dead trees and roots should be removed as soon and as completely as possible, as all the fragments of mycelium are liable to disseminate the disease.

Hart. & Som. Dis. Trees, p. 82; *Mass. Pl. Dis.* p. 120, f. 21.

Plane-Leaf Nerve Anthracnose.

Glœosporium nervisequum (Fckl.), Pl. XIX. fig. 9.

A common anthracnose on Plane leaves, forming irregular bleached spots on either side of the midrib and principal veins of the leaves. The pustules are scattered over these spots, on the under surface, and are round or oblong, brownish and at length black, splitting longitudinally or irregularly. The conidia are oblong or pear-shaped ($12–15 \times 4–6\,\mu$), hyaline, seated upon long, colourless, and slender footstalks ($20–25\,\mu$ long).

This species reaches its full development, as far as at present known, whilst the leaves are still attached to the tree. Wherever it is possible to reach and remove the diseased leaves they should be collected and burnt.

Recorded also in France, Germany, and Italy.

Grevillea, xiv. p. 124, No. 616; *Sacc. Syll.* iii. 3716; *Mass. Pl. Dis.* 284, fig. 76; *Hart. & Som. Dis. Trees*, p. 140.

Plane-Leaf Anthracnose.

Glœosporium platani (Mont.).

This second species of anthracnose occurs also on living leaves of Plane trees, but does not form spots along the midrib and nerves, but the minute pustules are scattered over discoloured portions of the leaves, which may be marginal or otherwise. The conidia have a tendency to become fusiform or sometimes oblong ($14–15 \times 5–6\,\mu$) with many small nuclei. The pedicels are short and slender (not exceeding $5–6\,\mu$).

The same remarks apply to this species as to *Glœosporium nervisequum*. Known also in France, Belgium, Holland, and Italy.

Sacc. Syll. iii. 3717 ; *Grevillea,* xiv. p. 124, No. 617.

Two or three ordinary kinds of leaf-spot, caused by *Phyllosticta* or *Septoria*, on Plane leaves have been recorded, but not yet as British.

Horse-Chestnut Leaf-Spots.

Septoria hippocastani (B. & Br.), Pl. XIX. fig. 10.

Common enough on the living leaves of Horse-Chestnut in Britain, but scarcely recognised elsewhere except in Italy.

The spots are at first minute and scattered, then becoming confluent, and forming broad rufous patches. Receptacles dot-like and scattered, sporules long, rod-like, curved and flexuous with divisions ($55–60 \times 3$ μ) ejected in thin, delicate, pale tendrils.

Presumably the Horse-Chestnut trees are not much injured by this leaf-spot, and we know of no remedies which have been applied.

Sacc. Syll. iii. 2578 ; *Berk. A.N.H.* No. 434 ; *Cooke, Hbdk.* No. 1305.

Horse-Chestnut Stereum.

Stereum purpureum (Fries), Pl. XIX. fig. 1.

Several trees have been destroyed in Greenwich Park, the trunks of which have borne this *Stereum*, and it has been contended that this fungus has entered as a wound parasite and destroyed the trees. This should be confirmed by experiment, as the same fungus has been credited with causing 'silver leaf' in stone-fruit trees.

Sacc. Syll. vi. 7284 ; *Cooke, Hdbk.* No. 910 ; *Mass. Fun. Fl.* i. 132, fig. 14 ; *Journ. R.H.S.* xxviii. p. xxii. (1903).

A leaf-spot (*Phyllosticta Paviæ* Desm.) has been found occasionally in this country on the leaves of *Æsculus indica* syn. *Pavia indica.* The sporules are cylindrically elliptical, biguttulate (11–12 μ long).

Known also in France and Belgium.

Sacc. Syll. iii. 2 ; *Grevillea,* xiv. p. 71, No. 365.

Elm-Leaf Phlœospore.

Phlœospora ulmi (Fr.), Pl. XIX. fig. 12.

One of the commonest parasites on leaves of the Elm, sometimes occupying nearly every leaf on a tree. The spots are small and brownish on the under surface, over which the pustules are scattered. The conidia are profuse, cylindrical, rounded at the ends, at first nucleate, and then divided into five cells (55×6 μ), exuding from the orifice of the pustule in whitish tendrils, and diffusing themselves over the surface of the leaf. Known in older books under the name of *Septoria ulmi,* and supposed to be an early stage, or condition, of *Phyllachora ulmi.*

No suggestion can be offered to check this parasite, from which many healthy trees constantly escape. Recorded throughout Europe and in North America.

Sacc. Syll. iii. 3138 ; *Cooke, Hdbk.* No. 1297 ; *Grevillea,* xiv. 105.

A leaf-spot, caused by *Asteroma ulmi* (Klotsch), has been recorded on Elm leaves in Britain, France, and Portugal, but the fruit does not appear to be known.

Cooke, Hdbk. No. 1369.

Elm-Leaf Scab.

Piggotia astroidea (Berk.), Pl. XIX. fig. 13.

Berkeley first made known the details of the structure of this parasite, and applied to it the name which it now bears. It occurs on the upper surface of living Elm leaves as small blackish scabs formed from the aggregation of minute tubercles, clustered in a stellate manner, and at first covered by the cuticle. The tubercles or receptacles are flattened, thin, and dark olive. The conidia are oblong, truncate at the base, and rounded at the apex ($8–10 \times 5–6\ \mu$), containing from two to four minute guttules, and generated at the apex of short pedicels which are fasciculate.

The presumed phases, or stages, in the life-history of this fungus, are recorded in the following note on the " Elm-leaf blotch."

Sacc. Syll. iii. 3387 ; *Cooke, Hdbk.* No. 1296 ; *Berk. A. N.H.* No. 503, t. v. f. 3 ; *Grevillea,* xiv. 106.

Elm-leaf blister, caused by *Taphrina ulmi* (Joh.), occurs on leaves of Common Elm, and Wych Elm, but is doubtfully British.

Mass. Pl. Dis. p. 92.

Elm-Leaf Blotch.

Phyllachora ulmi (Fckl.), Pl. XIX. fig. 14.

This blotch is not unusual on Elm leaves, which is supposed to pass through three stages, all of which have been recognised as different and distinct parasites, but are now assumed to be three conditions of the same species. The first stage, which has been termed the *spermogonia,* is still generally known as *Phlœospora ulmi.* The second stage, called the *pycnidia,* is known as *Piggotia astroidea,* both of which have been described here as different diseases. And the last is the perfect *Phyllachora ulmi,* in which the spores are produced in asci, and become matured on the dead leaves after remaining upon the ground.

The blotches are rounded, convex, nearly black, and somewhat rough on the surface, on the upper face of the leaves. Within these excrescences are white cavities or cells, in which the fructification is produced. Numerous cylindrical sacs or asci ($60–70 \times 8\ \mu$) are developed, side by side, each enclosing eight oblong, colourless, sporidia ($10–11 \times 5\ \mu$), which are extruded, when mature, through an opening at the apex of the cell. The stroma or blotch is greyish after maturing upon the ground.

Found also in France, Belgium, Holland, Sweden, and Italy.

The dead leaves should be collected and burnt to prevent the sporidia communicating infection.

Sacc. Syll. ii. 5091; *Sow. B. F.* t. 374, fig. 3; *Cooke, Hdbk.* No. 2412.

Brown Ash-Leaf Spot.

Phyllosticta fraxinicola (Curr.).

Not uncommon on living leaves of the Ash, in circular or irregular brownish spots, with a blackish margin. The receptacles are very minute, as usual, like small black dots scattered over the spots. The sporules are elliptical or curved ($5–7\frac{1}{2}\,\mu$ long) and colourless.

It was first described by Currey as a simple *Sphæria*, but the sporules are not enclosed in asci.

Known also in France and Germany.

Sacc. Syll. iii. 106; *Grevillea,* xiv. 72, No. 381; *Curr. Simp. Sph.* No. 388, fig. 148.

A great number of leaf-spots, caused by fungi of several genera, have been recorded on Ash leaves in Europe and America, but they do not appear to have been regarded as inflicting any serious injury.

Common Ash-Leaf Spot.

Septoria fraxini (Desm.), Pl. XIX. fig. 15.

This leaf-spot, on living leaves of the Ash, is common and affects almost every leaf of any tree which it attacks. The conceptacles are very minute, and immersed in the substance of the leaf, forming irregular patches, sometimes covering the entire leaflet. The sporules are cylindrical, obtuse at the ends, with a row of small nucleoles.

Known also in France, Belgium, Germany, Portugal, Italy, and North America.

Sacc. Syll. iii. 2672; *Cooke, Hdbk.* No. 1331; *Grevillea,* xiv. 101, No. 482.

Several species of anthracnose are recorded as occurring on Ash leaves in the United States, but not hitherto in Europe.

Heartwood Rot.

Polyporus hispidus (Fries).

This large polypore is a wound parasite, and will attack various broad-leaved trees. In orchards it seems to prefer the Apple, and we have seen it commonly upon the Ash. It often attains a large size, nearly a foot across, fixed by a broad base, and extending in a semicircular manner. It is of a dark brown colour, and the upper surface is coarsely velvety or hairy, and the internal substance soft and fibrous. The under surface is paler, of a yellowish-brown colour, punctured with innumerable pores. Whilst growing these pores exude water, which drips away in considerable quantity even in dry weather.

It can only obtain access to a tree through a wound, when the mycelium attacks the heartwood, the trunk soon becomes hollow, although the tree may continue to live for some years. It is by medium of the spores that healthy trees are inoculated, and hence to prevent the diffusion of spores all specimens of the polypore should be at once destroyed.

Sacc. Syll. vi. 5165 ; *Cooke, Hdbk.* No. 768; *Mass. Pl. Dis.* p. 191, fig. 44 ; *Sow. Fung.* t. 345 ; *Hussey,* i. t. 29, 31 ; *Mass. Fun. Fl.* i. p. 243.

Living Ash trees in this country have been attacked and killed by a sphæriaceous fungus, *Rosellinia ligniaria* (Nitschke). Specimens were exhibited by W. Carruthers at the Linnean Society, December 16, 1897.

Mass. Pl. Dis. p. 122 ; *Sacc. Syll.* i. No. 991 ; *Greville, Sc. Crypt. Fl.* pl. 82.

Small Oak-Leaf Anthracnose.

Glœosporium umbrinellum (B. & Br.), Pl. XIX. fig. 16.

This anthracnose has been found occasionally on Oak leaves in Britain, whilst some persons think it is the same species as one which has occurred in Belgium, France, and Germany, although the conidia are twice as large.

The spots are irregular and angular, minute, and of a brown colour, upon which are seated the almost inconspicuous pustules, from which the conidia are expelled when mature in pallid irregular tendrils. The conidia themselves are oblong (10–15 μ long), with two nuclei, and at first seated upon long and sometimes forked pedicels.

Sacc. Syll. iii. 3731 ; *Cooke, Hdbk.* No. 1412 ; *Berk. & Br. A.N.H.* No. 1141, t. 3, f. 5 ; *Grevillea,* xiv. 124, No. 61.

There are a host of leaf-spots on Oak leaves, which have been referred to fungi of different genera as the cause, but they do not appear to be of sufficient importance as "pests" to require notice.

Oak-Leaf White Mould

Microstroma album (Desm.), Pl. XX. fig. 17.

This is a small white mould which attacks the under surface of Oak leaves, appearing to the naked eye somewhat like hoar frost. The very short threads are developed in tufts, which form confluent patches. The conidia are oblong ($5–7 \times 3\,\mu$), unequal-sided, containing one or two small guttules; the basal threads about three or four times as long as the conidia.

We have observed it mostly upon the leaves of young seedling Oaks, and in coppices.

Known also in France, Germany, Belgium, Italy, Moravia, and South Africa.

Sacc. Syll. iv. 17 ; *Cooke, Hdbk.* No. 1831.

Not less than eighty species of fungus parasites have been recorded as occurring on various species of *Quercus*, at home and abroad, but not many of them are British.

Oak-Leaf Rust.

Uredo quercus (Brond), Pl. XX. fig. 18.

This parasite occurs, but not commonly, on the under side of the leaves of young Oak saplings when about three or four feet high, but probably without inflicting any serious injury. Nothing is known of any other stage than that of the uredospores.

The pustules are rounded and small, and either scattered or in clusters, yellow at first, and afterwards approaching orange. The uredospores are nearly globose, rough externally, and orange yellow ($15–25 \times 12–15\ \mu$).

It has been assumed, rather prematurely, that this is an early condition of some species of *Melampsora*.

Known also in France, Belgium, Germany, Switzerland, and Italy.

Sacc. Syll. vii. 2126; *Plowr. Br. Ured.* 257; *Cooke, Hdbk.* No. 1573; *Cooke, M.F.* p. 216.

Seedling Oaks are liable to the attacks of a fungus at the roots, which develops into a disease resembling the white root-rot, and in its mature condition is known as *Rosellinia quercina* (Hart.).

Hart. & Som. Dis. Trees, p. 78, figs. 26–28; *Mass. Pl. Dis.* p. 121.

Vegetable Beef Steak.

Fistulina hepatica (Fr.).

This well-known fungus is often to be seen flourishing year after year upon the same living Oak tree, and is gathered promptly, on account of its esculent properties. It is somewhat variable in form, being rounded, semicircular, tongue-shaped, and often two or three together, liver-coloured, not unlike a piece of bullock's liver, soft and easily cut, and internally mottled somewhat after the manner of Beetroot, and juicy, with a rather acid taste. The under surface is a little convex and paler, perforated with innumerable pin-holes which are mouths of tubes, closely packed side by side, bearing the spores on the inner surface. These spores are salmon-coloured and nearly round. Sometimes specimens have been found attaining a weight of thirty pounds, but usually only three or four pounds.

It is doubtful to what extent this fungus is a cause of injury to Oaks, as it is always found on dead parts.

Found throughout Europe, in North America, Australia, and Northern India.

Sacc. Syll. vi. 4849; *Cooke, Hdbk.* No. 841; *Sow. B.F.* t. 58; *Grev. Sc. Crypt. Fl.* t. 270; *Mass. Fun. Fl.* i. p. 256, fig. 8–10.

Sulphury Wood-Rot.

Polyporus sulfureus (Fries).

This large and attractive-looking polypor is a wound parasite on several trees, such as Oak, Alder, Willow, Poplar, and even Pear and

PESTS OF FOREST TREES.

Apple, as well as Larch. It commences as a round fleshy knob, but soon expands into an irregularly flattened body, with a crisped and waved margin, and often with several overlapping pilei, one above another. It is not unusual to find well-grown specimens of a foot in expanse, and wholly of a bright sulphur colour, the upper surface quite smooth, paler as it grows old. The flesh is nearly white, soft, and easily broken ; the under surface bright sulphur colour, and punctured with innumerable short pores ; the whole fungus with a faint and rather disagreeable smell.

This is an annual, which grows rapidly and decays in the autumn. The spores obtain access through a wound, broken branch, or unprotected pruning. The spores soon produce a mycelium which attacks the heart-wood, which changes to a clear reddish-brown colour.

Conidia are also produced in abundance from the mycelium in cavities of the wood.

It is important, therefore, to protect the ends of broken branches, or parts exposed by pruning, by use of some fungicide. Also, to prevent dispersion of the spores, all specimens found should at once be destroyed.

Sacc. Syll. vi. 5050 ; *Mass. Fun. Fl.* i. p. 240 ; *Mass. Pl. Dis.* p. 193, fig. 45 ; *Cooke, Hdbk.* No. 752 ; *Grev. Sc. Crypt. Fl.* pl. 113 ; *Sow. Fungi,* t. 135 ; *Hart. & Som. Dis. Trees,* 200 ; *Marshall Ward, Timbers, &c.* p. 165, fig. 17–19.

Wound Parasites.

Other of the large Hymenomycetal Fungi have the reputation of being destructive to forest and orchard trees as wound parasites, but we are inclined to think that the injury they cause is proportionately small, as only individual trees are affected, and only those which have suffered previous injury.

Tinder Fungus.

Fomes fomentarius (Fries).

This woody fungus is said to be a wound parasite of Beech and Elm as well as old fruit trees. The pileus is shaped somewhat like a horse's hoof, from three to seven inches across, dingy brown, marked with concentric ridges, smooth, and at first whitish at the edge. The under surface is almost flat, whitish, then brown, densely perforated. The substance is rust-coloured and fibrous, and rather spongy, but dry, and may be beaten out into the substance known as amadou or German tinder. The spores are oval and brown.

Sacc. Syll. vi. 5409 ; *Mass. Pl. Dis.* 185, 392 ; *Cooke, Hdbk.* No. 776 ; *Sow. B. F.* t. 133 : *Journ. R.H.S.* xxvi. 1902, p. 734, fig. 308 ; *Mass. Fun. Fl.* p. 220.

False Tinder Fungus.

Fomes igniarius (Fries).

This also is reputed to be a wound fungus of the Oak, as well as some other trees. It resembles *Fomes fomentarius* externally and superficially, but is minutely velvety when young, becoming blackish and cracking. The under surface is cinnamon-coloured, and the flesh is very hard, rusty-brown, and zoned. The spores almost globose and uncoloured, which serves to distinguish it from the other species above named.

Sacc. Syll. vi. 5412; *Mas. Pl. Dis.* 187, 393; *Cooke, Hdbk.* No. 778; *Sow. B. F.* t. 132; *Mass. Fun. Fl.* i. p. 221; *Hart. & Som. Dis. Trees*, p. 201.

Oak Polypore.

Polyporus dryadeus (Fries).

This large polypore is said to attack the Oak, but too rarely to be of much interest. It is expanded from the trunk in a semicircular manner, is thick, and attached by a broad base, measuring up to ten inches across, brown, rugged, with a paler margin which exudes drops of water. The flesh is rusty and fibrous, somewhat zoned. Under surface porous; spores elliptical, colourless ($5 \times 3\ \mu$).

Hart. & Som. Dis. Trees, p. 201; *Sacc. Syll.* vi. 5196; *Mass. Pl. Dis.* 197, 391; *Cooke, Hdbk.* No. 771; *Mass. Fun. Fl.* p. 243.

There are other species which have the same kind of reputation, but not troublesome enough to be regarded as pests.

Stereum Wood-Rot.

Stereum hirsutum (Fries), Pl. XX. fig. 19.

This is one of the most common of saprophytes on dead branches, trunks, and stumps of all kinds; but it has also the reputation of being a destructive wound parasite. It is a tough leathery fungus, of a shell shape, attached by the edge to the bark, spreading at right angles, with the upper surface coarsely velvety, dingy yellow, marked with zones, and the margin often crisped and wavy. The under surface, which bears the spores, is ochraceous-yellow. Mostly these pilei grow one above another in an imbricated manner. The mycelium is perennial, and having once obtained admission continues to spread, until all the living tissue is destroyed. Spores globose, $5\ \mu$ diam.

When found growing on living trees, it should be cut away, and the wound washed with paraffin and afterwards painted with tar.

Mass. Pl. Dis. p. 175; *Cooke, Hdbk.* No. 911; *Ward, Trans. Roy. Soc.* clxxxix. p. 123, pl. 17–21 (1898); *Mass. Fun. Fl.* i. p. 131; *Hart. & Som. Dis. Trees*, p. 205.

Partridge Wood.

Stereum frustulosum (Fries), Pl. XX. fig. 20.

This is another saprophyte which sometimes becomes parasitic, and attacks various forest trees. It differs from the above in being closely attached to the bark, with no portion free, the whole substance forming a cracked, hard crust, of a cinnamon colour on the surface, becoming grey with age. Spores elliptical, $4 \times 3\ \mu$.

Mass. Pl. Dis. p. 172, fig. 37; *Mass. Fun. Fl.* p. 134.

Black Wood Nodules.

Daldinia concentrica (De Not.).

Large black nodules, from the size of a walnut to that of an orange, have been known for a century to occur on dead wood, especially of Ash, and only recently has it been suggested that the fungus producing them is a wound parasite liable to infest with its spores, or conidia, growing and living forest trees, entering through wounds in the bark. We have met with it scores of times, but never on other than thoroughly dead wood, such as gate-posts, rails, rustic seats, &c., and are not yet convinced of its parasitism. The mature fungus is globose, depressed at the base, smooth and shining, and of a jet-black colour. When cut in sections, the interior is grey, rather firm, forming concentric rings. Hence its old name of *Hypoxylon concentricum*, and its newer one of *Daldinia concentrica*. The periphery everywhere consists of closely packed cells, or perithecia, containing the large, oval-shaped, dark brown sporidia in asci ($12–15 \times 7–10\ \mu$), which are ejected when mature, and form a dense sooty covering over the entire nodule.

Very recently M. Molliard has announced the discovery of conidia, suggested and figured by Tulasne, in the form of a white mould, to which he has given the name of *Nodulisporium Tulasnei*, possibly a form of *Botrytis*, with conidia $7–8 \times 4\frac{1}{2}–5\ \mu$, colourless or slightly grey.

Tulasne, Fungi Carp. Selec. t. ii. pl. xiii. figs. 14–16; *Gard. Chron.* 1861, p. 72; *Sacc. Syll.* i. 1515; *Cooke, Hdbk.* No. 2384.

Oak Canker.

Diaporthe taleola (Sacc.), Pl. XX. fig. 21.

The disease which is called Oak Canker is said to prevail until trees are forty years old. It is characterised by brown patches of the bark, which are usually of large size, and on different sides of the tree, whereby the bark is killed, and the tree dies. Pustules are formed in the dead bark, and consist of a kind of cushion, or stroma, imbedded in it, of an almost black colour, in which are cavities or cells, in which are first developed curved or sickle-shaped conidia. Afterwards flask-shaped receptacles are formed, in small groups, within these same pustules, on the same stroma, and the necks of two or three of these receptacles unite, and grow together into a common neck or opening which extends to the surface of the pustule. Within these receptacles asci, or cylindrical sacs, are formed ($150 \times 14\ \mu$), which each contain eight sporidia which are oblong, divided in the centre into two cells ($18–24 \times 7–8\ \mu$). From the median division projects a hyaline spine on each side, and one at each end of the spore. Both conidia and spores are capable of infecting a healthy tree, by entering a wounded spot in the bark.

The fungus is known in France, Belgium, Germany, Sweden, and Italy.

It is suggested that young trees thus infected should be felled to save the rest.

Sacc. Syll. i. 2426; *Mass. Pl. Dis.* p. 112; *Hart. & Som. Dis. Trees*, p. 99, figs. 46–49; *Cooke, Hdbk.* No. 2502.

Beech-Leaf Anthracnose.

Glœosporium fagi (Desm.).

This occurs on the under surface of Beech leaves, forming rather rounded tawny spots on the upper, and greenish on the under surface. The pustules are minute and honey-coloured, seated upon the spots. The conidia are oblong or sometimes rhomboidal ($15–20 \times 7–8\ \mu$), with two or three small guttules, produced at first at the apex of pedicels collected in bundles, within the pustules, and expelled when mature in tendrils.

Known also in France, Belgium, Austria, and Italy.

Sacc. Syll. iii. 3728; *Grevillea*, xiv. p. 124, No. 620.

The leaves are liable to show brown blotches caused by *Sphærella fagi.*

Beech Seedling Rot-Mould.

Phytophthora omnivora (De Bary), Pl. XX. fig. 21.

This rot-mould has a habit of attacking almost indiscriminately a large number of plants, among which are included the seedlings of Beech. Gaps are often made in seed-beds by this pest, which spreads rapidly when once it gets a footing. At first dark-coloured blotches appear on the cotyledonary leaves, with dark lines on the stem. The mycelium is furnished with minute roundish suckers, which pierce the cells to obtain nutriment. The threads are variously branched, but sparingly, and on one side, sometimes inflated in nodules at intervals, below the apex. Conidia ellipsoid or lemon-shaped ($50–60 \times 35–40\ \mu$), with a prominent papilla at the apex, when mature liberating as many as fifty zoospores. Resting-spore globose, smooth, yellowish-brown ($24–30\ \mu$ diam.), often clustered together.

Known also in Germany.

Diseased plants should be at once removed from the seed-beds. Oospores will retain vitality for four years; hence the soil which has produced diseased plants should not be used again.

Sacc. Syll. vii. 803; *Mass. Pl. Dis.* 66, fig. 8; *Hartig & Som. Dis. Trees*, p. 58, figs. 14–16; *Marshall Ward, Timbers, &c.* p. 271, figs. 42–44.

Beech Agaric.

Armillaria mucida (Schr.).

The slimy-white, or greyish-white, Agaric seen so commonly on dead Beech trees has been charged with being a wound parasite, capable of attacking a healthy branch, when broken or wounded, and causing death and decay.

The cap is from one to four inches across, hemispherical, then flattened, whitish or greyish-white, very glutinous, often growing in clusters from the trunk or branches of Beech trees, with a stem from two or three to five inches long, rather slender, but thickest at the base, whitish, sometimes with dark scales, with a broad distinct ring or collar surrounding the stem, above the middle. Gills very broad and white. Spores

BOARD OF AGRICULTURE AND FISHERIES.

The Felted Beech Coccus (*Cryptococcus fagi*).

Distribution.

This insect confines its attacks exclusively to the beech (*Fagus sylvatica*), and is one of the most destructive pests against which the arboriculturist has to contend. It is widely distributed throughout England, and has occurred in many parts of Scotland. It is common in the counties of Flint and Denbigh in North Wales; while in Ireland it has, so far, been recorded from one locality only. Its attacks are often restricted to a comparatively small area, or even to single isolated trees, this being especially noticeable where the tree-trunks are sheltered from the prevailing winds.

Signs of Infestation.

Owing to the whiteness of the felted covering with which the female protects its body, and also to its exposed position upon the trunks and main branches of the trees, the beech coccus is at all times a conspicuous species, and more especially so when the white secretionary coverings unite and almost completely cover the bark of the tree.

Young and old trees are alike attacked; and the insects usually confine themselves to the main trunk and larger branches; but the smaller branches, especially those of young trees, are sometimes infected to a serious extent. Where the infected trees are growing in exposed situations the insects almost invariably select the sheltered side of the tree. Many badly infected trees which have been under close observation for the last sixteen years are still apparently vigorous and healthy, while others have been totally destroyed. The first sign of decay is usually seen in the foliage, which becomes discoloured and sparse or thin, accompanied by the death of the smaller branches; this is followed by the death of the larger branches and, finally, the tree trunk; while the bark peels off from the branches and falls away. Whether the work of destruction is aided by the joint action of a bacterial or fungoid disease is not at present known, but it is probable that such is the case, otherwise it is difficult to understand how so many badly infected trees withstand the attacks of the insects for such long periods without showing any evident signs of decay.

Description and Life-History.

The beech coccus belongs to the generally destructive family of Scale insects (COCCIDÆ). *The adult female* is of a lemon-yellow colour, and measures about one twenty-fifth of an inch in length. It is both wingless and legless; is somewhat hemispherical in shape, being

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flattish beneath and highly convex above; and to the naked eye or under low magnifying power it appears like a small yellow egg. The mouth organs are placed on the underside of the body, and are composed chiefly of three hair-like appendages which in life are united to form a long sucking tube; with this slender apparatus the insect pierces the bark and sucks up the juices of the tree. She has no power of locomotion, remaining stationary throughout life, anchored to the tree by her mouth organs, motionless and apparently senseless. Almost immediately after leaving the egg she covers her body with the white felted secretion, composed of fine filaments of wax, which gradually thickens and forms an excellent protection to her body, being practically impervious to rain. Within this covering the insect lives, lays her eggs, and dies.

The *larvæ* or "lice" as they are sometimes called, are very tiny active creatures, and are scarcely visible to the naked eye. They possess three pairs of legs and a pair of horns (antennæ), and like their parents are of a yellow colour. Although they can and do travel over the bark of the tree, they usually settle down in the immediate neighbourhood of the parent, the majority working their way under the bodies of their dying or dead parents, taking up their positions, by preference, in the deepest parts of the fissures in the bark, where they remain for the rest of their lives pumping up the juices of the tree. Each individual protects its body with secretion, which adds to that already secreted above them by the insects of the previous generations; thus the secretion gradually thickens and spreads over the tree-trunk, forming a more or less continuous mass, often attaining a considerable thickness. Larvæ which wander over the bark are liable to be borne away by the wind or, inadvertently, by birds and insects, and this is undoubtedly the means by which fresh colonies are started.

The *male* is unknown in any stage, the females being parthenogenitic, reproducing their species without the intervention of the opposite sex.

Many of our indigenous Scale insects are subject to the attacks of minute parasitic insects related to the wasp family; but, so far, the beech coccus has proved immune from their attacks. Birds do not appear to feed upon them.

Treatment.

Owing to the comparatively smooth nature of the bark of the beech, and also to the fact that the insects are often confined to the trunk and main branches, this pest is more easily accessible for treatment with insecticides than are many other pests. But they are so well protected by their waxy coverings that the application of an insecticide must be carried out in a thorough manner or the result will be anything but satisfactory. The three formulas

Fig. 1.

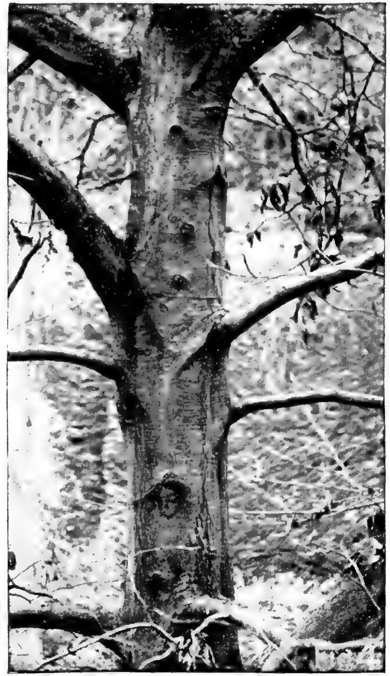

Fig. 2.

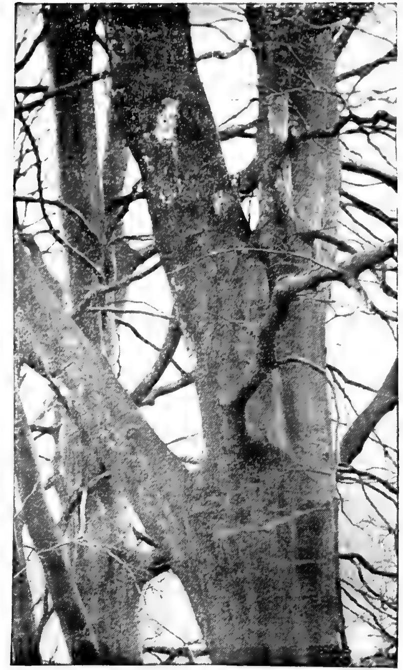

Fig. 3.

Fig. 1.—Main trunk of young beech badly infected with coccus. Fig. 2.—Young beech, which was similarly infected to that shown in Fig. 1, 21 months after treatment with insecticide No. 2; now free from the pest. Fig. 3.—Upper branches of very old beech killed by the coccus; the bark has peeled off in patches.

given below have proved to be thoroughly efficient in destroying this pest when applied according to instructions:—

1. *Paraffin Emulsion.*—This should be prepared in the following way :—Mix equal proportions of soft soap, dissolved in boiling water, and paraffin, and churn them up by means of a force-pump or syringe. When required for use add twenty times its bulk of water and again churn.

2. *Paraffin Emulsion with Sulphur and Turpentine added.**—Take about half a gallon of soft water, boil and dissolve about 1 lb. of common soap, add a handful of sulphur and a pint of paraffin, and about the same quantity of turpentine. Add about four gallons of soft water to this mixture and churn well together, as recommended above.

3. *Caustic Alkali Wash.*†—Dissolve 1 lb. of commercial caustic soda in water, then 1 lb. of crude potash or pearl ash in water. When both have been dissolved mix the two well together; then add $\frac{3}{4}$ lb. of soft soap, stir well and add sufficient water to make up to ten gallons. CAUTION.—Do not mix in painted vessels of any kind.

Formulas Nos. 1 and 2 should be applied with a good stiff scrubbing-brush, one having the bristles also set at the end being the most serviceable. Care should be taken to scrub the mixture well into the crevices and bifurcations of the branches and to break up the white coverings of the insects as much as possible. Nos. 1 and 2 may be applied at any time between September and the first week in April.

The caustic alkali formula is essentially a winter wash, but may also be applied in early spring. It is usually applied with a spray pump or syringe, and is particularly useful in treating the smaller branches of trees. Two or three sprayings at intervals of two or three days are necessary. This wash has a burning effect upon the hands of the operator, and care must be taken in employing it. Close-fitting rubber gloves may be worn to protect the hands; and a rubber washer or flange, about 2 in. wide, should be fitted to the tube of the sprayer or syringe to prevent the wash running down to the hands of the operator.

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* Gillander's Mixture: Trans. Manchester Microscopical Soc., 1898. Separate reprint, p. 12. † See also Leaflet No. 70.

4, Whitehall Place, London, S.W.
May, 1905.

The Board of Agriculture and Fisheries would be glad if recipients of this leaflet would make it known to others interested in the subject. Copies may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

elliptical (14–16 × 8–9 μ), very slimy and unpleasant to the touch, but very delicate eating when cooked.

Found throughout Europe and North America.

All wounds and cut branches should be protected by applying a coating of tar. Infection only by means of the spores, hence all the Agarics should be collected and eaten or destroyed.

Sacc. Syll. vi. 310; *Cooke, Hdbk.* No. 37; *Cooke, Illus.* t. 16; *Mass. Pl. Dis.* 204.

Hydnum diversidens (Fr.) is apparently a wound parasite, which has occurred on Beech in Epping Forest; it is an interesting species, but so rare as to be a curiosity.

Sacc. Syll. 6697.

HORNBEAM ANTHRACNOSE.

Glœosporium carpini (Desm.), Pl. XX. fig. 23.

The anthracnose on living and fading leaves of Hornbeam as developed on the under surface on olive-brown, irregular, and indefinite spots. The pustules are very minute, pale brown, and scarcely conspicuous. The conidia are cylindrical and curved or sickle-shaped (10–15 × $\frac{1}{2}$ μ), and very narrow and thread-like, oozing from the orifice in whitish tendrils.

Known also in France, Germany, Italy, and Austria.

Sacc. Syll. iii. 3722; *Grevillea,* xiv. p. 124, No. 619; *Sacc. F. Ital.* fig. 1021.

Another species (*Glœosporium Robergei*) is known on the Continent, on leaves of the Hornbeam, but not recorded for Britain. This tree is much favoured in immunity from fungus parasites.

HORNBEAM-LEAF BLOTCH.

Gnomoniella fimbriata (Anc.), Pl. XX. fig. 24.

It is not unusual to see living leaves of Hornbeam disfigured by prominent black convex blotches, which are themselves tuberculate with elevated warts, each of which indicates and covers an immersed cell or receptacle, and terminates in a spine-like neck, which is surrounded at the base by a white collar or fringe. These receptacles contain the fructification, which consists of oblong sacs or asci, each enclosing eight ellipsoid sporidia (10–11 × 5 μ), which, when mature, escape through the elongated neck of the receptacle.

It is believed that earlier in the season the conidia are developed under the form of an anthracnose, formerly considered a distinct species, and known as *Glœosporium carpini,* which has cylindrical curved conidia (10–15 × 1 μ), expelled when mature in whitish tendrils.

This blotch is known throughout Europe and in North America.

No remedy is suggested, except picking off and burning as many infested leaves as possible to prevent dispersion.

Sacc. Syll. i. 1589; *Cooke, Hdbk.* No. 2735.

Melampsora carpini is recorded as attacking the leaves of Hornbeam.

Birch-Leaf Spot.

Phyllosticta betulina (Sacc.), Pl. XX. fig. 25.

Possibly this leaf-spot bears the receptacles of the earliest stage, or spermogonia, of a species of leaf sphæria (*Sphærella maculiformis*) which is not uncommon on the dead leaves of various kinds of forest trees. There are no definite spots, but the receptacles are densely clustered together in large groups, which have the appearance of spots. These are globose, and immersed in the substance of the leaves, and contain minute curved sporules ($4–6 \times 1–1\frac{1}{2}\ \mu$), which are ejected when mature.

Recorded also in France and Italy.

Sacc. Syll. iii. 170; *Grevillea,* xiv. 72, No. 398.

Another leaf-spot on Birch is attributed to *Asteroma betulæ,* which occurs in Britain, but is not reputed to cause any serious injury

Sacc. Syll. iii. 1241; *Grevillea,* xiv. p. 75, No. 446.

Birch-Leaf Rust.

Melampsora betulina (Pers.), Pl. XX. fig. 26.

This rust is common on Birch leaves from May to November. Hitherto all efforts to discover the cluster-cups of this species, presuming them to exist, have been unavailing.

The pustules of the uredo are small, pale orange, roundish, and rather powdery. The uredospores are ovate or oblong ($25–40 \times 10–20\ \mu$), finely rough, and orange-yellow.

The pustules which contain the teleutospores are at first yellow, then they become brown, and ultimately black. The spores are cylindrical, partaking of the typical form of the genus, closely packed side by side, and slightly wedge-shaped ($50 \times 16\ \mu$), pale yellow-brown.

Reported also in France, Belgium, Netherlands, Germany, Finland, Lapland, Austria, Hungary, Switzerland, Italy, and Asiatic Siberia.

Sacc. Syll. vii. 2118; *Plowr. Br. Ured.* p. 243; *Cooke, Hdbk.* No. 1559; *Cooke, M. F.* 219, figs. 189, 190; *Hart. & Som. Dis. Trees,* p. 171.

Birch Polypore.

Polyporus betulinus (Fr.).

Although this polypore has long been known as a saprophyte on dead Birch trees, it has only recently been demonstrated that it will attack and destroy living trees, producing at first a brown discoloration and afterwards causing cracks in the decaying wood, which is replete with the white mycelium.

The complete fungus, when seen attached to the trunk, is hoof-shaped, with the upper surface smooth and at first soft, white, or greyish, and often brownish as it advances in age, when the brown cuticle often cracks and peels off. The under surface is flat, or a little concave, pierced all over with minute pores; the margin thick and curved inwards. When young, the substance is soft enough to be cut like cheese, and is persistently white; when older it becomes firmer, but is always rather soft. In size it varies from three to seven or eight inches across.

Common in Europe, Asiatic Siberia, and North America.

The fungus should be removed and destroyed whenever found, to prevent the dispersion of the spores. As it is probable that the mycelium is perennial, there is no hope of saving a tree after the appearance of the polypore.

Sacc. Syll. vi. 5207; *Mass. Pl. Dis.* 189, fig. 43; *Cooke, Hdbk.* No. 772; *Sow. B. F.* t. 212; *Mass. Fun. Fl.* i. p. 248; *Hart. & Som. Dis. Trees*, p. 206.

Witches' Broom of Birch.

Exoascus turgidus (Sad.).

The peculiar bunches of stunted twigs often to be seen on Birch trees are familiar enough, and so is the name of 'Witches' Brooms' or 'Witches' Besoms,' but it is not everyone who knows that it is a disease caused by minute fungi.

The naked asci, or sacs, which contain the sporidia are developed in spring and summer on the under surface of the leaves, which curl up, lose their fresh green colour, and at length appear covered with a greyish-white hoariness, like hoar frost. The asci ($46–50 \times 15\ \mu$) have a stem cell ($16-17 \times 15\ \mu$) at the base, and they diminish gradually downwards so that they penetrate the epidermal cells. The sporidia, which are enclosed in the asci, are globose ($3–4\ \mu$ diam.).

Known also in Germany, Denmark, Sweden, and Finland.

Sacc. Syll. viii. 3347; *Phil. Br. Disc.* p. 484; *Hart. & Som. Dis. Trees*, p. 133.

Birch-Leaf Blotch.

Dothidella betulina (Fries), Pl. XX. fig. 27.

This parasite on the living leaves of Birch has many features in common with the Elm-leaf blotch, with which it corresponds in the mature fruit not being developed until after the leaves have fallen, and are laid on the ground. The blotches are rather small ($\frac{1}{2}$ mm.), at first covered by the epidermis, at length naked, prominent, rather angular, with an uneven surface, black and shining, containing white cavities or cells, in which the fruit is matured. The asci are elongated ($70 \times 10\ \mu$), each enclosing eight sporidia, which are ellipsoid, obtuse at the ends, and divided into two nearly equal but sometimes unequal cells ($10 \times 5\ \mu$), of a very pale yellowish colour, discharged, when mature, through the prominent mouth at the apex of the cell.

Reported also in France, Germany, Sweden, Finland, Italy, and Asiatic Siberia.

Sacc. Syll. ii. 5256; *Cooke, Hdbk.* No. 2413; *Grev. Sc. Crypt. Fl.* t. 200, f. 2.

Lime-Tree Sooty Mould.

Fumago vagans (Pers.), Pl. XIV. fig. 21.

The leaves of the Lime are often blackened with this "sooty mould," which sometimes quite encrusts the leaves. It also occurs, but less commonly or profusely, on Oak, Elm, Birch, Willow, and other deciduous trees. It is commonly preceded by honey-dew, upon which the mould thrives and flourishes apace.

The mould consists of brown creeping hyphæ, which are branched or fasciculate, sometimes confluent and forming cellulose ganglia, constituting a thin membranaceous stratum, of a blackish colour. The fertile threads are short, ascending, and branched in the upper portion. Conidia terminal, forming short chains, for the most part two-celled, rarely one-celled, or three-celled (from 5–15 μ long), brown.

Doubtless a state or condition of more complex fungi, such as *Capnodium*.

Causes injury by closing the pores or stomata of the leaves, but usually so universal over all the foliage as to defy remedy.

Sacc. Syll. iv. 2618 ; *Berk. & Desm. Journ. Hort. Soc.* iv. 251.

Lime-Tree Leaf Spot.

Septoria tiliæ (West.), Pl. XX. fig. 28.

Perithecia on both surfaces of the leaves, seated on tawny spots, which become pallid in the centre. Sporules straight or curved, 3–4 septate ($35–40 \times 2–2\frac{1}{2}$ μ, or sometimes longer).

Known also in Belgium, Italy, and Austria.

Sacc. Syll. iii. 2562 ; *Grevillea,* xiv. p. 76, No. 466.

Alder-Leaf Spot.

Septoria alnicola (Cooke), Pl. XX. fig. 29.

This parasite was first found in Britain on living Alder leaves, and afterwards in Italy. The spots are pallid, brown or tawny, roundish (5–7 m.). The receptacles are minute, black, dot-like, scattered over the spots. The sporules oblong, and straight or curved (about $20–26 \times \frac{3}{4}$ μ).

Sacc. Syll. iii. 2735 ; *Cooke, Hdbk.* No. 1339 ; *Seem. Journ. Bot.* iv. p. 97, f. 23 ; *Grevillea,* xiv. 101, No. 488.

This is supposed to be a different species from *Septoria alni* and *Septoria alnigena,* both of which are found on Alder leaves in Italy, but it is doubtful whether at least one of them is not the same.

Alder-Leaf Black Mould.

Passalora bacilligera (Fres.), Pl. XX. fig. 30.

This mould occurs on living and languishing leaves of the Alder, occupying the under surface, forming small olive tufts. The threads simple, collected in bundles, flexuous and obtuse, olive-coloured, septate, often twisted and interwoven amongst themselves. Conidia produced at the tips of the threads, somewhat narrowly club-shaped, with one transverse division near the centre ($30–50 \times 5–7$ μ).

Known also in France, Germany, Belgium, and Italy.

Sacc. Syll. iv. 1640 ; *Sacc. Fl. Ital.* t. 788 ; *Cooke, Hdbk.* No. 1748.

Alder-Leaf Blister.

Taphrina Sadebeckii (Joh.).

The fungus causing this disease was at first called *Ascomyces Tosquinetii*, but that name has now been abandoned for the above.

It produces blisters on the upper surface of the leaves of the Alder, and the naked asci or spore-sacs produce a hoary appearance. These asci are truncate, or abrupt, at each end ($41–55 \times 15\ \mu$), and contain eight spherical sporidia, which are colourless ($5–6\frac{1}{2}\ \mu$ diam.).

Known in Germany, Belgium, and Sweden, as well as in Britain. Sometimes called *Exoascus flavus*.

Sacc. Syll. viii. 3338; *Phil. Br. Dis.* p. 403; *Grevillea*, vi. p. 25; *Mass. Pl. Dis.* p. 91; *Hart. & Som. Dis. Trees*, p. 133.

Alder Catkin Blister.

Exoascus alnitorquus (Tul.).

This species attacks the female catkins of the Alder, which are thereby much deformed. It occurs also sometimes on the leaves, which become yellowish and primrose, blistered and contorted. The asci, or spore-sacs, are clavate ($31–37 \times 6–7\ \mu$), with a basal cell attenuated downwards until it becomes acute ($11–20 \times 6–7\ \mu$). The globose sporidia are small ($3–5\ \mu$ diam.) and numerous.

Known also in France, Belgium, Germany, Sweden, and North America.

Sacc. Syll. viii. 3345; *Phil. Br. Disc.* p. 403; *Grevillea*, v. p. 62; *Hart. & Som. Dis. Trees*, p. 133, fig. 72.

Alder-Root Tubercles.

Plasmodiophora alni (Wor.).

This disease of Alder roots was first called *Schinzia alni*, but it does not appear to differ greatly from the club root of Crucifers. The roots become swollen and deformed, exhibiting a mass of small tubercles as large as the seed of a Vetch, or sometimes larger, and 2–10 cm. diam., which tubercles contain numerous globose spores aggregated in clusters or bunches ($8\ \mu$ diam.) and of a mucous consistency when cut.

Known in Germany, Poland, and Italy.

Sacc. Syll. vii. 1569; *Gard. Chron.* Oct. 6, 1894, p. 398; *Hart. & Som. Dis. Trees*, p. 39.

Tree-Root Rot.

Armillaria mellea (Fr.).

The blackish cord-like strands of mycelium long known under the name of *Rhizomorpha* are for the most part connected with this Agaric, which is common everywhere at the roots of trees. This mycelium consists of blackish cord-like strands of the thickness of fine twine, which creep over the roots, and the base of the trunk, close to the ground, radiating on every side until they come in contact with other roots, which are attacked. The rhizomorphs do not enter the roots, but give off delicate branches which enter the roots and form white sheets of mycelium between the bark and wood.

The complete fungus grows in dense clusters at the foot of trees, and is an Agaric, of the Mushroom form, with a cap two or three inches across, of a honey-yellow colour, generally clad with darker scales. The stem is from three to six inches long, smooth, and rather paler than the cap, darkest at the base. Gills white when young, becoming creamy with age. The stem above the middle is surrounded by a white frill or ring. The spores are white ($9 \times 6\,\mu$) and are produced in great profusion, falling and settling on the grass and surrounding objects like a dense white powder.

Care should be taken in orchards not to wound the roots of trees with the spade. All clumps of the Agaric should be destroyed. Affected trees should be isolated by digging a trench around them.

Sacc. Syll. vi. 289 ; *Cooke, Illus.* No. 32 ; *Mass. Pl. Dis.* 201, fig. 47 ; *Cooke, Hdbk.* No. 36, fig. 36 ; *Journ. R.H.S.* xxvi. 1902, p. 735, fig. 309 ; *Marshall Ward, Timbers &c.* p. 154, figs. 15–16.

Poplar-Leaf Spot.

Septoria populi (Desm.), Pl. XX. fig. 31.

This common leaf-spot on Poplar leaves occurs on the upper surface, and is characterised by small orbicular spots, which are sometimes confluent, whitish or bleached, greyish towards the circumference, with a brown border. The receptacles are few and pale at first, becoming blackish when dry. Sporules rod-shaped, obtuse at the ends, and curved ($45 \times 3\,\mu$), with a single septum.

Recorded in France, Belgium, Portugal, Italy, and Siberia.

Sacc. Syll. iii. 2712 ; *Cooke, Hdbk.* No. 1317 ; *Grevillea,* xiv. 101, No. 485.

Poplar-Leaf Anthracnose.

Marsonia populi (Lib.), Pl. XX. fig. 32.

This parasite appears to be the same as that described by Berkeley many years ago under the name of *Asteroma labes,* and is found on the leaves of *Populus nigra, italica,* and *alba.*

The spots are on the upper surface, and are somewhat rounded, often confluent, brown, with a dark margin, upon which the pustules are scattered. Conidia somewhat pear-shaped ($20 \times 12\,\mu$), divided by a transverse septum into two cells, expelled when mature in whitish tendrils.

Recorded for France, Belgium, Germany, Austria, and Italy.

Sacc. Syll. iii. 4024 ; *Cooke, Hdbk.* No. 1409 ; *Grevillea,* xiv. 126, No. 644 ; *B. & Br. A.N.H.* No. 203, t. ii. f. 6.

Aspen-Leaf Anthracnose.

Glœosporium tremulæ (Lib.), Pl. XX. fig. 33.

The leaves of the Aspen (*Populus tremula*) are liable to the attacks of an anthracnose which causes greyish spots on either surface, which are either rounded or oblong, with a tawny margin. The pustules are found also on both surfaces, and are either scattered or disposed in rings. The epidermis of the leaves above the pustules is often blackened and rough. The conidia are curved (10–15 × 2 μ), seated upon short thread-like pedicels.

Recorded also in Sweden, France, Germany, Austria, and Italy.

Sacc. Syll. iii. 3719; *Grevillea*, xiv. p. 124, No. 618.

Aspen-Leaf Rust.

Melampsora tremulæ (Tul.), Pl. XXI. fig. 34.

This parasite is common enough on the leaves of *Populus tremula* from June to November. It has been said that the cluster-cups are to be found on the leaves of *Mercurialis perennis*, having been known hitherto under the name of *Uredo confluens*.

The uredospores are produced in small pustules on the under surface of the leaves, or larger when upon the young twigs. The spores are subglobose or ovate, rough, and of an orange colour (15–20 × 14–16 μ).

The teleutospores are also found on the under surface, forming abundant flattened, compact pustules, at first reddish-brown, becoming black. The spores are closely compressed together, side by side, and are elongated, attenuated downwards, almost wedge-shaped (45–50 × 10–12 μ).

Rostrup contends that the cluster-cups of this rust are to be found in the species called *Cæoma pinitorquum*, which occurs on young Pine seedlings.

It has been found in France, Germany, Switzerland, Netherlands, Finland, Austria, Bohemia, Italy, and Portugal.

Sacc. Syll. vii. 2111; *Plowr. Br. Ured.* 240; *Cooke, Hdbk.* No. 1560; *Cooke, M. F.* 219; *Hart. & Som. Dis. Trees*, p. 164, fig. 96.

White Poplar Rust.

Melampsora æcidioides (DC.), Pl. XXI. fig. 35.

This rust occurs on the leaves of *Populus alba*, and has evidently been united hitherto with *Melampsora populina*, from which it is probably distinct. It has been suggested that the cluster-cups are to be found on the leaves of *Mercurialis perennis*, which Dr. C. B. Plowright thinks that he has demonstrated.

The uredo occurs in small roundish pustules, surrounded by a white wreath of large crowded paraphyses. Uredospores, spherical or elliptical, with a colourless rough coating, and orange contents (17–24 × 15–17 μ). Paraphyses clavate (40–60 × 15–20 μ).

Teleutospores forming small brown crusts, cylindrical, cohering laterally, and truncate at the apex (50 × 10 μ), of a brown colour.

Has been recorded for France and Germany.

Sacc. Syll. vii. 2112; *Plowr. Br. Ured.* p. 241.

Black Poplar Rust.

Melampsora populina (Jacq.), Pl. XXI. fig. 36.

This endophytal parasite occurs commonly on the living leaves of *Populus nigra, balsamifera,* and *italica.* It has been affirmed that the cluster-cups are to be found on the Clematis, but this has not been confirmed by those whose unbounded faith rests upon artificial cultures.

The pustules of the uredo are found on the under surface, are roundish, and at first covered by the epidermis, brown. The uredospores are elongated elliptical, or ovate, and rough ($28–40 \times 15–20\ \mu$), of an orange-yellow colour, mixed with capitate paraphyses.

Teleutospores in flat pustules, generally crowded and often confluent, forming reddish-brown and then blackened crusts. The spores are cylindrical, closely packed side by side, and angular by compression, so that they are polygonal in section, a little attenuated downwards ($40–50 \times 10–15\ \mu$), pale brown in colour.

Known also in France, Belgium, Netherlands, Germany, Finland, Bohemia, Austria-Hungary, Switzerland, Italy, Portugal, Asiatic Siberia, and North America.

Sacc. Syll. vii. 2113 ; *Plowr. Br. Ured.* p. 242 ; *Cooke, Hdbk.* No. 1561 ; *Cooke, M.F.* 219, figs. 195, 196.

Poplar-Leaf Blister.

Taphrina aurea (Fr.), Pl. XXI. fig. 37.

This blister on Poplar leaves has long been known on *Populus nigra,* forming roundish blisters, which are convex on the upper surface and concave beneath, where they acquire a golden-primrose appearance. The asci are clavate, attenuated at the base, and truncate at the apex ($92–100 \times 16–25\ \mu$). The sporidia are globose ($4\ \mu$ broad).

The same fungus, apparently, produces pocket-like growths on the ovary of *Populus tremula* and *P. alba* (*H. & S.* fig. 74).

Known also in France, Germany, Sweden, Finland, and Italy.

Sacc. Syll. viii. 3325 ; *Sacc. F. Ital.* fig. 1281 ; *Hart. & Som. Dis. Trees*, p. 135, figs. 73, 74 ; *Mass. Pl. Dis.* p. 91.

Another blister (*Taphrina Johansonii*, Sad.) attacks the carpels of the Aspen, causing them to swell and become of a bright golden-yellow. Not as yet determined to be British, unless it proves to be the above form of *Taphrina aurea.*

Mass. Pl. Dis. p. 92.

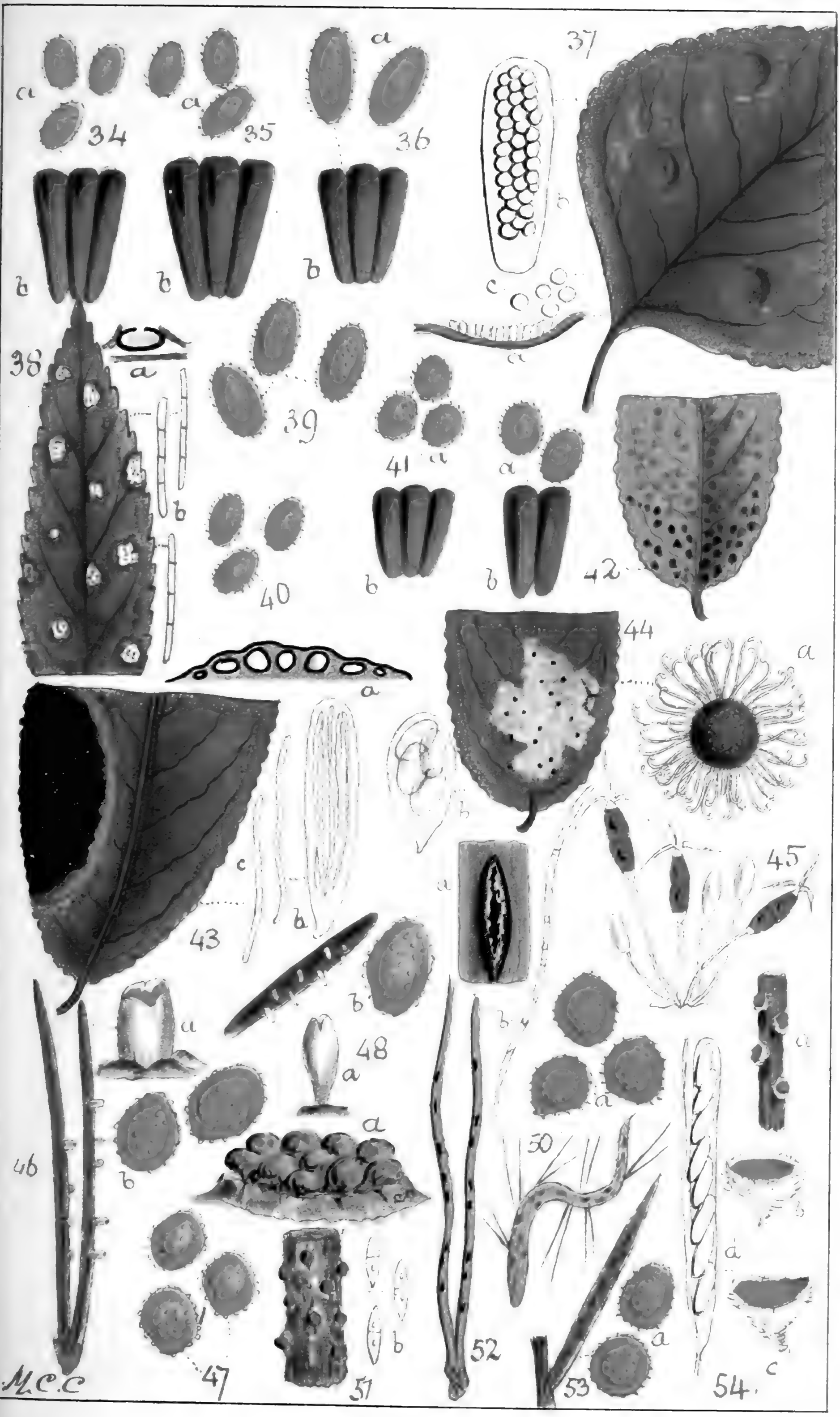
The Lombardy Poplar is attacked by *Didymosphæria populina,* which produces a disease met with in many parts of France and Germany.

Hart. & Som. Dis. Trees, p. 104.

Willow-Leaf Spot.

Septoria salicicola (Fries), Pl. XXI. fig. 38.

This spot is generally found on the leaves of *Salix cinerea* and *S. viminalis*, but it occurs also upon other species. The spots are rounded



PESTS OF FOREST TREES.

and white with a brownish margin, upon which are scattered the minute and dot-like black receptacles. The sporules are rod-like and curved ($40–50 \times 3\ \mu$), with three transverse septa.

Recognised also in Sweden, France, Austria, Italy, and Siberia.

Sacc. Syll. iii. 2711; *Grevillea,* xiv. 101, No. 484.

Septoria salicella (Berk.) is now called *Rhabdospora salicella,* and appears to be confined to dead twigs and branches.

Osier Rust.

Melampsora vitellinæ (DC.), Pl. XXI. fig. 39.

This rust is found on both surfaces of the leaves of *Salix pentandra fragilis, triandra, viminalis,* and *vitellina.* The uredo appears to be the only stage which is perfectly known, and this was originally called *Uredo vitellinæ* and *Lecythea saliceti.*

The pustules of the uredo are small, round, soon becoming powdery, and golden-yellow. The spores are elliptical or ovate, rough, and orange ($25–28 \times 15–20\ \mu$), mixed with globose paraphyses attenuated at the base.

The teleutospores are said to be confined to the under surface, and occur in small crusts, at length dark brown.

Reported in France, Belgium, Germany, Italy, and Asiatic Siberia.

These species of *Melampsora* on Willows appear to be sadly in need of thorough investigation and disentanglement.

Sacc. Syll. vii. 2110; *Plowr. Br. Ured.* p. 240; *Cooke, Hdbk.* No. 1593; *Cooke, M. F.* p. 221.

Purple Willow Rust.

Melampsora mixta (Thüm.), Pl. XXI. fig. 40.

This fungus is found on the leaves of *Salix triandra* from May to November. The uredo was formerly known as *Lecythea mixta.* There is at present no insinuation as to its cluster-cups.

The pustules of the uredo are found on the under surface, and are crowded and powdery, of an orange colour, larger, and sometimes confluent when occurring on the young twigs. Spores elliptical or nearly so, rough, and of an orange colour ($14–18 \times 12–15\ \mu$), mixed abundantly with capitate paraphyses.

Teleutospores also on the under surface, in small blackish crusts.

Has been found in France, Germany, Italy, and South Africa, and is reputed to occur on *Salix hastata* and *S. silesiaca.*

Sacc. Syll. vii. 2109; *Plowr. Br. Ured.* p. 239; *Cooke, Hdbk.* No. 1592; *Cooke, M. F.* p. 221.

Crack Willow Rust.

Melampsora epitea (Kze.), Pl. XXI. fig. 41.

This parasite on the leaves of *Salix viminalis* is at present without any accredited cluster-cups. The uredo is generally found on the under surface, in minute orange powdery pustules. The uredospores are globose, rarely somewhat elliptical, rough, and pale yellow (20 μ diam.), mixed with numerous clavate paraphyses.

Teleutospores also on the under surface, very small, at first brown, then nearly black, crowded and somewhat hemispherical, and compact. Spores cylindrical, pale brown ($30–34 \times 12–14\ \mu$) and smooth, with a thick coat.

Recorded also in France, Belgium, Germany, Italy, and Asiatic Siberia, probably in North-Western India.

This species is also said to be found on *Salix alba*, *S. incana*, *S. purpurea*, *S. nigricans*, and *S. retusa*.

Sacc. Syll. vii. 2108 ; *Plowr. Br. Ured.* p. 239 ; *Sow. Fung.* t. 398, f. 1 ; *Cooke, Hdbk.* No. 1558, pp.

Goat Willow Rust.

Melampsora farinosa (Pers.), Pl. XXI. fig. 42.

The final stages of this rust are found on the leaves of *Salix Caprea*, *cinerea*, *aurita*, and *reticulata* ; it was formerly known as *Melampsora salicina*, and although it has been suspected that the cluster-cups would be found on the leaves of *Euonymus*, it has not been demonstrated.

The uredospores are found on the under surface in roundish pustules, which are either scattered or clustered together, sometimes in a circular manner, powdery, and of an orange colour. The spores are more or less globose, rough, with a hyaline coat and golden - orange contents ($17–22 \times 13–15\ \mu$), mixed with numerous clavate paraphyses.

The teleutospores occur on the upper surface, covered by the epidermis, in clusters which are often confluent and form thick flat crusts, which are at first orange, then brown, and at length nearly black. The spores are cylindrical, slightly narrowed downwards, and closely packed side by side ($40–45 \times 16–17\ \mu$), pale brownish.

Found also in France, Belgium, Germany, Finland, Austria, Switzerland, Italy, Asiatic Siberia, and North America.

This appears to be the same as *Melampsora caprearum*.

Sacc. Syll. vii. 2106 ; *Plowr. Br. Ured.* 238 ; *Cooke, Hdbk.* No. 1558 ; *Cooke, M. F.* 219, figs. 191, 192.

Willow-Leaf Blotch.

Rhytisma salicinum (Pers.), Pl. XXI. fig. 43.

This blotch in some respects resembles that which is so common on Sycamore and Maple, forming large, thick, pitchy-black blotches on the leaves of the Goat Willow, *Salix Caprea*, and several other species.

The early stage, whilst the leaves still remain attached to the tree, is known as *Melasmia salicina* and is the conidial condition. The blotches are large but variable, convex and rugulose, rather shining, and pitchy-black, but internally the stroma or substance is white.

The mature stage only accrues after the leaves have remained upon the ground through the winter, and is perfected within the same blotches as contained the conidia in the summer. The asci are clavate, containing eight thread-like sporidia, which are curved and colourless ($60–90 \times 1\frac{1}{2}–3\ \mu$).

This also is known in France, Belgium, Germany, Sweden, Italy, and Siberia.

Sacc. Syll. vii. 3085; *Cooke, Hdbk.* No. 2278, fig. 357; *Grev. Sc. Crypt Fl.* t. 118, fig. 2.

Willow Mealy Mildew.

Uncinula adunca (Wallr.), Pl. XXI. fig. 44.

This mildew attacks the foliage of Willows, Poplars, and sometimes of Birch, giving it the usual mealy or frosted appearance. The mycelium is spreading, rather thin and white, giving rise to conidia of the *Oidium* form, the joints of which fall away as they mature, and increase the mealy appearance of the leaves.

The conceptacles are globose and scattered or sometimes gregarious, minute and dot-like, surrounded by a rather dense circle of appendages, which are unbranched, and hooked at the apex. Each conceptacle encloses from eight to twelve asci, containing four sporidia.

Known throughout Europe, in Asiatic Siberia and North America.

Sacc. Syll. i. 20; *Cooke, M.F.* t. xi. f. 221–224; *Cooke, Hdbk.* No. 1913.

Conifer Seedling Disease.

Pestalozzia Hartigii (Tub.), Pl. XXI. fig. 45.

This disease is reported to destroy the seedlings of Spruce and Silver Fir in immense numbers. The young plants lose their colour and die. The bark just above the ground is destroyed, and exhibits the mycelium, with the receptacles of this fungus which contain the conidia.

The pustules are immersed, springing from a flattened stroma. The conidia are extruded in black masses. They are at first colourless and undivided, then oblong, with three transverse divisions. The two central cells large, coloured, containing guttules, the terminal cells small and colourless (18–20 μ long), bearing at the apex from one to four slender bristles ($20 \times 1\ \mu$), and attached at the base to slender pedicels.

The only remedy we have heard of is to remove and burn all diseased seedlings.

Mass. Pl. Dis. 297, 432; *Hartig & Som. Dis. Trees*, p. 136, figs. 76, 77.

The cortex of the Silver Fir is attacked by *Phoma abietina* in the Bavarian forests and the Black Forest.

Hart. & Som. Dis. Trees, p. 138, fig. 79.

Pine Cluster-cups.

Peridermium pini (Wallr.), Pl. XXI. fig. 46.

These peculiar cluster-cups are found on the leaves and young branches of *Pinus sylvestris*, in about May and June. Those on the leaves differ somewhat from those on the branches; the former are scattered or in small groups, and are cylindrical or compressed laterally. The mouth is torn irregularly ($2–2\frac{1}{2}$ mm. high). Those on the young twigs form swellings, from the presence of the mycelium the cups are larger, crowded, whitish, with the mouth spreading and much torn (5–6 mm. broad). The æcidiospores are spherical or angular by compression, of an orange colour, and coarsely and thickly warted ($30–40 \times 18–30\ \mu$).

The remaining stages of this parasite are affirmed to be passed upon the leaves of different species of Ragwort, as *Senecio vulgaris, viscosus,* and *Jacobæa*, and has generally been known as *Coleosporium senecionis*.

Recorded also in France, Belgium, Netherlands, Germany, Russia, Bohemia, Hungary, Transylvania, Switzerland, Italy, Asiatic Siberia, and North America.

Sacc. Syll. vii. 2633 ; *Plowr. Br. Ured.* p. 249 ; *Cooke, Hdbk.* No. 1600 ; *Cooke, M.F.* p. 191, t. ii. f. 27, 28 ; *Hart. & Som. Dis. Trees*, p. 172, fig. 102 ; *Marshall Ward, Timbers &c.* p. 256, fig. 37–39.

Pine Witches' Broom.

Peridermium elatinum (A. & S.), Pl. XXI. fig. 47.

This parasite produces on the branches of *Pinus Pinea* that peculiar form of distortion known as Witches' Broom. The mycelium causes fusiform swellings in the branches affected, from which arise the deformed shoots, bearing pale green swollen leaves.

The cups are whitish, opening irregularly. Æcidiospores elliptical or angular, coarsely warted ($16–30 \times 15–17\ \mu$).

Known in Germany Belgium, Hungary, and North America.

Sacc. Syll. vii. 2932 ; *Plowr. Br. Ured.* 271 ; *Cooke, Hdbk.* No. 1601 ; *Cooke, M.F.* p. 104 ; *Hart. & Som. Dis. Trees*, p. 179, figs. 109, 110, 111.

Silver Fir Cluster-cups.

Æcidium pseudo-columnare (Kuhn), Pl. XXI. fig. 48.

This is the species which has been known in this country as *Peridermium columnare*, but which Dr. Plowright affirms is not that species, but another which is known by the above name. It occurs on *Abies pectinata, Nordmanniana, amabilis,* and *cephalonica*, as well as on Spruce.

The cluster-cups appear in two rows on the under side of the affected leaves, which are not otherwise altered, except that they are paler in colour. They are either spherical or elongated, with the edges irregularly torn. Æcidiospores white, finely warted, ovate or long elliptical, sometimes irregular, angular, and even triangular in section ($33–37 \times 18–25\ \mu$).

Recorded for Germany and Britain. The teleutospore condition is known as *Melamspora Goeppertiana*.

Sacc. Syll. vii. 2937 ; *Plowr. Br. Ured.* p. 271 ; *Cooke, Hdbk.* No. 1602 ; *Cooke, M.F.* 194, figs. 27, 28.

Pine Branch Twist.

Cæoma pinitorquum (Br.), Pl. XXI. fig. 50.

This disease is prevalent throughout Germany, often attacking Pine seedlings. The infection is said to be caused by the teleutospores of *Melampsora tremulæ*.

Pustules linear (up to 2 cm. long), either solitary or crowded, orange-yellow. Uredospores rounded or ovoid, angular by compression, warted (15–20 μ diam.), pale reddish-yellow.

Sacc. Syll. vii. 3141; *Mass. Dis. Pl.* 236, fig. 60; *Hart. & Som. Dis. Trees*, p. 166, figs. 97, 98, 99.

Spruce Nectria.

Nectria cucurbitula (Fries), Pl. XXI. fig. 51.

This common *Nectria* occurs usually as a saprophyte, but it also becomes a wound parasite, and attacks the Spruce, or less commonly the Silver Fir. The red perithecia burst through the back, which is killed, and ultimately the wood dries up and dies. The perithecia produce colourless sporidia contained in asci (14–18 × 6–7 μ), uniseptate and binucleate.

Hart. & Som. Dis. Trees, p. 89, figs. 37, 38; *Mass. Pl. Dis.* p. 130; *Cooke, Hdbk.* No. 2349; *Sacc. Syll.* ii. 4680.

Spruce Woolly Sphæria.

Trichosphæria parasitica (Hart.).

This parasite of the Spruce and Silver Fir appears on the young branches, spreading to the under side of the leaves, and is well known in parts of Europe.

Hart. & Som. Dis. Trees, p. 72, fig. 18.

Black Woolly Sphæria.

Herpotrichia nigra (Hart.).

Is destructive to Spruce in the Bavarian forests.

Hart. & Som. Dis. Trees, p. 76, figs. 24, 25.

Conifer Root Rot.

Fomes annosus (Fr.).

This has the reputation of being one of the most destructive fungi which attack Conifers. Germinating spores gain an entrance into the living tissue of the roots and form a thin white mycelium between the bark and the wood. The cell contents change to a brown colour, and the wood soon assumes a pale yellowish-brown colour, with scattered white patches, each with a black spot in the centre.

The complete fungus is variable in size and form, sometimes resembling a thin white cake, with the porous surface uppermost, and one or two inches in diameter. When perfect, the pileus is expanded, thin and overlapping one above another, the upper surface brown, irregularly tuberculose and wrinkled, sometimes concentrically zoned, silky at first but afterwards smooth. The substance is white, hard, and woody; the under surface white and porous. Sometimes six inches across, and once we found a confluent mass upwards of fourteen inches in diameter.

Diseased trees should be removed, with all the roots and fragments of diseased roots, and all examples of the polypore destroyed.

Common in Europe, North America, and Cuba, and is known also as *Trametes radiciperda.*

Sacc. Syll. vi. 5487; *Mass. Pl. Dis.* 183, fig. 41; *Cooke, Hdbk.* No. 788; *Hart. & Som. Dis. Trees,* p. 187, figs. 119, 120; *Marshall Ward, Timbers &c.* p. 142, figs. 11–12.

Douglas Fir Blight.

Botrytis Douglassii (Tub.).

Seedlings and young trees of the Douglas Fir and *Wellingtonia* are liable to have their leading shoots destroyed by this mould, which makes its appearance as a brownish-grey mould on the branches, which soon curve and die. The threads are brownish, either solitary or in tufts, branched towards the summit, with the branchlets dilated, and toothed or spinulose at the tips. Conidia grouped in heads, oval, colourless, $9 \times 6\,\mu$. Minute sclerotia are formed on the dead branches.

With rather more zeal than judgment, Mr. Massee has called this species *Sclerotinia Douglassii,* although he does not know that a *Peziza* cup or sclerotinia has ever been produced, only that it *might* have been. He seems to have forgotten that biology is a science of facts, and not of dreams, and that we have no right to assume a fact until it can be proved. Moreover, we have every reason to believe that this is no other than *Botrytis cinerea.*

Known also in Holland and Germany.

Spraying with Bordeaux mixture at an early stage would destroy the conidia and check the disease. When badly infected the plants should be burnt at once.

Sacc. Syll. x. 536; *Mass. Pl. Dis.* p. 160; *Hart. & Som. Dis. Trees,* p. 130, fig. 71.

Hypoderma nervisequum (DC.).

Is a common disease on the leaves of the Silver Fir in the Erzgebirge. The leaves become yellowish-brown on the under side; the midrib bears a black longitudinal ridge.

Hart. & Som. Dis. Trees, p. 108, figs. 52, 53; *Sacc. Syll.* ii. 5787.

Spruce-Leaf Redness.

Hypoderma macrosporum (Hart.).

Is produced on the leaves of the Spruce, also in the Erzgebirge, and in Switzerland.

Hart. & Som. Dis. Trees, p. 109, fig. 51; *Sacc. Syll.* ii. 5789.

Spruce Shoot Disease.

Septoria parasitica (Hart.).

This new disease has manifested itself on the Continent in young Spruce woods and in seed-beds.

Hart. & Som. Dis. Trees, p. 143, figs. 81, 82.

Pine-Leaf Cast.

Lophodermium pinastri (Chev.), Pl. XXI. fig. 52.

This little parasite has long been known on the leaves of Conifers, but only recently has it been charged as a special disease, especially on seedlings. Hartig says its presence is often indicated by the appearance of brown blotches on the primary leaves, the rest of the leaf being purple-red. The early condition of spermagonia appears first on the leaves as small black spots, often killing them.

In the final stage the conceptacles are scattered, at first innate, elliptical or elongated, black, smooth, split lengthwise so that the mouth opens like a pair of lips when moist, and discloses a livid-coloured disc, which is composed of myriads of cylindrical asci, closely packed side by side, the apices of which form the disc ($115–150 \times 14–16\ \mu$). The sporidia, of which eight are enclosed in an ascus, are thread-like, thickened at the apex, collected in a parallel bundle ($100–140 \times 1\frac{1}{2}–2\ \mu$), the asci mixed with a number of slender paraphyses which are curved at the tips. This final stage only matures after the leaves have fallen to the ground.

Known in France, Belgium, Germany, Sweden, Finland, Italy, and North America.

Hart. & Som. Dis. Trees, p. 110, figs. 56, 57 ; *Mass. Pl. Dis.* 139, fig. 27 ; *Sacc. Syll.* ii. 5819 ; *Cooke, Hdbk.* No. 2302 ; *Grev. Sc. Crypt. Fl.* t. 60.

Conifer Rot Polypore.

Polyporus Schweinitzii (Fries).

This large brown polypore has the reputation of being destructive to Larch, Scotch Fir, and Weymouth Pine.

The pileus is thick, soft, and spongy, of large size (6–9 inches diam.), but variable in form, rounded or angular and deformed, flattened or depressed, tomentose or coarsely velvety, bright brown, supported upon a thick, short stem of the same colour, which is sometimes nearly suppressed. Under surface punctured with large pores, which are torn at the edge, and at first greenish-sulphur colour. Spores ovoid ($7–8 \times 3\frac{1}{2}\ \mu$). Substance, when in good condition, soft and spongy, becoming harder with age, and fragile when dry, of a rhubarb-brown colour.

Known in Pine woods throughout Europe, North America, Cuba, and the Himalayas.

Hart. & Som. Dis. Trees, p. 198 ; *Cooke, Hdbk.* No. 739 ; *Sacc. Syll.* vi. 4938 ; *Mass. Pl. Dis.* p. 196.

Another woody fungus called *Trametes pini* has a like reputation, but it is too rare in this country to require notice.

On the light sandy soil of France and Germany, the roots of Conifers are attacked and killed by the mycelium of *Rhizina undulata* (Fries).

Hart. & Som. Dis. Trees, p. 124, figs. 61 to 69.

Larch Rust.

Cæoma laricis (West), Pl. XXI. fig. 53.

Found early in the year on the foliage of the Larch, but so inconspicuous that it is easily overlooked.

The pustules are seated on yellow spots, and are surrounded by the remains of the ruptured epidermis and a circle of barren cells. The uredospores are subglobose, or somewhat elliptical, minutely rough ($15–25 \times 12–18\ \mu$), and of an orange-yellow colour.

A suggestion has been offered that this rust is connected with a form of *Melampsora tremulæ*, but at present the evidence of such a relationship beyond the fact of their growing in proximity, is confined to Hartig.

Known also in Belgium and Germany.

Sacc. Syll. vii. 3128; *Plowr. Br. Ured.* p. 262; *Grevillea,* xiii. p. 73; *Hart. & Som. Dis. Trees,* p. 169, fig. 100.

Hysterium laricinum is liable to infest the leaves of Larch. It is more accurately called *Lophodermium laricinum* (Duby).

Sacc. Syll. ii. 5821.

Larch Canker.

Dasyscypha calycina (Fckl.), Pl. XXI. fig. 54.

The *Peziza* which establishes itself on the twigs and branches, and declared by some observers to be the cause of the Larch disease, consists of pretty little cups ($\frac{1}{2}$ to 1 line broad) which are either clustered or scattered, are at first hemispherical, soon manifestly stipitate, and of a waxy consistency, externally white and hairy. The disc is orange-yellow, with an entire margin. Stem short and rather stout, expanding upwards into the base of the cup. The asci, or spore-sacs, are cylindrical, closely packed to form the disc, enclosing eight oblong, elliptic sporidia ($18–22 \times 7\ \mu$), mixed with thread-like paraphyses, scarcely thickened upwards.

Recorded in Germany, France, and Italy, where it is sometimes called *Peziza Willkommii.*

Sacc. Syll. viii. 1822; *Phil. Br. Disc.* p. 241; *Hart. & Som. Dis. Trees,* p. 117, fig. 58–60; *Mass. Pl. Dis.* 145, fig. 30; *Cooke, Hdbk.* No. 2034; *Marshall Ward, Timbers &c.* p. 227, 34–36.

EXPLANATION OF PLATES XIX., XX., XXI.

Fig. 1.—*Phyllosticta aceris*, Sacc.—*a*, section of perithecium enlarged; *b*, conidia × 400.

2.—*Phlœospora aceris*, Lib.—*a*, section of perithecium; *b*, conidia × 400.

3.—*Septoglœum Hartigianum*, Sacc.—*a*, twig with pustules; *b*, section of pustule; *c*, conidia × 400.

4.—*Botrytis deprædans*, Cooke.—Portion of capitulum × 400.

5.—*Rhytisma acerinum*, Fries.—*a*, conidia; *b*, ascus and ascospores × 400.

6.—*Uncinula aceris*, DC.—*a*, receptacle enlarged; *b*, tip of appendage enlarged; *c*, ascus and ascospores × 400.

7.—*Rhytisma punctatum*, Fries.—*a*, conidia; *b*, ascus and ascospores × 400.

9.—*Glœosporium nervisequum*, Fckl.—*a*, conidia × 400.

10.—*Septoria hippocastani*, B. & Br.—*a*, section of perithecium; *b*, sporules × 400.

11.—*Stereum purpureum*, Fries.—*a*, basidium with spores × 400.

12.—*Phlœospora ulmi*, Fries.—*a*, section of perithecium; *b*, sporules × 400.
13.—*Piggotia astroidea*, Berk.—*a*, conidia × 400.
14.—*Phyllachora ulmi*, Fckl.—*a*, section of stroma; *b*, ascus and ascospores × 400.
15.—*Septoria fraxini*, Desm.—*a*, section of perithecium; *b*, sporules × 400.
16.—*Glœosporium umbrinellum*, B. & Br.—Hyphæ with conidia × 400.
17.—*Microstoma album*, Desm.—Basidia and conidia × 400.
18.—*Uredo quercus*, Brond.—*a*, uredospores × 400.
19.—*Stereum hirsutum*, Fries.—*a*, basidium with spores × 400.
20.—*Stereum frustulosum*, Fries.—*a*, basidia with spores × 400.
21.—*Diaporthe taleola*, Sacc.—*a*, pustules enlarged; *b*, section of stroma; *c*, conidia; *d*, ascus and ascospores × 400.
22.—*Phytophthora omnivora*, DBy.
23.—*Glœosporium carpini*, Desm.—*a*, pustule enlarged; *b*, conidia × 400.
24.—*Gnomoniella fimbriata*, A. & S.—*a*, section of perithecia enlarged; *b*, ascospores × 400.
25.—*Phyllosticta betulina*, Sacc.—*a*, conidia × 400.
26.—*Melampsora betulina*, Pers.—*a*, uredospores; *b*, teleutospores; *c*, teleutospores germinating × 400.
27.—*Dothidella betulina*, Fries.—*a*, section of stroma enlarged; *b*, ascospores × 400.
28.—*Septoria tiliæ*, West.—*a*, section of perithecium enlarged; *b*, conidia × 400.
29.—*Septoria alnicola*, Cooke.—*a*, section of perithecium; *b*, conidia × 400.
30.—*Passalora bacilligera*, Fres.—*a*, hyphæ with conidium; *b*, conidia × 400.
31.—*Septoria populi*, Desm.—*a*, section of perithecium; *b*, conidia × 400.
32.—*Marsonia populi*, Lib.—*a*, section of pustule; *b*, conidia × 400.
33.—*Glœosporium tremulæ*, Lib.—*a*, section of pustule; *b*, conidia × 400.
34.—*Melampsora tremulæ*, Tul.—*a*, uredospores; *b*, teleutospores × 400.
35.—*Melampsora æcidioides*, DC.—*a*, uredospores; *b*, teleutospores × 400.
36.—*Melampsora populina*, Jacq.—*a*, uredospores; *b*, teleutospores × 400.
37.—*Taphrina aurea*, Fries.—*a*, section of blister; *b*, ascus and spores; *c*, ascospores × 400.
38.—*Septoria salicicola*, Fries.—*a*, section of perithecium enlarged; *b*, conidia × 400.
39.—*Melampsora vitellina*, DC.—Uredospores × 400.
40.—*Melampsora mixta*, Thüm.—Uredospores × 400.
41.—*Melampsora epitea*, Kunze.—*a*, uredospores; *b*, teleutospores × 400.
42.—*Melampsora farinosa*, Pers.—*a*, uredospores; *b*, teleutospores × 400.
43.—*Rhytisma salicinum*, Pers.—*a*, section of stroma; *b*, ascus and ascospores; *c*, ascospores × 400.
44.—*Uncinula adunca*, Wallr.—*a*, perithecium with appendages, enlarged; *b*, ascus with ascospores × 400.
45.—*Pestalozzia Hartigii*, Tub.—Conidia in various stages × 400.
46.—*Peridermium pini*, Wallr.—*a*, cluster-cup, enlarged; *b*, æcidiospores × 400.
47.—*Peridermium elatinum*, A. & S.—Æcidiospores × 400.
48.—*Æcidium pseudocolumnare*, Kuhn.—*a*, cluster-cup, enlarged; *b*, æcidiospore × 400.
50.—*Cæoma pinitorquum*, Br.—*a*, æcidiospores × 400.
51.—*Nectria cucurbitula*, Fries.—*a*, cluster of perithecia, enlarged; *b*, ascospores × 400.
52.—*Lophodermium pinastri*, Chev.—*a*, perithecium enlarged; *b*, ascospore × 400.
53.—*Cæoma laricis*, West.—*a*, æcidiospores × 400.
54.—*Dasyscypha calycina*, Fries.—*b*, cup; *c*, section; *d*, ascospores × 400.

THE PRESERVATION OF OUR WILD PLANTS.

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Though Shakespeare did for a moment describe the work of the gardener as "an art which does mend Nature," he hastens to correct his phrase to "change it rather." Thus, though we are largely interested in plants which, under cultivation, have widely departed from their original condition, we must, as horticulturists, still retain considerable interest in wild species. Many of the flowers in our gardens, or even the orchids and other valuable exotics in our stoves, or some of the esculents that we have cultivated for some little time, have departed little, if at all, from their wild state. Not to speak of the Pelargoniums of South Africa, the *Cactaceæ* or arborescent Ericads of America, or the bulbs from the Mediterranean area, a good many British plants, more or less uncommon in a wild state, are frequently grown—in an unaltered condition—in our gardens. Most of our British ferns, several species of *Thalictrum, Saxifraga,* and *Linaria,* our *Trollius* and *Menyanthes, Anemone Pulsatilla, Geranium sanguineum, Campanula glomerata,* and *Primula farinosa,* may be cited as examples; whilst the spread of the taste for wild gardens has naturally led to the extended use of such species as the Primrose, Foxglove, and Woodruff. From a more or less selfish standpoint, therefore, the gardener should be interested in the preservation of our indigenous flora from all danger of extermination, and I may be justified in arguing this matter before the Royal Horticultural Society. I may, however, mention in passing that the subject has been forced upon my attention during the last three years by facts that have come to my knowledge as editor of *Nature Notes,* the organ of the Selborne Society, and by correspondence in the general and in the horticultural Press. I wish also, before stating even the main lines of my inquiry, to disclaim any view so narrow as an interest only in the wild plants of the British Isles. We cannot consistently plead for consideration for the beauties of our own country-side and the claims that our posterity has to receive them from us undiminished if, at the same time, we are to disregard the fact that the people of Switzerland, Italy, Portugal, Greece, South Africa South America, or any other country have a like inalienable heritage. Our charity may begin at home, but it must not end there.

The first question, then, to which I wish to direct your attention is whether any wild plants are undergoing any serious diminution in their numbers, or are in danger of extermination; and, if so, under what classes do they fall, and to what various causes is this diminution due? After considering this, we may deal with the further questions whether it is worth while to take any measures, and, if so, what measures, to check such diminution.

There are undoubtedly many purely natural agencies by which the character of the vegetation of any country is constantly undergoing a gradual change, some species being lost and others added to its flora. Elevation of the land with reference to the sea may not only bring about land connections, and so facilitate the migration of species, but by producing desiccation, as has apparently happened in Biluchistan, may largely alter and impoverish the flora. The recent researches of Mr. Clement Reid as to the seeds found fossil in deposits geologically recent indicate the former presence in England of *Trapa*, the Water-chestnut, and, among others, of species of *Naias*, not now known here. It is noteworthy that these are aquatic forms. Who shall say whether their disappearance is due solely to such a natural cause as elevation of the land, or to some human interference such as the indirect drainage of the country dating from Roman clearing of our forests, or the deliberate drainage of later times? On the other hand, either with or without a depression of the land-level, we have had, and still have, local encroachments of the sea, which may cause the partial or complete loss of species. In a startling paper on "The Diminution and Disappearance of the South-Eastern Fauna and Flora within the Memory of Present Observers," communicated to the South-Eastern Union of Scientific Societies last year, Messrs. Webb, McDakin, and Gray speak of the decadence in East Kent of no less than 500 species of plants, and not a few of these, such as *Statice*, *Salsola*, *Silene maritima*, *Hippophaë*, *Glaucium*, *Cochlearia*, *Euphorbia Paralias*, and *Lactuca virosa*, are attributed to encroachment by the sea.* Such causes of loss as these we may dismiss as being practically beyond our control. We do not urge the construction of breakwaters to preserve a few beautiful or interesting flowers.

Equally inevitable, no doubt, are some of the losses attributable to the increasing density of population and its concomitants, clearing, draining, and building. Here, however, we are at once confronted with a vast amount of reckless destruction, wholesale waste of economic products, and utterly needless uglification of wide areas of country. It is, of course, obvious that the nine million inhabitants of England in the year 1800, fed mainly on home-grown corn and meat, must have required a larger area of cultivated land than the two million of 1200 A.D., or the five million of 1600, and that the 76 million people of the United States now require a vastly larger area than the three million at the time of the War of Independence. As Mr. Lloyd Praeger says, in writing of Ireland, "It is not easy to conjecture the primeval condition of the fertile portions of this country before tillage, grazing, and drainage began to play their part. We can conceive great woods and thickets, open park-like land, and grassy downs; but the details of the primitive vegetation we may never know." † An attempt to sketch this primeval condition of England was made by the late Mr. Elton in his "Origins of English History," and I have myself attempted to carry out the same inquiry, rather more in detail, in an address on "The Influence of Man upon the Flora of Essex," delivered to the Essex Field Club in 1884. "Agriculture," as I then insisted, "is essentially an interference with the balance of Nature. Man deliberately endeavours to exterminate many plants which he puts to

* *South-Eastern Naturalist*, vol. viii. pp. 48-60.
† *Irish Topographical Botany*, p. xxxiv.

no use, in order to clear a larger area for the few species which he can utilise." It is important also to bear in mind that this is true alike of animals and plants: we multiply a few domesticated species, or such semi-domesticated ones as our game-birds and beasts of the chase, at the expense of other unutilised species.

Though I do not wish to dwell to-day on the mainly economic question of forest destruction, I cannot entirely ignore it. Public attention has been very generally directed to the serious injury to climate resulting from wholesale disafforesting in South Africa, Mauritius, Italy, and other countries; and most European countries are now awake to the serious diminution in their timber supply owing to reckless mismanagement. In newer lands, such as the United States and Australia, the vast areas of forest seemed, however, to be illimitable. I remember a Californian lumberman at the Forestry Exhibition at Edinburgh in 1884 ridiculing my suggestion that there could be any need for conservation in the case of the Californian Redwood (*Sequoia sempervirens*), and yet the diminished supply had so enhanced the price of this wood that in 1895 Mr. J. G. Lemmon wrote, "At the present rate of destruction not an unprotected Sequoia of timber-producing size will be left standing twenty years hence." Its price has risen from $25 to $45 per 1,000 feet, and it is said that to produce a sleeper worth 35 cents timber worth 187 cents is wasted. At length America may be said to have awakened to the importance of this question. There are now more than forty Government forest reserves having a total area of nearly 47 million acres, and since 1898 private owners have requested the Government to undertake the management of over 4 million acres more.* "The pulp-mill is," writes Dr. Grout,† "without question the most dangerous enemy of our forests. The ordinary lumberman will leave enough young trees standing to practically reforest the lumbered area in twenty years, but the pulp-wood cutter leaves nothing but desolation." The wasteful way in which the Hemlock Spruce in Canada used, when felled for its bark, to be left to rot on the ground is a familiar example, though happily of the past, as was also the cutting of young Greenheart trees in Demerara to serve as rollers to get out the larger ones; but of the turpentine industry in Georgia it has been said that "there is no business connected with the products of the soil which yields so little return in proportion to the destruction of the material involved." ‡ The Forest Reserve Board of New York, in a recent report, call attention to two new industries that threaten destruction to the forests of the Adirondacks—the manufacture of barrel staves from hardwood, and that of wood alcohol from softwood, small species of hardwood being used as fuel for the retorts of the alcohol factories. The two industries are combined from motives of economy, and result "in a complete denudation of the tract, everything being taken, even to the smallest saplings, which are split into barrel hoops. Nothing is left but a stump field strewn with the dead brush from the twigs and tops. Fire is almost

* F. H. Knowlton, *Journ. New York Bot. Gard.* iii. (1902), and *The Plant World*, vol. v. (1902), pp. 62-63.

† "How shall our Wild Flowers be Preserved?" *The Plant World*, vol. v. (June), 1902.

‡ *Wood*, by G. S. Boulger (1902), p. 123.

sure to follow, after which the grey rocks appear among the blackened stumps." * Mr. B. E. Fernow, Chief of the Forestry Division of the U.S. Department of Agriculture, wrote in 1886 of "a use to which no other civilised nation puts its forests. I refer to the 10 million acres or so of woodland burnt over every year, intentionally or unintentionally, by which a large amount of timber is killed or made useless; and, what is worse, the capacity of the soil for tree growth is diminished." † This last remark is so true that this total destruction of forests means the loss also of many beautiful woodland flowers, so that the flower-lover is certainly interested in forest conservation. Little or nothing, it might seem, can be done to prevent such clearing where the advance of an increasing population makes the land sufficiently valuable to pay for its conversion to agricultural or building purposes. Some few beautiful tracts of woodland in the neighbourhood of large towns may be preserved as public parks or places of recreation, as in the cases of Epping Forest, or Bronx Park, New York, or even of the Yellowstone and Banff National Parks; but this can be but to a small extent: our growing populations must be housed, and the demand for timber must be met. Herein, however, lies the consolation: economic considerations come into play: men's pockets are concerned; and consequently laws regulating the felling of timber are gradually being added to those regulating the killing of game.

So, too, in other cases where an article of commercial importance is at stake. About the year 1810 Kamehameha, King of Hawaii, was in receipt of about $400,000 a year for sandalwood, with the result that, with the exception of New Caledonia, where they are cultivated, the species of *Santalum* are now almost extinct on the islands of those seas.‡ Again, between 1854 and 1875 over 12 million pounds of gutta percha were exported from Sarawak alone, meaning the death in those twenty years of at least 3 million trees.§ Our imports of "gutta percha," so called, for 1890 alone were nearly 8 million pounds, representing perhaps 2 million trees; but before that year it was announced that the tree yielding the true gutta percha, or rather "gutta taban," *Palaquium* (*Dichopsis*) *Gutta*, had ceased to exist in a wild state.‖ Botanists may find substitutes for sandalwood and gutta percha, or it will prove commercially worth while to cultivate these plants. I have to-day to appeal to other than commercial instincts.

Though many species of flowering plants in the British Isles have undoubtedly been much reduced in numbers, and some are now apparently on the verge of extinction, it is somewhat strange that I am not prepared to mention a single case in which extinction has actually taken place, so far, that is, as our whole archipelago is concerned. This may be due in part to the imperfect investigation of our flora in former times. One of the nearest cases of extinction would seem to be one recorded by Mr. Druce, which is connected with forestal operations. A great gale in 1895 blew down large numbers of pines at Loch Tay near the habitat for a

* Quoted by Miss Ruth E. Messenger in *The Preservation of our Native Plants.*
† Annual Report of the Division of Forestry for 1886, p. 155.
‡ *Encyclopædia Britannica*, 9th edition, vol. xxi., p. 256.
§ *Ibid.*, vol. xi., p. 339.
‖ *Ann. du Jard. bot. Buitenzorg*, v. (1886), p. 1.

grass determined by Prof. Haeckel to be the var. *borealis* of *Calamagrostis neglecta* (*C. stricta* Nutt.), and, therefore, distinct from the form which still exists in Cheshire. Mr. Druce, visiting Loch Tay, found saw-mills erected 100 yards from the marsh where the grass grew, so that there was no apparent danger ; but on a subsequent visit he found that the sawdust from the mills had been cast on the marsh and had utterly destroyed the rare grass.*

Drainage has perhaps been an even more prolific cause of local extermination than has the clearing of woodland. The reclaiming of the Fens has locally done away with many species of *Carex*, *Scirpus*, and *Juncus*, such orchids as *Malaxis paludosa*, *Liparis Loeselii*, *Epipactis palustris* and *Orchis latifolia*, *Potentilla Comarum*, and even to some extent the Marsh Marigold (*Caltha palustris*). The more completely aquatic species, such as the Potamogetons, may survive in such localities in the ditches constructed for drainage ; and it may be possible in some cases to preserve small areas of bog nearly in their pristine condition, as has been done at Wicken Fen and on the Black Hill of Cromarty, the locality for *Pinguicula alpina*. Among our British Ferns *Lastrea Thelypteris*, the Ophioglossums, and *Botrychium* are liable to diminution by this same drainage. On even a larger scale than the drainage of our own fen-land is the reclamation now in progress in the Everglades of Florida, a vast plain covered with swamps and shallow lakes half-choked with vegetation, a subtropical analogue of our Norfolk Broads having perhaps no exact parallel in the world. This area is now being drained for the cultivation of Pine-apples and Bananas.†

Agriculture has probably added many more species to our floras than has forestry, those "weeds of cultivation," mostly annual herbs with small seeds, the migrations of which form a most instructive study. Their name of "weeds" implies, alas ! that they are to the agriculturist "plants in the wrong place" ; and the necessary care of the modern farmer to secure his very dubious profits means that the beautiful Corn-cockle (*Lychnis Githago*), Corn-flower (*Centaurea Cyanus*), and others are not as common now as they were thirty years ago, and even Poppies are, perhaps, more confined to railway embankments and other uncultivated margins of cultivated ground. Thus what Agriculture has given with one hand she takes away with the other. Special planting operations may do much local damage, as, for instance, the extermination of the Spider Orchis by the sowing of coarse grasses, or that of *Anemone Pulsatilla* by the planting of Larch on some limestone slopes.‡

The extension of buildings round our towns, and even in rural situations which may happen to be localities for rare plants, is quite inevitable. We can no longer expect to find *Saxifraga granulata* at Gray's Inn, where it grew in 1640, or Arrow-head, Skull-cap, Ladies-smock, St. John's-wort, Fenugreek, and *Trifolium subterraneum* and *T. filiforme* in Tothill Fields—that is to say, practically the neighbouring site of Westminster

* Report of Committee of Cotteswold Naturalists' Field Club in 1903, reprinted in *Nature Notes*, vol. xiv., p. 118.

† Mary Perle Anderson, "The Protection of our Native Plants," *Journ. New York Bot. Gard.*, vol. v., No. 52 (1904).

‡ Report of Committee of Cotteswold Naturalists' Field Club previously quoted.

Cathedral—where many of these species were growing in 1815: we shall not find the Gipsy-wort on "ditch-banks about Piccadilly"; the Grass-vetchling (*Lathyrus Nissolia*) or the Flowering Rush (*Butomus umbellatus*) in Battersea Fields, where they grew in 1840; or the rare *Cyperus fuscus* on Walham Green, where it lingered down to 1865. It is, in fact, remarkable that Mr. W. Clarkson Birch should have been able recently to collect 130 species of wild flowering plants in the parish of Fulham. His collection, now at St. Paul's School, includes Gipsy-wort, Skull-cap, Purple Loosestrife (*Lythrum Salicaria*), the interesting American Balsam (*Impatiens biflora*) which has spread down the Tillingbourne and the Wey since 1822, and the Peruvian *Galinsoga* which has spread so abundantly from Kew Gardens during the last fifty years.* Building has destroyed a site for the rare Pink (*Dianthus prolifer*) on Boar's Hill, near Oxford; † and, by an unfortunate accident, a lovely situation on the North Downs, which happened to be the only locality over a wide district for *Herminium Monorchis*, was pitched upon for a house. It was also presumably the needs of surrounding houses that caused the Metropolitan Board of Works to desiccate with a main drain the locality at the head of the Leg-of-Mutton pond at Hampstead, where thirty years ago I used to study *Drosera* and where *Menyanthes* used then to flower.

Quarrying is, no doubt, as necessary as building; but most kinds of stone are obtainable in several places, so that it ought to be possible to protect from such destruction some of the most beautiful spots in England, which happen also to be localities for some of our rarest species, such as the gorge of the Bristol Avon at Clifton, the home of *Arabis stricta* and *Sedum rupestre*, the Cheddar rocks with their rare Pink (*Dianthus gratianopolitanus*) and Meadow-rue (*Thalictrum montanum*), and the gorge of the Wye.

If our losses by forest-clearing, drainage, agricultural improvements and extension, building and quarrying are inevitable, others are certainly not. Among the avoidable causes of loss I class the needless deruralising of rural districts, smoke, trade-collectors, and the excesses of children, tourists, and botanists.

A recent measure for decentralising our local government seems to have created the necessity for some means of expending rates. The lighting of our country lanes by gas may be desirable; but I fail to see the necessity for replacing the turf edging of our footpaths by stone or cement kerbs, the destruction of many a roadside strip of grass and flowers where the width of the roadway is greater than the traffic requires, and the wholesale plastering over of our hedge-banks with the mud laboriously excavated from our now formalised roadside ditches. Such trimming of the turf along Watling Street by a County Council destroyed the only locality in Northamptonshire for the beautiful *Eryngium campestre*, the "Chardon Roland" of French flamboyant architecture.‡ No doubt employment is provided by this policy, and the rates are increased; but the beauty of our country roads is being proportionately destroyed.

* C. J. Cornish in the *Times*. Oct. 17, 1903.
† Cotteswold Report previously quoted.
‡ G. C. Druce in the Cotteswold Report, as above.

I feel constrained at this point to record the damage done by golf, since this same species *Eryngium campestre* has been destroyed by the players near New Romney in Kent, whilst from across the Atlantic I learn that a rare *Clematis* is in danger of the same fate on Staten Island.*

In 1882 the late Professor Paley published a long and interesting list of the flowering plants then found by him on Barnes Common.† Barnes Common is still an open space, protected by a body of conservators from all depredators except golfers; but I very much doubt if *Teesdalia nudicaulis*, and some others among the species found by Paley in 1882, can be found there now. The Common is surrounded by houses and railways, and traversed by well-drained roads, and it is exposed to an ever-increasing volume of smoke from Putney, Hammersmith, and the rest of London. The smoke nuisance is by no means merely a sentimental one. Some years ago Dr. Alfred Russel Wallace expressed to me the fear that, as it has already all but demolished the lichen-flora of Epping Forest,‡ on the one side, and of Kew Gardens on the other, London smoke was killing the junipers on the more distant Surrey hills. But not only are increasing areas round our manufacturing centres being rendered barren and ugly, while the health of the community is suffering from the contamination of the air; for, as Mr. Druce has reminded me in a letter on this subject, we may well call the attention of Parliament to the fact that the very life of the buildings in which they hold their deliberations is being shortened by this same agency. It is, moreover, one that could at least be checked if even existing legislation were enforced.

We must all rejoice in the vastly increased appreciation of the beauties of the plant-world, especially by those "in populous city pent," and in the well-meant, but often misdirected, efforts of the suburban amateur gardener. These have, however, created a demand which has had, and is having, truly deplorable results. The beautiful Sea-Holly (*Eryngium maritimum*), loosely rooted on our sandy or shingly shores, has been torn up wholesale by the roots to satisfy the artistic tastes of the towns, and has now disappeared from several of its former localities. As Darwin's work on "Insectivorous Plants" caused *Drosera rotundifolia* to be for a short time offered for sale in the streets of the City, so it may have been his work on Orchids that spurred the suburban gardener to the ambitious, but almost certainly futile, effort to cultivate our native representatives of that remarkable group. Possibly from the absence of the appropriate mycorhiza these species even at Kew constantly die out and require to be renewed. Within the last few years hundreds of the local *Orchis purpurea* (*fusca*), one of our most striking British species, have been uprooted on the Downs of East Kent and sold—together with bunches of its blossoms—in the streets of Folkestone, and even the common *O. Morio* and *O. maculata* are beginning to show signs of diminution in that district from the same cause.§ During this spring most British species

* Mrs. E. G. Britton, *How the Wild Flowers are Protected.*

† *West London Observer*, February 18, 1882.

‡ Rev. J. M. Crombie "On the Lichen-Flora of Epping Forest, and the Causes affecting its Recent Diminution," *Trans. Essex Field Club*, iv. (1884), pp. 54–75.

§ Webb, McDakin, and Gray, *South-Eastern Naturalist*, vol. viii. (1903), p. 58.

of Orchid were on sale in Farringdon Market at a penny a root, and none of these are the result of cultivation. The Primrose and the Male Fern are more tolerant of London cultivation, though in its murky atmosphere and gas-saturated soil they can hardly be said to flourish, and, rather than increase, generally require frequent renewal. Thus, apart from, and antecedent to, all foolish and error-based political symbolism, the spring-tide glories of pale clustering blossoms and unrolling fronds have long led to a wholesale rooting-up of these species in the neighbourhood, not only of London, but also of our other large towns, by dealers who find it cheaper to steal their wares ready grown. In 1869, long before the death of Lord Beaconsfield, Messrs. Trimen and Dyer, in the "Flora of Middlesex," write of the Primrose that it "has become scarce round London from being dug up and carried away for sale"; whilst of the Ferns they say that they "in consequence of being marketable have become of late years very scarce in the vicinity of London; some have been quite eradicated." *Osmunda* was last recorded in Ken Wood in 1813, and *Lastrea Oreopteris* for the last time in Middlesex in 1855: the Primrose is well-nigh unknown within twenty miles of the metropolis, only surviving in strictly watched game-preserves; while its disappearance from Epping Forest is being followed, *mirabile dictu*, by that of the prolific Foxglove. Miss Robinson, of Saddlescomb—a hollow in the South Downs—reports its complete extinction in that immediate neighbourhood, owing to the depredations of the Brighton hawkers; * and similar accounts reach me from Plymouth † and other large towns.

The case of our Ferns is, however, even more serious, since there are no specific limits to the ambitions of that amateur gardener, and consequently the trade collector greedily tears up anything besides *Filix-mas*—except, perhaps, bracken—in hope of a higher price. In less than fifty years I have seen the disappearance of the English Maidenhair (*Asplenium Trichomanes*) and the Hart's-tongue from most of the country round London; and nowadays cheap and fast railway accommodation enables the depredators to extend the field of their operations to the more prolific, because moister, regions of the West of England. It is true that the Fern wealth of Devon, Somerset, Hereford, or West Gloucestershire could better survive such depredations than the south-eastern area, which is naturally less favourable to Fern-growth; but this is only a question of degree and of time, and it must be borne in mind that the men who range so far afield from London as the Devonshire lanes look to recoup themselves for their railway fares by the wholesale scale of their operations. In these cases, moreover, the actual collectors are probably mere employés of Covent Garden dealers. When we read of three men with a horse and trap carting away ten sacks of Ferns each week for three weeks in succession, we can understand that a county like Devon, that depends largely on the attractions of its Fern-grown lanes for the tourist, is led to take action in its own defence. In the Lake district and elsewhere men, who certainly in some cases do not cultivate Ferns, constantly advertise that they are prepared to supply collections of different native species at a small price. Among these are some of the local clergy. When we come

* *Nature Notes*, vol. xv. (1904), p. 196.
† T. R. Archer Briggs, *Flora of Plymouth* (1880), p. 278.

presently to consider possible remedies, I would ask you to remember that the only plants that appeal to the trade-collector are those that can be obtained readily in large quantities and are showy, and, if uprooted, easily transplanted. Ferns and Primroses best answer to this description, Daffodils, Fritillaries, Lilies-of-the-valley, and Bulrushes being more commonly only gathered. Nevertheless such a collector may not always work on a large scale and may yet do much damage, as in the case of one of whom Mr. J. G. Baker informed me the other day, who, happening upon a plant of *Cypripedium Calceolus*—one of the rarest and most beautiful of British Orchids—dug it up and sold it to a florist for half-a-crown as a new kind of *Calceolaria*!

The complaints from the United States are similar to our own. Here, too, it is the neighbourhood of the large towns that suffers most, and a limited number of popular showy species that are most in danger. The Maidenhair Fern has been exterminated from several stations near New York by dealers,* the Christmas Fern (*Polystichum acrostichoïdes*) is said to be ruthlessly consumed by florists,† whilst in Connecticut the Hartford or Climbing Fern (*Lygodium*) was in such danger of immediate extermination that a law has been passed for its protection.‡ The glossy leaves of *Galax aphylla*, now known as "Galaxy," from the South Alleghanies, have become fashionable for funeral wreaths: they are picked by the crateful, and are becoming more expensive, only too certainly a sign of diminished supply.§ The fringed Gentians from the Berkshire hills and their allies the Sabbatias, the favourites of the streets of Boston and Plymouth, are generally uprooted, but seldom successfully transplanted. Among the beautiful shrubs of the Heath family, not only are the native *Rhododendron* and *Azalea* stripped of their blossoms for the supply of Philadelphia, but the lovely evergreen Mountain Laurel (*Kalmia*) loses both flowers and foliage, like our own Guelder Rose (*Viburnum Opulus*), which would seem to be similarly imperilled. Last, but not least, the Trailing Arbutus or Mayflower (*Epigæa repens*), which should be endeared to every New Englander, and which cannot be transplanted with success, has been so extensively uprooted that its delicate pink and white bells have disappeared from many parts of New York.‖ I mention these American complaints because in several respects the Americans, though in a new and comparatively thinly populated country, are setting us examples of how to protect our indigenous flora from such threatened destruction.

In turning to the depredations wrought by children, though I do not want to minimise them, I wish to remove several misconceptions. Children who go into the country in large parties do not as a rule root up plants, neither do they search out rarities, and they should at least be sufficiently under control to prevent their trespassing or to enforce their obedience to any conspicuous notice. No one wishes to prevent the child, whether village resident or visitor from town, picking flowers. We may well

* Mrs. E. G. Britton, *loc. cit.*

† Mary Perle Anderson, *loc. cit.*

‡ Mrs. E. Britton, "Vanishing Wild Flowers," *Torreya*, vol. i. (1901), p. 89; and David S. George, *The Plant World*, vol. vi. (1903), p. 160.

§ Mrs. E. G. Britton, "Vanishing Wild Flowers," p. 88.

‖ *New York Tribune*, May 5, 1901, quoted by Mrs. Britton.

regret the handfuls of Cowslips, Buttercups, or Bluebells, that never even reach home, but wither in hot little hands only to litter the homeward path; but it is possible, without diminishing their enjoyment by one iota, to teach the children several valuable lessons. Anyone who has carried a bunch of flowers through city streets knows how constantly he is asked for "just one flower." Is it strange, then, that while the glass windows of the florists serve only to tantalise, and the parks where flowers must not be picked do little more to satisfy this natural longing for the possession of "a thing of beauty," every accessible bit of wild should be incontinently stripped of every blossom it bears?* Even a baby, however, can be taught that the flower is intended to produce seed to grow into the plants of next year; that we cannot eat our cake and have it; that if we destroy the flower the insect will not have its honey, the seed cannot be formed, and we ourselves may find no flowers next year. It will not be difficult to make them realise that a true love of flowers will lead us to study them closely, and to admire them most in their natural haunts and surroundings, not merely to grab a handful of them. Above all, we can teach the lesson of unselfishness, that what we admire ourselves we should give others a chance of admiring, not only this year but also in the future. At the same time, mere gathering without uprooting may do much harm, even in the case of some perennials. Our terrestrial Orchids, for example, are largely dependent upon seed for their perpetuation. If not allowed to seed, each tubercle produces but one to replace it—not like the many cloves of some bulbs and corms—and this is liable to various vicissitudes which may terminate the life of the plant, being eaten by field-mice, for example.

The simple lessons which I have just mentioned as desirable for children are, I am afraid, very often equally needed by the adult excursionist. The feeling which underlies the gathering of wild flowers may be a love of things delicate in form, in perfume, and in colour; but to transplant them to unsuitable conditions in a garden or to vases in a gas-lit town drawing-room is as perverted a taste as that which would cage a lark or a swallow, the embodiment of joyous freedom and grace of movement.† We read of railway companies in Colorado running special "flower trips," from which the tourists return with their arms full and decorate the carriages and engines with their spoils; ‡ and I am not sure that similar orgies might not be recorded nearer home. And yet it is a very general experience that few of our wild flowers look as well, or last as well, when cut as do the creations of the horticulturist's art. These latter are often "doubled," which deprivation of their power of reproduction makes them last longer without withering, and they have, moreover, a certain artificiality in many cases more in keeping with the surroundings of a drawing-room.§

Unfortunately, too, the tourist may often have learnt from some local guide-book what is the special rarity of the district, and the greed of

* G. Gordon Copp, "Protection of the Wild Flowers," *Journ. New York Bot. Gard.*, vol. v. (1904), p. 116.

† J. D. in *Sheffield Independent*, May 30, 1904.

‡ Mary Perle Anderson, *loc. cit.*

§ G. Gordon Copp, *loc. cit.*

possession (regardless of the fact that mere rarity makes a plant neither more beautiful nor more instructive) leads him to uproot not one, perhaps, but many specimens, or to buy from ignorant and reckless peasant collectors, until such plants as our Cheddar Pink and Meadow-rue, or the Edelweiss and other floral treasures of the Alps, may be in imminent danger of extermination.

As is so often the case, harm is more the result of ignorance or thoughtlessness than of design. In connection with the excellent Nature-study movement in the United States, we not only read of seventy-five town teachers receiving a weekly barrelful of specimens; but of 1,800 specimens of *Cypripedium Reginæ* gathered from one spot,* of 150 Pitcher-plants (*Sarracenia*) sent from one bog in Massachusetts,† and even of a circular asking for forty twigs, and adding "from one bush or tree the desired forty can be obtained"! Elementary teachers, I think, require to be reminded that for instruction in anatomy, physiology, ecology, or even systematic botany, common species are, in general, better than rarities.

It is, I am sorry to say, impossible to acquit botanists of deliberate selfishness in the needlessly wholesale collection of rarities. Mr. E. M. Holmes has mentioned how, when once walking over Ballard Down, near Swanage, he saw six plants of *Orchis ustulata*, and, on his return, six holes in the turf. *Orchis ustulata* does not, I believe, now occur in that district. When we hear, as I have done within the last two years, of botanists collecting 100 whole plants of *Anemone Pulsatilla* from one locality, 200 specimens of the rarer and equally non-variable *Trifolium Bocconi* from the Lizard, and the rarities of Teesdale in almost equal numbers, or when we hear of the wholesale collecting of every specimen seen of some new bulb in the Mediterranean region, or some new tropical Orchid, we can only lament that gentlemen should be unable to rise above mere trade instincts unworthy even of a street hawker.

Having passed in review the dangers to which some of our most beautiful and interesting plants are exposed, I turn to the various possible remedies. So serious are the inevitable causes of local extermination which I have described that it is assuredly worth while to do something to check those causes of loss which are not inevitable. I need add nothing to what I have already said as to the recklessly wholesale clearing of forest, as to the abatement of the smoke nuisance, or as to the desirability of checking the wasteful expenditure of local rates on the deruralising of our country roads. I propose dealing with other protective measures under the heads of concealment, enclosure, cultivation of wild forms, transplanting, re-introduction, education, moral suasion, and legal protection, whether by existing laws or by fresh legislation.

I am strongly of opinion that it is inadvisable to publish in local floras, and still more so in local guide-books, localities for rarities more precisely indicated than by the name of the parish or district in quite general terms. This, with oral tradition of a select—very select—few, will amply suffice to prevent any locality being lost. The Boston Park Commission in 1896 published a flora of their parks with special localities

* Mary Perle Anderson, *loc. cit.*

† Mrs. Britton, "Vanishing Flowers," p. 90.

for rarities, merely prefixing the caution:—"The public should be exhorted, if they come across such plants as these, to preserve them rigidly. The true botanist and lover of nature needs no such exhortation." I cannot but think this an instance of misplaced confidence. The Rev. H. P. Reader, the excellent Dominican botanist, who rediscovered that rare Orchid, *Cephalanthera rubra*, in Gloucestershire, adopted a wise precaution when asked to show the locality to the late Sir William Guise, a grower of rare plants: he led him by many circuitous paths through the woods, taking him back by another route, so that the old gentleman, though he saw the plant growing, was not likely to find it again. Another plant-lover in the same district, Atkins, whose name is familiar to Cyclamen-growers, adopted another expedient. A neighbour collector, named Wintle, remarked to him that some of the less common plants of the neighbourhood—Bee-orchids, I think—seemed to be suffering from the wholesale attacks of some new enemy, whether bird or slug he did not know, by whom all their flowering-shoots were nipped off. "Oh," said Atkins, "I did that, to prevent your finding them." However advisable in the case of bulbous or rhizomatous plants, this plan is, as I have said, likely to be harmful in the case of Orchids.

Strict enclosure, as in the case on the Black Hill of Cromarty, already mentioned, in that of one Kentish locality for the Lizard Orchid, and in that of *Cypripedium Calceolus*, may be very desirable in such small and almost unique habitats; but it is expensive, and unless very complete—almost necessitating a special keeper—might prove worse than useless by calling attention to the rarity.

Much good may, I think, be done by the cultivation of rare native plants in botanical gardens, so that hawkers, collectors, or tourists seeking souvenirs may, for a small sum, have cut or growing specimens without endangering the continuance of the rarity in its native habitat. This has been most successfully done by M. Henri Correvon at Geneva, especially in the case of the Edelweiss, and by friendly imitators at various gardens in Italy and the Tyrol. I am very sorry that a bold attempt to do something of the sort on a small scale by Mr. Philip Cochrane at Perry Hill has recently failed for want of the very moderate support for which he asked. It would, I think, be most desirable to have such small gardens in the Scottish Highlands for such rarities as those of Ben Lawers, in the extreme West of England, in Yorkshire, where Messrs. Backhouse have practically met this want, or the Lake District, and in the Channel Islands. By supplying colleges, schools, and Nature-study classes with material, and perhaps also with photographs, descriptions, and microscopic slides, such an institution might be self-supporting. In the South of France there are preserves of scarlet anemones, where for a small fee you may enter and gather a few specimens, and it has been suggested * that in the United States the Mayflower, *Sabbatia*, Fringed Gentians, &c. might similarly be cultivated profitably. School gardens and the private amateur gardener, on the other hand, had better entirely refrain from the attempt to cultivate the rarer British plants from wild specimens.

It has been suggested that where an uncommon species is in danger of extermination, as, for instance, where the sea is eroding a coast-line,

* By Mary Perle Anderson, *loc. cit.*

or quarrying is cutting back a hill, it may be desirable to transplant specimens to a place of safety. To such a plan there can, I think, be no objection.

The late Mrs. Ewing (whose charming story, "Mary's Meadow," originated a short-lived Parkinson Society) advocated the re-introduction of lost species, or the deliberate introduction of new ones into wild spots. Many botanists, such as Sherard at Eltham and Borrer at Henfield, have in the past done this more or less deliberately. If done secretly and not placed on record, such well-intentioned action is liable to falsify our local botanical geography. It has, for example, been proposed * that the seed of such species as *Geranium sanguineum* or *Veronica spicata* should be saved and sown, or that seedlings should be planted. Apart from any alteration effected by cultivation, which would probably be insignificant and evanescent, in these very instances, which were not chosen by me, there might be some risk that the Walney Island *Geranium prostratum,* otherwise known as *G. lancastriense,* might be substituted for *G. sanguineum,* or the Eastern Counties *Veronica spicata* for the Western *V. hybrida,* or *vice versâ*, which might easily mislead future students.

To secure the safety of our more attractive plants, however, it will in the long run be essential to create a more enlightened public sentiment regarding them. Dr. F. H. Knowlton, in an invaluable essay on the subject, published in America in 1902, drew a suggestive parallel from the case of wild birds. "As they are practically valueless for food, they were not at first," he points out, "included under protecting laws. They were common property to be destroyed at will. Under the caprice of fashion, millions were destroyed annually simply for decorative purposes. Owing to this ceaseless persecution, not a few species were threatened with absolute extinction, and only then did the sentiment for their protection begin to gain ground. At first confined to a few nature-lovers, the agitation has spread until, within the past ten years, we have seen a veritable wave of sentiment for bird-protection extend from end to end of this country. Dozens of societies for the study and protection of birds have been organised, magazines of similar scope have been established, numerous books have been written, and finally legislation has been enacted, making it a crime against the State or the nation to traffic in our song or insectivorous birds. As a result, the birds of the seashore, plain, and forest are to be spared to us. . . . To devise means for the adequate protection of our native plants will not be easy; but the same might have been said a few years ago about our birds, yet their protection by legislative enactment and an awakened public sentiment is an accomplished fact. It is but reasonable to suppose that the same may in time be accomplished for our vanishing plants. It seems to me that all legitimate effort that can be made for the conservation of the native flora is naturally divisible into two fields—first, the broader, higher plane of enlightened public sentiment regarding the protection of plants in general; and, second, the immediate steps that must be taken to save certain of the more showy or interesting forms now threatened with extermination. The first is something we may reasonably hope for, even if it comes slowly; the

* Cotteswold Report quoted above.

second is a practical question that must be solved quickly, or it will be too late."

Much may undoubtedly be done in time by the teaching of our primary and secondary schools. Teachers should inculcate that unselfishness of which I have spoken, and a respect for even the commonest beauties of our fields and hedges, teaching children not to pick even Buttercups and Daisies merely to throw away again almost immediately. The school garden is an invaluable means of arousing an interest in the life and life-purposes of the plant, and so creating the sentiment we want to see aroused. Teachers of field-botany may well demonstrate mainly with common species, point out how much may be learnt of any plant without uprooting it, and abstain from taking large classes of children, or of students who are not well under control, to the habitats of rarities. I anticipate but little difficulty in this part of our task, as we may expect a ready response from the intelligence of our teachers. As has been well said,* "The new hunting with the camera in place of the gun is already gaining ground; the new herbarium composed of mental pictures should find its way into our schools." The distribution among teachers of leaflets stating the case, and perhaps the provision of an elementary reading-book, intermingling interesting accounts of plants and plant-life with appeals for plant-protection, should assure our ultimate success in this direction.

The education of adult sentiment is more pressing and more difficult. As our wild plants, like our birds, are of little or no money value, it must be an education of sentiment, and we cannot compel adults to listen even to reason. The institution of "Arbor" or "Tree-planting Days," though meant primarily for the children, may, it is hoped, also interest their elders, and afford one opportunity of inculcating those simple lessons (such as the right and the wrong way to pick flowers) which many adults require as much as children. Other obvious methods of moral suasion are the giving of popular lectures, the circulation of leaflets, and the establishment of a press bureau. Strange as it may seem, it is necessary to point out, with regard to the sale of wild plants in the streets of our large towns, that it is the demand that creates the supply, that if there were no purchasers there would be no dealers, if there were no receivers there would be no thieves. It may also be desirable to erect notice-boards requesting the public to abstain from uprooting plants, picking rarities (which might for purposes of identification be represented by coloured drawings), or large quantities of common flowers. It may well be urged that the organisation of such a crusade of sentiment requires some central society with a journal, such as "The Wild Flower Preservation Society of America" and its official organ, "The Plant-World."† Local Natural History Societies and Field Clubs can do much. I would suggest that every such society should enumerate among its objects "the discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals"; and that in the agenda for every meeting of such society should appear the question: "Has any member to report

* By Mary Perle Anderson, *loc. cit.*
† Dr. F. H. Knowlton, *loc. cit.*

that any plants, animals, or objects of interest are in danger?" Such societies can arrange lectures, distribute literature, or fix the places for notice-boards; but a central organisation is desirable to provide the lecturers, leaflets, and notices, and, if necessary, to act on reports received, so as to co-ordinate efforts—even, if needful, to secure legislation. In our own country I feel confident that I may say, on behalf of the Council of the Selborne Society, that, mindful of Gilbert White's interest in plant as well as in animal life, they willingly bind themselves to do all in their power to so stimulate and combine national effort, and place their organ, "Nature Notes," at the disposal of such a movement.

While, however, regard for the rights of others is being preached, some species are in immediate danger of extermination. Here, then, the protection of the existing law, or of some fresh legislation, is necessary. As it stands at present, the law in this country is wholly inadequate to protect wild plants. It is necessary to prove damage to fences, to the land, or to cultivated crops; wild plants, such as ferns, flowers, blackberries, or uncultivated mushrooms, not being in themselves protected. In Devonshire the energetic United Devon Association has roused the county to a sense of the danger to its pockets by the simple argument that the well-being of the county depends upon tourists, tourists come to see the natural beauties of the county, and, therefore, with the destruction of these beauties the prosperity of every hotel or town is imperilled. The hearty co-operation of the magistracy and of the police has there been secured, and there have been several convictions of Fern-collectors in cases where damage to the ground by making holes in it could be proved. The existing law, however, appearing to the Devon County Council to be inadequate, they, in 1902, addressed the Home Secretary with a view to the preparation of a bye-law on the subject. In his reply the Home Secretary stated: "If it is confined to cases where serious damage and disfigurement is caused to public highways, &c., there may not be much difficulty, from the legal point of view, in framing the bye-law; but the Secretary of State would not be willing to allow a bye-law which would be likely to injure unsuspecting poor people residing in the district, or lead to the punishment of young children. Possibly, however, the bye-law could be restricted in its operations so as not to involve any danger of this, *e.g.* by confining it to particular places to be indicated by notices. If, however, it is proposed that the bye-law should only apply to rare Ferns or plants, the difficulties in framing it are likely to be greater. In any event, a bye-law which would prevent any person from taking one or two common Ferns or plants from the road-side for his own use would, in the opinion of the Secretary of State, be inadmissible." Acting on these suggestions, in March of this year the County Council, on the motion of the well-known botanist, Mr. Hiern, of Barnstaple, submitted a bye-law in the following form: "No person above the age of 14 years within the Administrative County of Devon, not being part of any municipal Borough, shall without lawful Authority wilfully uproot, destroy, or mutilate any Fern or other wild plant, provided that this Bye-law shall not apply to persons merely collecting specimens for private or scientific use, and not for sale or profit, and in small quantities, and not tending to extirpate any rare or interesting species. No person above the age of 14 years shall wilfully employ or induce any child below that age to commit any such prohibited act. Any person acting in contravention of this Bye-law shall be liable on summary conviction to a penalty not exceeding 40*s.* for the first offence, and not exceeding 5*l.* for any second or subsequent offence." This the Home Secretary considered "too wide in scope, especially if applied to the whole county," still thinking it better if "the bye-law could be limited to particular spots or districts where the protection is chiefly needed; or, supposing the protection is wanted generally throughout the county, if it could be limited to rarer kinds of Ferns and plants." To this the Council, on Mr. Hiern's motion, replied in June that they "consider that it would be scarcely practicable to frame a satisfactory bye-law to apply only to rare Ferns or plants, but they suggest that the bye-law should be confined to particular parishes, or parts thereof, to be indicated locally by public notices."

Other counties are, I fear, likely to be far more apathetic in the matter; and one of the main difficulties, as also to a great extent in the case of the Wild Birds' Protection Acts, is to get occupiers of land to prosecute. The United Devon Association has paid watchers and a paid conductor of prosecutions, somewhat on the lines on which the Royal Society for the Prevention of Cruelty to Animals and the National Society for the Prevention of Cruelty to Children find it necessary to supplement the ordinary police force. This is, I think, unsatisfactory, so that special legislation is called for, on the lines of the Wild Birds' Protection Acts, to strengthen the hands of the County Councils and simplify the action of the Home Secretary. In Switzerland, Italy, Savoy, and to some extent in Connecticut, species are scheduled. Thus in Savoy the uprooting of Edelweiss, Cyclamen, Rhododendron, Lady's-slipper, *Eryngium alpinum*, Gentian, and Tutsan is expressly prohibited; the transport, hawking, and sale of roots of Alpine plants are also forbidden, and the obligation of enforcing this order is laid on mayors, gendarmes, police, and forest guards. In Connecticut it has been enacted that—

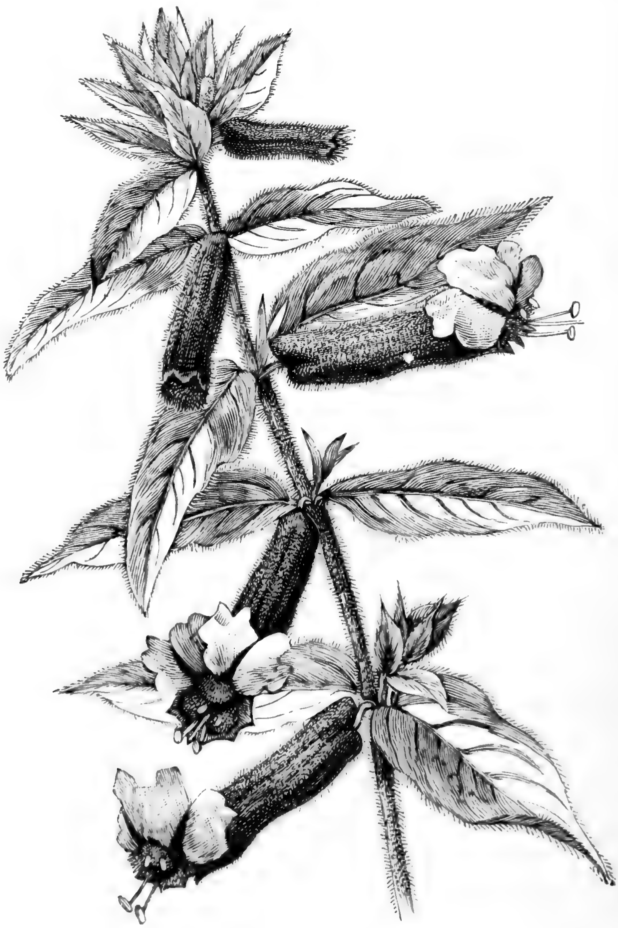
"Every person who shall wilfully injure any tree or shrub standing upon the land of another, or on the public highway in front of said land or injure or throw down any fence, trellis, frame-work, or structure, on the land of another, or shall wilfully cut, destroy, or take away from the land of another any creeping Fern, crops, shrub, fruit, or vegetable production, shall be fined not more than one hundred dollars or imprisoned not more than twelve months, or both. . . .

"Every person who shall wilfully pull up, tear up, dig up, or destroy any trailing Arbutus from the land of another, or who shall sell, expose for sale, purchase, or have in his possession, any Arbutus with the roots or underground stems attached, shall be fined not more than twenty dollars; provided, however, that any person may take such Arbutus on land owned or leased by him, or with the permission of the owner or lessee."

These enactments were specially framed to protect the White Birch from the injurious removal of its bark down to the cambium, the Hartford Fern (*Lygodium palmatum*), the Walking Fern (*Camptosorus*), Maidenhair Fern (*Adiantum pedatum*), and Mayflower (*Epigæa repens*).

Magistrates might, no doubt, prove reluctant to convict a man for gathering, say, *Thlaspi perfoliatum* or *Gladiolus illyricus* if he protested that he thought that the former was Chickweed or that he was gathering the other as *Digitalis* for the herb-doctors. This difficulty does not, however, apply to the entire prohibition of digging up plants in certain areas, as has been done to some extent in Canada and in the Yellowstone Park. I would remind you that the Home Secretary, acting on the initiative of the County Councils, has, under the Wild Birds' Protection Acts, several distinct courses open to him: he may protect specified species for the whole year, for the whole county, or temporarily or locally, or he may protect all birds in specified parishes or other areas.

It seems to me that powers closely analogous to these should be given in the case of plants, that something should be done, that all lovers of the country should bestir themselves to see that it is done, and that it should be done quickly.



GEOGRAPHICAL BOTANY AS THE RESULT OF ADAPTATION.

By Rev. Prof. G. Henslow, M.A., V.M.H., &c.

Introduction.

Geographical Botany, or the study of the existing distribution of plants over the globe, has been a favourite one with many botanists. Linnæus, in 1750, noticed how groups of plants from various countries often had peculiarities common to many or most of them, and the classification of such groups has been the work of succeeding geographical botanists.

"The Vegetation of the Globe" was the title of a large work by Grisebach in the seventies, who described vegetation under the headings of Climate, Forms (such, for example, as the uniformly dwarf habit of Arctic plants), the Vegetable Formations of the Tundra, of Forests, Steppes, &c.; while the study of plant-structure soon showed that it was in correlation with the conditions of life. Thus, Grisebach alludes to the thick cuticle in plants of hot deserts, as well as to their reduction of leaf-surface, &c. To this study Haeckel has now given the name of "Ecology."

Before the last quarter of the nineteenth century geographical botanists made little or no attempt to explain how such adaptations came about. Thus, speaking of spiny processes, Grisebach observes that certain cases "ought to supply us with the law according to which the most suitable habitat has been assigned to such plants."

It is now perceived that it is by the universal law of Self-adaptation to the Environment, by means of protoplasmic response to external influences, that the correlations are brought about. Hitherto, therefore, Botanical Geography has been contented with but little more than the accumulation and classification of the materials, so to say.

For this law we are really indebted to Darwin,* though he unfortunately discarded it for his theory of Natural Selection as being "the means" by which vegetable forms were supposed to be selected and survive in the struggle for life.

We now know that this view was based on unfortunate mistakes, and what I have elsewhere called "the True Darwinism" is the real interpretation of Evolution. This has been proved to be true by an ample amount of induction, as well as an abundance of experimental verification of an exhaustive kind.

What I propose now doing is to take examples of the different classes of vegetation over the globe, from the Tropics to the Arctic regions, calling attention to prominent instances of adaptation, brought about by the plants themselves, which constitute their generic or other characters. The external conditions which excite plants to adapt themselves to their

* There were really others before him, as Lamarck; but I refer to his books now.

environments consist of an infinite variety of combinations of the relative amounts of light, heat, and moisture of the air, as well as the composition of the soil or water in which plants may live. Plants are also modified so as to meet mechanical strains and stresses. In the Tropics one or more of these agencies are permanently in excess; hence a constantly high degree of heat and moisture and a relative increase of nitrifying microbes are the immediate causes of the dense tropical forests; whereas great heat with a deficiency of water results in the desert flora of a totally different character.

A plant has many functions to perform in order to live a healthy life, and to set an abundance of seed. Its various organs, root, stem, leaves, flowers, and fruits, require an *optimum* degree of heat, light, &c., respectively, but plants rarely, if ever, secure a totality of such *optima.* Thus, an ordinary flowering plant may thrive well enough in the shade, but is incapable of flowering there; conversely, on the sunny open downs the plants may blossom freely enough, but remain dwarf in size.

If we ask *how* a plant can become adapted to a changed environment, there is as yet no answer; for it is a property of life, and the properties of life are inscrutable. The process, however, may be described as follows:—As long as a species lives, generation after generation, in precisely the same average conditions, it has no inducement to change; but if the seeds of a plant be sown in a markedly different environment, then, as they grow up, they may show a tendency to depart from the structure and form of the parent plant, and to be more in harmony with the new surroundings. Then, if their seedlings grow up under the same conditions, a fresh increment is added to the alterations acquired. If this be continued for some five or six years, experiments prove that a relatively permanent form is reached in adequate equilibrium with the conditions of life. The change of form, then, becomes relatively fixed and hereditary; and it may be reproduced subsequently even when the plant is raised in a totally different environment.

It must be borne in mind that more seeds are formed by a plant than can possibly survive.* But many of the young plants die prematurely, partly by being crowded out by those of better nourished seeds, partly by being on a barren soil, while many are eaten off, &c. Such is the true sphere of Natural Selection, but it has nothing to do with the *origin* or *survival* of new varietal structures in the sense of Darwinism. These always arise by response to what Darwin called the "definite action" of the environment. Natural Selection represents the result of the struggle for existence which goes on everywhere, but it is solely concerned with the *distribution* of organisms.

The principal argument for Adaptation is based on inductive evidence, in that when we find a large number of plants, often having no affinities whatever between them, to have assumed the same special adaptive structures under the same or similar conditions of life so that they could not have been derived by heredity one from another, it becomes a moral conviction that each genus or species, as the case may be, has acquired

* An accidental plant of the White Melilot came up in my garden. It bore nearly 16,000 seeds; they would have required more than an acre if sown. A Foxglove bore half a million of seeds.

the structure in question independently by a direct response to the influences of the environment.

Taking the Tropics as a commencement, the most important features of the environment are usually temperature with humidity. These are uniformly of a high degree. Moreover, the economic * optimum for any plant—that is, the best degree of temperature, &c., for each of its functions respectively—is much the same, so that a uniform luxuriance is the general result.

In Temperate and Arctic climes the temperature may be at one time high and at another very low, as in the interior of continents. The plants respond to such differences, and produce deciduous trees with hygrophilous † foliage in summer and xerophilous ‡ features in winter. As a rule, while a relatively high temperature favours vegetative growth, lower temperatures favour reproduction; hence temperate plants rarely blossom in the Tropics. On the other hand, the flowers of high Alpine and Arctic regions are notorious for their brilliant colouring and abundance.

Tropical Rain Forest.

The first results to be considered of the effects of a perpetually great amount of heat and moisture are the "Tropical Rain Forests." In the Tropics there is no "turf" as in cool temperate regions, because intense heat and moisture cause the grasses to grow to a great size. This is well seen in the gigantic bamboos which mount to 60 feet or more in the season, growing at the rate, as measured, of 23 feet in 31 days, or nearly an inch in 24 hours. In order to secure the stability of the comparatively slender and hollow stems, they consist of strong cylinders with thick diaphragms at intervals which prevent their collapsing, possessing a minimum of material with a maximum of strength. Another type of stem is that of Tree Ferns and Palms and many Dicotyledonous trees. These types show the result of the intense struggle for life in the dense Tropical forests in order to reach the light above. They grow tall, and are branchless till they attain a great height. This form, having been acquired under the conditions of the environment, is now a permanent feature in Palms.

As a contrast, the Doum Palm of Egypt, and Dracænas, &c., live in the open and are branched.

Dicotyledonous trees follow the forms of Palms in having their stems mostly unbranched for a great height. In some, adventitious roots develop flat, vertical buttresses at the base, to resist any strain from above during the severe storms. Unlike our cooler temperate forests of Pines, &c., there is a dense undergrowth below, due to the intense heat and moisture, notwithstanding there being a great reduction of light. There are several other special features of rain forests showing interesting adaptations, of which the following may be mentioned:—

Epiphytes.—These plants, being adherent to the stems and boughs of trees, partake more of a "xerophytic" character. Such, *e.g.*, is well seen in the minute foliage of epiphytal *Lycopodiaceæ*, this being a familiar

* *I.e.* best for functions. † *I.e.* "water-loving."
‡ *I.e.* "drought-loving."

character of Thuyas, our own Ling, New Zealand Alpine species of *Veronica*, &c., as well as in saline plants, as our Saltwort, and in some desert plants (e.g. *Salsola Pachoi*, of Egypt). This identity of leaf-form arises from a similar response to drought in all these different localities; but in the case of plants in salt-marshes, though moisture may be abundant, it is not so serviceable as if devoid of salts. Consequently, saline plants are said to be "physiologically xerophytic." Even Mangroves, which may actually grow below high-water mark, are xerophytic in their structure. The methods of securing and retaining a sufficient amount of water among epiphytes are various. Thus Orchids and Aroids are provided with similar absorbing roots, the outer coat, called the *velamen*, being capable of absorbing water as easily as blotting-paper. *Tillandsia usneoides* has its stems provided with colourless scales which absorb water. Other Bromeliads form water-tanks by the close imbrication of their leaves, so that they assume the form of a shuttlecock. Orchids have water-storage tissues in their pseudo-bulbs, &c. The great Banyan trees of India (*Ficus indica*) begin life as epiphytes, but they soon send down roots which penetrate the soil. Having killed the original host-trees, they finally grow into the well-known gigantic form supported by myriads of vertical root-props.

Lianes.—These are woody-stemmed climbing plants, and are of great variety. Their methods of climbing differ in several ways; thus, some climb by means of tendrils, others by clasping roots, others by means of hooks, just as we have herbaceous plants climbing by like methods in England, the Honeysuckle and Clematis being our only woody-stemmed climbers. The structure of the stems is usually anomalous; the prevalence of much corky matter or large medullary rays adds much elasticity to them, the wood being accompanied by large vessels which can convey fluids rapidly to great distances, for they often extend to some hundreds of feet in length, as do the climbing Palms or "rattan canes." A prominent feature in the structure of the stems of Lianes is the methods adopted to secure great strength coupled with elasticity—a combination of features often aimed at by engineers and secured in much the same way. Thus in some stems supernumerary small ones form outgrowths along the main axis, which, by becoming twisted, exactly resembles a cable. In some (*Bauhinia*) the stem is a flat ribbon at first, but soon bulges into cup-like depressions on alternate sides, the whole having a corrugated appearance. Very similar corrugations are made in boilers to resist the pressure of the steam and to allow of expansion. Sheet iron is also corrugated so as to impart additional strength. Similarly, the spokes of certain wheels are curved like an S. This is to allow for tension on cooling, so that they may not be torn away from the rim, as the rates of cooling are different. The ribbon-like stems of *Bauhinia* are sometimes made stronger still by means of flanges down the edges.

The above are illustrations of adaptations acquired in response to mechanical strains, as soon as they are *felt* by the plant. The actual fine and slender tendrils by which some Lianes climb add additional means of security, being often coiled up so as to allow considerable play against being torn away from the support. There may be many coils, but, in order to avoid breaking, some turn one way and others the reverse. This may be well seen in our own Bryony. In all cases the stems or tendrils grow and form the above structures in response to the mechanical strains experienced by the organs in the course of their development.

Mangroves.—This name is given to trees of several distinct families, growing in or by the sea in tropical countries. They are especially abundant in the muddy estuaries of rivers, sometimes growing even below high water. Like herbs of salt-marshes, the structure of Mangroves reveals their xerophytic character, for although they live more or less in water, this being salt makes the trees physiologically xerophytic. Their common peculiarity is to be supported on aërial "stilt-roots," like tent-ropes, and, in addition, they may send down arching roots from the higher branches.

In the typical Mangrove (*Rhizophora*) the germination is peculiar; for the embryo, as soon as it is formed, begins to grow while the fruit is still on the tree, forming a long spindle-shaped radicle which protrudes from the end of the pear-shaped fruit. This is developed at the expense of the cotyledons. When these are exhausted the embryo falls directly into, and then stands erect in, the mud.

Another peculiarity of several Mangroves is to be provided with "pneumatophores" or "air-carriers," for the exchange of gases. These consist of modified roots, sometimes hollow, which rise vertically in the air, or curve above the water like bent knees. They are provided with orifices by which the oxygen of the air can be absorbed and carbonic acid gas exhaled. It was found in one case that the latter amounted to 45 c.c. in one hour, showing that the respiration proceeded from the whole root-system of the tree.

As the amount of oxygen available in water for the respiration of the plant is less than in air, to meet this aquatic plants have large cavities, or *lacunæ*, in their stems in which air can accumulate; while the corky surface of exposed parts of the roots of Mangroves have fissures and the so-called lenticels, through which air can pass.

The Deciduous Cypress (*Taxodium distichum*) is an extra-tropical tree; but it is similarly provided with pneumatophores, showing that they are self-acquired adaptations, independently, by each species in response to similar environmental conditions.

Tropical Thorn-wood.

In those tropical, sub-tropical, and warmer temperate regions in which there is great heat, but at the same time a great deficiency of water, as rain only occurs for a few weeks in the year, features of a totally different character prevail. The first and most prominent is spinescence. This is the result of *response*, but can scarcely be called an *adaptation*, because the fact that the shoots are arrested in their growth through the want of water, and therefore necessarily end in points, is of no special advantage to the plant.*

A more important result is the production of water-storage tissues. These are an obvious advantage during the long dry season. They may

* The not uncommon teleological view that spines are for the purpose of keeping browsing animals away is inapplicable, since no such creatures occur in the sandy deserts where spinescent plants abound. Evolution excludes teleology.

occur anywhere within the plant, or even externally as on the Ice-plant (*Mesembryanthemum crystallinum*) as swollen globular hairs, filled with fluid. In many plants the storage tissues are not very obvious from without, as they may consist of layers of cells within the leaves, or in the cortex or pith of the stems or in the roots, or again in the scales of bulbs, &c. They become more conspicuous in all the numerous fleshy-stemmed or leaved plants, such as of the families *Cactaceæ*, *Crassulaceæ*, *Asclepiadaceæ*, *Euphorbiaceæ*, &c.

As this feature is thus found in families of no affinity, but only in plants growing under similar climatic and "edaphic"* conditions, water-storage adaptations afford another of the innumerable coincidences which prove—even if there were no experimental evidence in corroboration of it—that they are the result of a direct response to the influences of the environment.

It may be added that many plants of maritime or saline regions, as salt-marshes, put on precisely similar structures, such as those of the Samphire and Marsh Samphire, because they are physiologically xerophytic.†

As an example of trees being provided with water-storage tissues is the Baobab (*Adansonia digitata*) of Africa. It has an enormous trunk, but the woody fibres are of a spongy texture for storing water.

There is another species in Australia (*A. Gregorii*) as well as the Bottle-tree (*Sterculia rupestris*), so called from its shape. These have undoubtedly and independently acquired the same swollen form of trunk by living under similar conditions of life.

The two above-mentioned species of *Adansonia*—one in Africa, the other in Australia—are examples of the fact that there are many families possessing the same genera in these two continents, but there is not a single *species* common to both.

North African and other Deserts.

Passing into the temperate but still warm regions with but little rain, we find many plants have very similar features, which have originated in response, or in adaptation, to the surrounding conditions. They only grow in the "wadis," or dry watercourses, below which water remains at varying depths. To secure it the roots grow proportionately long, extending to even 40 feet in the case of the Narras plant (of the Cucumber family) of Damaraland.

Above ground there is always a great suppression of leaf surface, the energies of the plant being directed to the reduction of any loss of water by transpiration.

As the leaves are small, the diminution of the usual assimilative tissue (the so-called palisade cells) in area is compensated for by an increase in thickness, the number of layers being increased.

The epidermis is protected by a thick cuticle, often having a layer of

* A word coined to signify the influences of the soil.

† At Bad Nauheim, where salt springs and marshy ground saturated more or less with salt occurs, there are numerous plants of a "saline" nature. Amongst them is an abundance of *Plantago maritima*. As that place is situated some 200 miles from the nearest coast, it raises the question whether *P. maritima* may not be a saline form of *P. Coronopus*, which it most nearly resembles, and so evolved on the spot.

wax as well, and very frequently covered with hair; this is often dense, making a felt-like layer. The stomata, or breathing pores, are sunk in depressions, themselves being covered by hairs, &c., in various ways.

All these adaptations to drought have long been noticed; but the question was, How did they arise?

M. Eberhardt has lately experimented upon a number of plants, growing them in ordinary air, in saturated, and in very dry air respectively. The results were that plants produced all the above features characteristic of plants growing naturally in our own climate, in deserts, and in a very moist atmosphere.

He has, therefore, proved experimentally that such adaptations arise in nature by direct response to the action of the surrounding conditions, a fact previously inferred by ample inductive evidence.

Aquatic Plants.

In opposition to growing in the driest deserts, many plants are aquatic, and live partly or entirely submerged.

Here, as before, the forms and structures of the various organs are in strict adaptation or else merely the result of response only. The latter seems to prevail, because the general results are more of the nature of degradations than possessing any advantages to the plant. This is well seen in the feeble development of all kinds of supportive or mechanical tissues, the absence of an epidermis and stomata, &c.

Again, numerous dicotyledonous plants have dissected leaves when entirely submerged, and, as they belong to many distinct families having no affinities among them, it becomes evident that the details of structure are the result of response to the direct degenerative influence of the water.

That this is the fact has been proved experimentally to be the case; for experiments with a plant having dissected leaves below water and completely formed ones in air, bore similar complete leaves *under* water, when, by dissolving certain salts in it, the increased density of the external medium caused the superfluous water to be withdrawn by osmotic action from the protoplasm of the stems. These *then* bore, as stated, completely formed leaves under water, similar to those normally produced in air.

On the other hand, the *lacunæ* or air-passages in the stems, petioles, &c., are increased in number, size, and assume definite forms. These have a distinct use, not only in containing air which assists in supporting the stem under water, but for the accumulation and exchange of gases.

The following are special results in aquatic plants, showing relative degeneracy, &c.: Leaves have elongated petioles to reach the light. They may be phyllodes only. The blade may become reduced to filiform segments. A true epidermis with a cuticle is wanting, likewise stomata. The mesophyll is much reduced, and the palisade tissue is wanting. The cortex of the stem may be increased as well as the *lacunæ*, while the fibro-vascular strands are displaced towards the centre; all supportive tissues are much reduced or wanting. These features are more or less common to all, hence they must have been acquired in response to the aquatic medium.

Alpine Plants.

Tourists in Switzerland cannot fail to notice that high Alpine plants are dwarf in size, but have very brightly coloured flowers, such as those of the deep blue of some Gentians and the red blossoms of *Saxifraga oppositifolia.*

These and other features, as well as the correlated anatomical structure of the leaves, &c., are simply the outcome of the surrounding conditions. This has been proved experimentally. Moreover, there are innumerable coincidences between all the floras of high mountains.

The external conditions, which are very similar to those of Arctic and Antarctic regions, are the relative amount of continuous light through the summer months, coupled with a diminution of heat and moisture with a cold subsoil relatively poor in nitrifying microbes. These render the plants more or less xerophytic.

The prostrate habit of many is due to the responsiveness of the plant to the higher temperature of the surface of the ground when warmed by the sun compared with that of the air above the surface. The brighter colours of the flowers are due to the enhanced assimilative powers of the leaves, in response to the prolonged amount of sunlight during the growing period.

So that, both by inductive evidence and experimental proofs, the ecology of Alpine plants is thoroughly accounted for.

Arctic Regions.

The most obvious feature is the stunted growth. Plants attaining a few feet in Scandinavia only grow to a few inches in the highest latitudes. The character of the plant-organs is thoroughly xerophytic and closely resembles those of hot southern deserts.

The low temperature, cold soil, and continuous illumination are the chief factors of the environment to which all plant-structures correspond. It is remarkable that there is no special protection against excessive cold, the protoplasm itself having acquired an immunity.

The reproductive processes are remarkable for abundance and brilliancy of the corollas from the continuous illumination for so many months. But, though the light be prolonged, there is often a deficiency of ripened fruits.

Unlike what occurs in hot deserts, ethereal oils are rare as well as scented flowers and aromatic vegetative organs.

Tundra.

The last distinct plant-formation is the Arctic Tundras. These are called Moss-, Lichen-, or Rock-Tundra, according to the prevailing kind of plant in the first two, while the third shows an absence of plants. Shallow, moist depressions, with sphagnum, &c., constitute Arctic moors, while sunny slopes abound with flowering plants, resembling garden flower-beds, and are called "Heat-oases."

NOTES ON THE "PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON PLANT BREEDING AND HYBRIDISATION, 1902."

By C. C. Hurst, F.L.S.

The first International Conference on Hybridisation was held in London in 1899 under the auspices of the Royal Horticultural Society, a full report of which was published in this Journal, vol. xxiv. (1900), pp. 1-348.

The second International Conference was held in New York in 1902 under the auspices of the Horticultural Society of New York, a full report of which has recently been published in the "Memoirs" of that Society, vol. i. (1904), pp. 1-271.

A third International Conference is announced to be held at the Royal Horticultural Society's new buildings in Vincent Square, Westminster, commencing on Tuesday, July 31, 1906. All who are interested in the subject should at once send in their names to the Secretary of the Society, who will in due course send them the different notices and programme as published.

In the following notes an attempt is made to review the leading features of the American report.

As a result of the recent discoveries in heredity by Mendel and his successors, the whole question of hybridisation has taken on a new phase, and in these circumstances it is hardly surprising to find that the key-note of the American Conference was the possibility of applying the Mendelian principles to economic plant breeding.

Mr. Bateson opened the proceedings of the Conference by giving an outline of the Mendelian principles of heredity, and the possibility of their application to practical breeding.

Practical Aspects of the New Discoveries in Heredity.
By W. Bateson, F.R.S., of England.

This paper gives a brief account of the advances that have been made since the re-discovery of Mendel's paper by de Vries in 1900. The all-important discovery of the purity of the germ-cells in regard to each unit-character is duly emphasised. The significance of this fact to the practical breeder is shown to be very great, as it revolutionises previous conceptions as to the nature of artificial selection. In the author's own words: "We have lost for ever, I think, the conception that fixity of character is solely or chiefly a function of the number of generations during which that character has been manifested, or of the number of successive selections of that particular variety which has been made.

"*Purity of strain, or fixity of character, is, on the contrary, due primarily to the union of similar gametes in fertilisation.* Such purity may therefore occur among the immediate offspring of cross-bred organisms." It appears, therefore, that certain recessive characters, like

Green Peas (Cotyledons) and Bearded Wheats, will breed true at sight, no matter how mixed their ancestry may have been; on the other hand, dominant characters, like Yellow Peas and Beardless Wheats, may or may not breed true at sight. So that "whenever it is desired in a cross-bred strain to fix a *dominant* character selection must always be made of *single* families containing no recessive members."

At present the pure dominants can only be distinguished from the hybrid dominants by experimental breeding.

With regard to the question of the nature and causation of dominance, it is said that we have as yet no clear indication of the causes which govern the same, and that, so far, the breeder has no means at his disposal by which dominance can be created, modified, or controlled. Abundant evidence is, however, to hand that *pure breeding* is not essential to the constitution of dominance, but whether *inbreeding* may be concerned in the matter is not yet clear.

Another class of facts is next dealt with: *i.e.*, when dissimilar gametes meet in the process of crossing they often produce an ancient form; *e.g.*, two modern varieties of Sweet Peas crossed together may produce the old purple Sweet Pea, with chocolate-coloured standards and purple wings. This is now recognised as the *rationale* of Darwin's "reversions on crossing"; it should, however, be carefully noted that these "reversions" do not breed true, but split up into the components which produced them. Allusion is made to some curious results obtained in experiments with Sweet Peas. Most varieties have long pollen grains, but the white 'Emily Henderson' has usually round pollen. A few plants of this variety, however, were found to have long pollen, like other Sweet Peas.

The round-pollened 'Henderson' with pure white flowers was crossed with the long-pollened 'Henderson,' also with pure white flowers, giving seeds all of which produced plants bearing flowers with *chocolate purple standards and blue purple wings*! This experiment was also made independently by Miss E. R. Saunders, with the same result. All had long pollen, showing dominance of the long character over the round. The true nature of this phenomenon will no doubt become apparent in the following generations, which will be looked for with interest.

"The occurrence of these heterozygous forms concerns the practical breeder very closely. The breeder may breed a new variety of value, and he may be most anxious to obtain its seed pure. Year by year he selects it, but every year, if it be a heterozygote, it fails to come true, because, as we now see, its germ-cells do not transmit or represent the heterozygous character, but merely the pure characters of its components." An illustration of this is one of Messrs. Sutton's lavender-coloured forms of *Primula sinensis*. "The seeds of the self-fertilised lavenders are sown each year, but of the total offspring only about one-half are lavenders, one-quarter being a tinged white, and one-quarter magentas." The lavender is evidently a hybrid form between the tinged white and the magenta, and consequently will never breed true, however long or well it be selected.

It would appear, therefore, that the only way to get all lavender Primulas would be to remake the hybrid form each time by crossing the tinged white with the magenta.

In conclusion, Bateson says:—"We have at last a clear notion of the meaning of purity or fixity of type, of the consequences of dominance, and of the nature of heterozygous forms—phenomena which go to make up the daily experience of those who are practically engaged in these pursuits." . . . "Apart from the profounder mysteries, the unravelling of the problems of heredity has now become a matter for simple statistical research." . . . "We may confidently look forward to the time when the laws of heredity, hitherto a hopeless mystery, will in their outward presentments, at least, be as the laws of chemistry now are, a matter of everyday knowledge."

Notes on Mendel's Methods of Cross-Breeding. By C. C. Hurst, of England.

This paper gives a brief outline of Mendel's methods in planning and carrying out his classical experiments with Peas. Mendel obtained definite results by taking each *single character* separately as a distinct unit, ignoring for the time being the individual plant made up of many characters. In this respect Mendel apparently was the first experimenter to recognise the importance of unit-characters. Mendel worked only with the *constant characters* of fixed races, thus eliminating all questions of ancestry as regards those particular characters. Mendel selected for crossing characters that were distinctly *differential* in the two parents, so that they could be clearly defined in the offspring of the subsequent generations. Mendel worked with pairs of unit-characters, one of which was always dominant over the other, which was recessive. This gave uniformity in the first generation, and avoided the difficulty of working on to the following generations with results that were not uniform. Mendel raised large numbers of plants in each generation, taking care to regard separately the offspring of each individual plant or type. Mendel was not content to stop at the first or even the second generation, as so many of his predecessors were, but in all cases carried on the experiments to the third and fourth generations, and in some cases to the fifth and sixth.

To sum up, those who desire to follow in the footsteps of Mendel, and help to elucidate the baffling problems of heredity, will find it essential to select parents possessing characters which are at once *single and constant, differential and dominant*, and they will also take care to raise *large numbers* of individuals through *many generations*, regarding separately the offspring of each individual. By thus following Mendel's methods definite results will assuredly be obtained.

On Artificial Atavism. By Hugo de Vries, of Holland.

Professor de Vries gives an account of his experiments in crossing two constant races of the Snapdragon (*Antirrhinum majus*) and the behaviour of the hybrids in subsequent generations, which, he says, "gives an entire confirmation of Mendel's predictions."

In the first generation White × Red gave all hybrid Reds like the Dark Red parent. In the second generation the hybrid Reds self-fertilised gave rise to four types, which are classified as Dark Red, Flesh-coloured, Delila (Red and White), and White. These four forms appeared approximately in the ratio of 9 : 3 : 3 : 1, which, from the Mendelian point of view, suggested that two pairs of unit-characters were concerned in the original cross of White × Red. De Vries suggests that these two pairs were Flesh-coloured + White and Delila + White, and that the original Dark Red was a compound character composed of Flesh and Delila, which components were resolved after the crossing of the Red with the White.

"In other terms, if the Dark Red colour is composed of Flesh and Delila, and the antagonistic character of both these elements is White, the crossing of Dark Red with White must give Dark Red hybrids which in the following generation must split up into four types according to the given distribution."

On this interpretation of the facts, in the third generation the White forms would breed true; the Flesh and Delila forms would be part constant, and part hybrid (giving Whites as well); the Dark Red forms would split up into Red and Flesh forms, Red and Delila forms, and so on, in accordance with the Mendelian principles. These results were obtained in the experiments. Further, by crossing Flesh with Delila all Dark Reds like the original grandparent were obtained.

From these results de Vries draws the following conclusions:—

1. It is possible to split up the colours of some flowers by crossing the coloured type with the White variety.

2. The constituents arrived at by this splitting often follow Mendel's laws.

3. By crossing the appropriate constituents the original compound colours may be rebuilt.

4. Instances of atavism may in this way be artificially produced.

The above results of de Vries' experiments with *Antirrhinum* have been reviewed and interpreted by Bateson * and Cuénot † on the basis of the resolution of compound characters, much on the same lines as de Vries' own interpretation.

The reviewer, however, believes that the facts may be more simply interpreted, without reference to the question of the resolution of compound characters.

The first noteworthy point in de Vries' results is that in the second generation of the White × Red the proportion of Whites was only one in sixteen. This suggests that the original "White" parent was not a simple albino, but that the "White" was made up of two distinct unit-characters. If the "White" had been a simple albino the proportion of Whites in the second generation would have been one in four, instead of one in sixteen, as certain experiments by the reviewer and others have already proved. Reference to the original text of de Vries' "Mutationstheorie," vol. ii., p. 197, confirms the idea that the "White" form was not a simple albino, for it is described there as "Weiss mit oft deutlichem, sehr blassrothem Anhauch." In other words, this flesh-tinted White form would appear to be a Flesh and White bicolor rather than a simple albino.

* *Proc. Camb. Phil. Soc.*, 1902, xii. pp. 50-54.
† *L'Année Biologique*, 1902, p. lxx.

The other parent used was apparently a self-coloured Red ("Röhre und Lippen roth, die Lippen dunkler"). The original cross, therefore, may be described as Flesh Bicolor × Red Self, and the two pairs of unit-characters concerned in the mating would appear to be Red + Flesh and Self + Bicolor.

In the first generation, Flesh Bicolor × Red Self gave all Red Selfs, Red being dominant over Flesh, and Self over Bicolor. In the second generation the result was: 9 Red Self : 3 Flesh Self : 3 Red Bicolor : 1 Flesh Bicolor; which is the simple Mendelian expectation; the proportion of Red : Flesh, and Self : Bicolor, being each 12 : 4 or 3 : 1 (the Red Bicolor is, of course, the Red and White form known as Delila, while the Flesh Self is that known as Flesh-coloured). In the third generation de Vries found that some of the Red Bicolors and some of the Flesh Selfs bred true, while others of the Flesh Selfs gave a mixture of Flesh Selfs and Flesh Bicolors. Some of the Red Selfs gave a mixture of Red Selfs and Flesh Selfs, while others gave a mixture of Red Selfs and Red Bicolors. All these results are in accordance with the above interpretation, for the expectation in the third generation would be that all the Flesh forms (whether Selfs or Bicolors) would breed true to the Flesh colour, while all the Bicolors (whether Red or Flesh) would breed true to the Bicolor character. Similarly some of the Red forms would breed true, while others would give a Mendelian mixture of Red and Flesh forms; while some of the Selfs would breed true, and others would give a Mendelian mixture of Selfs and Bicolors.

This interpretation of the facts in a simple Mendelian way has the advantage of avoiding the complicated question of the resolution of compound characters. It also explains the fact that the Flesh Self crossed with the Red Bicolor (Delila) gave all Red Selfs like the original form, for Red is dominant over Flesh and Self over Bicolor.

De Vries apparently regards this as a true synthesis, and presumably would expect the Red Selfs obtained in this way to breed true.

If, however, the reviewer's interpretation be correct, these Red Selfs would not breed true, but would give rise to all the four forms again. In other words, the Red Selfs obtained from Flesh Self × Red Bicolor would have the same gametic constitution as the Red Selfs obtained from Flesh Bicolor × Red Self. The above discussion of Prof. de Vries' Antirrhinums provides a good illustration of the value of the Mendelian principles. No matter what interpretation may be advanced to explain certain facts, its value can be at any time tested and determined by a few simple experiments.

Some Conclusions. By Max Leichtlin, of Austria.

In this paper Herr Max Leichtlin gives some practical suggestions as to the most favourable conditions of pollination. A warm cloudy day is best for six-tenths of plants, others require a dry atmosphere like their native climate. Fertilisation should not be attempted before the stigma is ripe, and the pollen should be neither too fresh nor over-ripe. In many cases it is well to put a hand-glass over the fertilised flowers for a day or two, to raise the temperature. Pollen can be kept in small glass vessels, well corked, for several days without losing its power. Microscopical examination of pollen grains will show whether they are fit for use: if nearly alike they will do; if very different, fertilisation will not be possible. In the majority of cases hybrids have larger flowers than their parents. Herr Leichtlin states that in eight cases out of ten the female parent has the greater influence over the form of the offspring, while the male gives colour. It should, however, be noted that this statement is not confirmed by recent scientific experiments. In cases of Mendelian dominance, for instance, it is obvious that the character is dominant whether it is introduced by the male or the female parent. The fact is that no general rule can be laid down in this matter, as either sex may appear to dominate simply because it happens to carry the dominant character.

Classification of Hybrids. By R. I. Lynch, of England.

This paper suggests the desirability of classifying hybrids according to their behaviour rather than on the lines of botanical classification.

Mr. Lynch believes that such a classification would be valuable for reference, and would assist in the determination of laws yet unknown. To illustrate his point, Mr. Lynch mentions the following headings:—Bigeneric hybrids, fertile and true from seed; Bigeneric hybrids infertile; Hybrids which come true from seed, never reverting; Hybrids that are more fertile than either parent; Hybrids which return in a generation or two to parent species, &c. The classification of hybrids according to their individual behaviour would undoubtedly be of great value, if carefully carried out, and it is to be hoped that Mr. Lynch will continue his work in that direction notwithstanding, as he himself says, that the behaviour of hybrids may be infinite in point of variety.

Some of the Fundamental Principles of Plant Breeding. By Luther Burbank, of California.

In considering the principles of plant breeding, Mr. Burbank sees two controlling influences or forces, heredity and environment. The sole object of the breeder is to guide the interaction of these two forces. "To nature's persistence in crossing we owe all that the earth now produces in man, animals, and plants." "Natural and artificial crossing and hybridising are among the principal remote causes of nearly all, otherwise perplexing or unaccountable, sports and strange modifications, and also of many of the now well-established species." Distinct new species can be produced by the plant-breeder with the same precision that machinery is produced by the mechanic. The variations of plants are simply the means they employ in adjusting themselves to external conditions. They must adapt themselves or perish. Plant breeding is in its earliest infancy, and is the intelligent application of the forces of the human mind in guiding the inherent life forces into useful directions by crossing.

A general knowledge of the relations and affinities of plants is not a sufficient equipment for the successful breeder; he must be a skilful botanist and biologist, and, having a definite plan, must be able to correctly estimate the action of the inherent and external forces which he would guide.

The main object of crossing is to combine various individual tendencies, which in later generations will be dissociated and recombined in new proportions, giving the breeder a wider field for selection. The plant-breeder, before making combinations, should select with great care the individual plants which seem best adapted for his purpose. By careful and intelligent breeding any peculiarity can be made permanent, and there is no limit to the improvement of plants. The plant-breeder is an explorer into the infinite, and the vast possibilities of plant breeding can hardly be estimated.

"Cultivation and care may help plants to do better work temporarily, but by breeding, plants may be brought into existence which will do better work always, in all places, and for all time."

On the Breeding of Disease-resistent Varieties.
By W. A. Orton, of Washington.

This paper describes experiments carried out by the United States Department of Agriculture in the Southern States mainly on the group of diseases known as "Wilt Diseases," affecting Cotton, Cow-peas, Water-Melons, Cabbages, Tomatos, and other plants. The Cotton Wilt is caused by a fungus, *Neocosmospora vasinfecta*, which gains entrance through the smaller roots from infected soil, and grows upwards through the water-vessels, shutting off the food supply of the plant. The usual remedial measures, such as rotation of crops, fertilisers, and fungicides, were all without effect in checking the disease on infected soils. It was, however, observed that not all plants were equally attacked by the disease, and in a field where nearly everything was killed a few plants would survive and show no trace of the disease. Seed of these was saved from individual plants, *and their offspring all proved to be resistent to disease when planted in infected soil,* while the ordinary Cotton plants round them nearly all died. This immunity was continued in the two following generations, and in the latter case, out of fifteen acres planted on badly infected soil, all resisted the disease except a few scattered plants; while the adjoining Cotton of another kind was much injured by the wilt.

Seed of this resistent variety of cotton is being distributed by the Department among the planters.

In securing resistance to disease by simple selection other desirable qualities have not been sacrificed, for in length, fineness, uniformity of staple, and yield it is above the average.

In the case of the Sensation Sea Island Cotton in the seventh generation, the wilt resistance is as marked as when first observed.

In the case of the Cow-pea, the variety known as "Iron" is not only resistent to the wilt disease, but also to the root-knot worm or nematode (*Heterodera radicicola*).

As this is a common pest with Tomatos and other vegetables, it seems likely that from individual resisting plants resistent races could be easily formed. The precise reason of the resistance to infection in individual plants is not yet known, but it appears to be physiological rather than mechanical.

These experiments are of great practical and biological significance.

It will be noted that these fully resistent types appeared as isolated individuals and bred true at once.

There was no question of a gradual selection of individuals more and more resistent to the disease; the resistance was fully fixed from the beginning, and selection merely consisted in finding the resistent individual. It would appear, therefore, that these resistent types are of the nature of "mutations" (de Vries), rather than "slight variations" (Darwin).

Breeding for Intrinsic Qualities.
By W. M. Hays, of Minnesota.

Professor Hays shows that the value of plants and animals annually produced can be increased 10 per cent. by an outlay of 1 per cent. By carefully growing and testing very large numbers of plants, there will frequently be found one superior individual which will more than repay the cost. As a practical illustration of this, Professor Hays refers to a new race of Wheat raised by himself (No. 163), which has already paid the bill for breeding this and other field crops at the Minnesota Station. In 1902 it is estimated that 80,000 acres of this Wheat were grown by the farmers, and they report that it yields a dollar per acre more than the Wheats it is supplanting. The first operation is to secure the best foundation stocks. In some cases the union of certain blood-lines often results in an unusual proportion of superior progeny, but for the most part crosses must be made between those varieties which most nearly approach the desired ideal, and which supplement each other. Since hybrids combine their numerous characteristics in such a multitude of forms, it is necessary to seek from among many thousands that one individual or small group of plants which shall possess the desired correlation of qualities. Distinguishing marks are useful, but to combine breeding for distinguishing marks with breeding for intrinsic qualities has often defeated whole economic purposes. There is some danger in making a variety uniform or "thoroughbred" in appearance and mongrel in yield. Creating values and scientific work go hand in hand. Scientific research will furnish the laws to make easy and popular the production of wealth. By hybridising we can create new values. By selecting from among large numbers we can segregate the individuals carrying these powers and multiply them for use. Values can be enormously increased at relatively slight expense. To secure these, larger co-operation is required between the State and private individuals.

Correlation between Different Parts of the Plant.
By S. A. Beach, of New York.

This paper calls attention to the important question of correlation and its practical significance. Professor Beach gives a number of illustrations from his own observations and those of others. *E.g.*, in the Beet, high sugar content is said to be usually associated with a small amount of woody tissue. In grain a high nitrogen content is said to be often correlated with blue-stemmed plants. In Zonal Geraniums the darkest-coloured flowers are said to be nearly always proterandrous and self-sterile, while the paler colours are homogamous and self-fertile. Male

Vines of *Vitis bicolor* are said to have leaves more lobed or divided at all ages than pistillate Vines of the same species, and this is discernible in seedlings when the sixth leaf is formed. Professor Beach finds that in Vines, Gooseberries, and Peaches large leaves and large fruits, small leaves and small fruits, usually go together. In his experiments with Apples there appears to be no constant relation between the colour of the flowers and fruits, except that a large majority of the very pale or white flowers were either Crabs or Russian Apples. One Crab recorded, however, had pure white flowers and blood-red fruits. Yellow Raspberries have paler foliage than red or black, while purple Raspberries have a distinct purple tinge on canes and foliage. Some white Roses, Pelargoniums, Cannas, Asters, and other flowers have paler foliage than those of dark-coloured varieties, but exceptions to this were found in perennial Phloxes. Grapes with pale foliage do not have dark-coloured fruit, but some dark foliage varieties may have white fruit. White-fleshed Peaches have paler leaves and bark than those with yellow flesh. In Runner Beans white-seeded races are said always to have white flowers, while black-seeded races have strongly coloured flowers. Scarlet Runners have reddish stems, while White Runners have light green stems. Beans with spotted pods usually have spotted seeds. Potatos with green young stems are said to have white flowers, and coloured stems coloured flowers. In Carnations it is said that white, yellow, pink, red, crimson, purple, and striped flowers have corresponding root colours. In conclusion, Professor Beach quotes that in Peas, Mendel found white seed-coats associated with white flowers, and grey, grey-brown, leather-brown (with or without violet spotting) correlated with violet-purple flowers and reddish axils.

Variant Tendency and Individual Prepotency in Garden Vegetables. By W. W. Tracy, of Michigan.

Mr. Tracy's long experience has enabled him to examine carefully immense numbers of pedigree individuals of garden vegetables developed under varying conditions, and has brought him to the following conclusions:—

1. Different plants of the same natural order tend to vary along parallel lines; *e.g.* fruits of certain races of Tomato, Pepper, Egg-plant, and Potato are exactly alike in form. In such cases hybridisation is often credited with variation which is due to this common variant tendency.

2. The natural orders are distinctly but differently affected as to the character of their seed product by conditions of soil and climate; *e.g.* Sweet Corn taken from the same ear planted under different conditions of soil and climate will differ materially, while cucurbitaceous plants will not.

3. Cultural and climatic conditions are cumulative in their influence and affect the whole species; *e.g.* Runner Beans and Sweet Peas remained climbers for many years, but within three years dwarf forms suddenly appeared in several different places simultaneously.

4. The variant tendency in a race is common to different stocks and peculiar to each season; *e.g.* in 1896 a distinct tendency to neckiness was

noticed in the Long Green Cucumber, which increased in 1897 until it resembled the Crook-necked Squash in shape; afterwards this tendency disappeared, giving place to thicker fruits with white spines.

5. Seeds of the same stock, equally well grown under precisely the same conditions, differ in adherence to type in different seasons; *e.g.* the 1893 crop of Green Globe Savoy gave more evenly typical plants and heads than any subsequent crop of the same strain, grown by the same grower, in the same field.

6. Seeds of individual plants, of the same pedigree, grown under the same conditions, and equally adherent to type, differ in prepotency or ability to reproduce themselves; *e.g.* in a field of Beauty Tomato (of which every plant was from seed of an ideal plant, selected the previous year under similar conditions) five ideal plants were selected, indistinguishable from one another: seed from these individuals was sown separately, and the result was that the offspring of one plant was inferior, of another superior, and of the rest intermediate in quality. From this it follows that the only way to secure a high degree of uniformity and excellence in a race of vegetables is to select not only one ideal plant but one that has the ability to reproduce itself; its descendants must be multiplied until the entire stock is the lineal descendant of that individual plant.

Improvement of the Sugar-cane, by Selection and Cross-fertilisation. By Sir Daniel Morris, K.C.M.G., of the West Indies.

The problem to be solved in behalf of the Sugar-cane planter of the West Indies is described by Sir Daniel Morris as:—(1) An increase of weight of cane per acre; (2) a higher sugar content; (3) freedom of canes from diseases and pests. To secure these the following methods of search have been adopted:—(*a*) Testing of selected canes from other countries; more than sixty named varieties of canes have been tested from all parts with no striking or definite results. (*b*) Experimental cultivation of bud sports. Apparently only striped or ribbon canes give rise to coloured bud sports, and these may occur on a part of one cane or on a whole cane of a stool. These bud sports tend to come true to colour. Experiments with these in the West Indies are not yet completed, but others report that "most of the sports seem to be hardier than their parents and yield more sugar." "Yellow sports have a tendency to grow sweeter than the coloured canes of the kindred variety." "The sugar contents of sports are fully equal to those of the ribbon and purple canes, over which they have as yet no pronounced excellencies." (*c*) Chemical selection of tops from individual canes or from stools with high sugar value. As the richest canes are simply those that are ripest and well nourished, the advantages of this method seems to be very doubtful. (*d*) By raising seedling varieties, by selection and cross-fertilisation. The effective discovery of seed in the Sugar-cane was only made in 1888, but seedling canes are now numerous. The difficulties of securing fertile seed are, however, very great. Many canes never flower, and out of several thousand spikelets only ten to thirty fertile seeds are usually obtained. Owing to the minuteness of the flowers, the ordinary methods of fertilisation are not available. Hitherto, seedlings appear to have been raised by chance fertilisation in the field, so that only the seed parent is usually known. Of these probably only 1 in 10,000 survive the severe field and chemical tests to which they are subjected for four years. In future experiments in the West Indies it is intended to raise cross-fertilised seedlings by the use of certain ingenious contrivances whereby both parents can be definitely known. This has already been done in Java by Dr. Kobus by using a variety with infertile pollen as the seed parent and planting alternate rows with a distinct variety with fertile pollen. By this method good results have been obtained as far as high sugar content and disease-resisting power are concerned.

Some Cytological Aspects of Hybrids. By W. A. Cannon, of New York.

Mr. Cannon introduces the important question of the relationship between cytological studies and the experimental work of hybridists, with special reference to the discoveries of Mendel and his successors. In the present state of knowledge this relationship cannot be definitely stated, but as a result of his cytological experiments with Cotton hybrids Mr. Cannon believes :—

1. That the normal divisions of the male nuclei lead to fertility in hybrids, while the abnormal divisions lead to sterility.
2. That variation of the hybrids may or may not be associated with variation in spermatogenesis.
3. That in certain cases the chromosomes derived from the original parent tend to preserve their individuality.

Hitherto, cytological and experimental research has gone on independently, and Mr. Cannon suggests that it would be better in the future for cytological work to be done on forms that give marked experimental results.

The Improvement of Roses by Bud Selection. By L. C. Corbett, of Washington.

The recorded results are based on a series of tests with Rose cuttings made from "blind" and "flowering" wood, and cover a period of five years. The cuttings were all grown under the same conditions, and were potted up to flower under glass; five varieties of the Tea section were used, principally 'Bride' and 'Bridesmaid.'

In the following year cuttings were taken from these plants on the same lines, *i.e.* "blind" from "blind," and "flowering" from "flowering" wood, and so on throughout the experiments. The general result was that while the plants propagated from "flowering" wood gave an average of 29½ blooms per plant for the season, those propagated from "blind" wood produced on the average only 11½ blooms per plant for the season. Professor Corbett concludes, therefore, that the tendencies manifested in a branch are perpetuated from generation to generation by cuttings. It is equally demonstrated that cumulative results are not to be expected by selecting parts showing like tendencies through successive cutting generations. The flowering habit of plants produced from "flowering" wood was not increased in the fifth generation, nor were the plants produced from "blind" wood less floriferous in the fifth generation. Where "bloom" rather than stock plants is the end sought, cuttings taken from "flowering" wood are far superior to those taken from "blind" wood.

Improvement of Oats by Breeding. By J. B. Norton, of Washington.

This paper contains a description of the work recently undertaken by the United States Department of Agriculture in the breeding of Oats to secure rust resistance, hardiness, and increased yield. With regard to the cross-fertilisation of the Oat, pollination is best done from 1 to 3.30 P.M., as it is hard to find ripe anthers before this time, and later than this most of the pollen has escaped. Flowers emasculated one day are pollinated in the afternoon of the following day. In dry hot weather only about 5 per cent. of successful crosses were made, but in cool moist weather 75 per cent. were obtained. Natural crosses in Oats appear to be rare, indicating that Oats are nearly always self-fertilised. The individual plant is taken as the basis of selection : this is found absolutely necessary for good work on account of the great individual differences found in the same race.

On Breeding Florists' Flowers. By E. G. Hill, of Indiana.

Mr. Hill deals in a general way with the breeding of Roses, Carnations, Chrysanthemums, and Begonias. In Roses, out of several thousand seedlings, less than two dozen were of permanent value, and a few only were put into commerce. The ripening of the seeds was the most difficult task in Rose breeding. In Chrysanthemums the large double flowers gave little seed, but these produced large full flowers. On the contrary in Roses and Carnations, when both parents were full-petalled, a large proportion of singles and semi-doubles were produced. In Begonias Mr. Hill obtained a whorl-leaved variety of 'Rex' by crossing the ordinary 'Rex' with the whorled variety, 'Countess Erdödy'; about thirty of these were raised having the 'Rex' markings and colouring, with a distinct single or double whorl of the leaf.

A Medley of Pumpkins. By L. H. Bailey, of New York.

Professor Bailey records some of his experiments in crossing cucurbitaceous plants from 1887-1897. The original object of the investigation was to determine the question of the immediate influence of pollen on the fruit (Xenia). More than 1,000 hand crosses were made, and in no case was there a trace of Xenia. The popular idea that "Cucumbers spoil Melons" is therefore not confirmed. Most of the crosses were between races of *Cucurbita Pepo*. In the first, second, and third generations there was the greatest possible diversity in the progeny. More than 1,000 kinds of fruit were produced, and in one season eight acres of ground were required to grow the plants. The magnitude of the results prevented detailed publication, as no underlying principles were discovered. New characters appeared that were wholly lacking in either parent, *e.g.* unusual colours, shapes, and wartiness of fruits.

Hybrids were obtained between *C. Pepo* ♀ and *C. moschata* ♂, and out of 88 plants raised there were five well-marked types, but none showed any certain influence of the staminate parent. These "hybrids" appear to have matured only one fruit.

Professor Bailey found that both Squash and Pumpkin flowers were nearly always infertile with pollen borne by the same vine. Out of 200 tests with 50 varieties only 22 fruits developed, of which seven only contained good seeds.

Professor Bailey states that his work with Squashes appears on the surface to run counter to Mendel, but he considers it possible that if the work were to be done over again by Mendel's methods, the same laws would be found to hold with cucurbitaceous plants.

Results of Hybridisation and Plant Breeding in Canada. By W. Saunders, of Ottawa.

A comprehensive survey of 40 years' work in producing new varieties of fruits, cereals, and other plants, together with an account of the methods used in crossing many kinds of plants. Dr. Saunders's own work since 1868 has been with Gooseberries, Currants, Grapes, Raspberries, Cereals, Peas, Plums, Apples, and other plants. Among other interesting crosses, that between the Gooseberry ♂ and the Black Currant ♀ produced 28 hybrids, all similar in character, and intermediate, except that they are thornless, as in the Currant, odourless, and bear fruits singly, as in the Gooseberry. The Gooseberry saw-fly and mildew, neither of which affects the Black Currant, attack the hybrids strongly. Wheat crossed with Rye gave a sterile hybrid closely resembling Rye. A series of new varieties of *Pyrus* were produced by crossing *P. Maulei* with a semi-double variety of *P. japonica.* The hybrids were intermediate in size, and very variable in size and hue of flowers, one of which had large semi-double scarlet flowers. A hybrid between the Sand Cherry (*Prunus pumila*) and the cultivated Plum (*P. americana*) gave the Rupert Cherry, which resembled the Cherry, except that it had an elongated stone like the Plum. Of fifty fruiting hybrids between the Siberian Crab (*Pyrus baccata*) and garden varieties of Apples, eight were found to be worthy of cultivation by reason of their size and quality.

Hybridising Gladiolus Species. By W. Van Fleet, of New Jersey.

Dr. Van Fleet records the results of sixteen years' active hybridisation among many species of *Gladiolus.* Altogether 150,000 seedlings were raised, and although many beautiful and promising novelties were obtained, yet only two of these were thought worthy of naming and putting into commerce. These were 'Princeps,' raised from *G. cruentus* × *G.* × *Childsii,* a fine scarlet-crimson feathered below with white and cream, a flat circular flower 6 inches in diameter, with a vigorous habit of growth, and a flowering period of nearly five weeks. The other one is known as 'Lord Fairfax,' a direct cross between *G. purpureo-auratus* and *G. Saundersii,* with a long curving spike of Indian red flowers with a yellow and purple spotted throat. Dr. Van Fleet found that first-generation hybrids seldom proved valuable, but seemed to improve in later generations.

The Improvement of Carnations. By C. W. Ward, of New York.

Mr. Ward gives the results of twelve years' work in breeding Carnations. The first six years were spent in indiscriminate crossing, and little or no advancement was made. The last six years he adopted a definite system of breeding from definite shades of colour and habits of growth. After securing habit and colour he then bred for size of flower with great success. In this way Mr. Ward was apparently following Mendel's methods of breeding, but quite unconsciously.

The colour forms were divided into classes or sections, and of these the crimson, dark pink, scarlet, white, and light pink have become fairly fixed, reproducing their own type in the greater percentage of seedlings. The yellow and white variegated, fancy, and blue sections are not so well fixed, and, being hybrids in the Mendelian sense of the word, will possibly never be fixed. Altogether 50,000 seedlings have been grown, and out of these 36 varieties of commercial value have been produced and profitably grown. Mr. Ward believes that, while indiscriminate breeding on a large scale may produce occasionally good results, yet it is largely a waste of effort. More uniformly better results were secured by him from pedigree stock than from mixed breeding. As to the determining influences of the respective parents, Mr. Ward does not believe that the pollen parent has a positive determining influence in colour nor the pistillate parent in habit. After the hybrid has been secured it can be much improved in habit of growth by skilful selection of the cuttings used to perpetuate the variety.

The Breeding of Native North-Western Fruits. By N. E. Hansen, of Dakota.

The prairie regions of the North-West require hardier varieties of fruits, and to secure these Mr. Hansen has raised more than 100,000 seedlings of Cherries, Plums, Raspberries, and Strawberries. Chief reliance is placed on selection from large numbers and good cultivation. So far 75 Cherries and 200 Strawberries have been selected as worthy of propagation. The Ever-bearing Strawberries imported from France were winter-killed, but their hybrids with the wild Dakota Strawberry proved hardy.

Advantages of Selection and Hybridisation among Grapes. By T. V. Munson, of Texas.

A summary of results obtained in attempting to combine four distinct species of vines. Mr. Munson claims that quality of Grapes can be improved by increasing the vigour of the vine. Better varieties are to be obtained by conjoint selection and hybridisation. Selection alone is too slow, as inbreeding limits variation and causes weaknesses. Indiscriminate crossing without selection may prove injurious, and valuable results can only be obtained by crossing followed by careful selection. In crossing, pure races alone should be used. Special sorts of Grapes should be produced for special localities, and no one variety can be expected to possess all good qualities for all climates. The pedigree of the Grape known as 'Wapanuka' raised by Mr. Munson apparently includes the four species—*Vitis Labrusca, V. vinifera, V. vulpina,* and *V. Bourquiniana.*

Notes on Some Variations in the Second Generation of "Berberis" Hybrids. By C. E. Saunders, of Canada.

Dr. Charles Saunders gives a most valuable account of some hybrids raised at Ottawa between *Berberis Thunbergii* ♀ and *B. vulgaris purpurea* ♂ and their descendants in the following generation. The original hybrids were uniformly intermediate, except that "green" leaves were dominant over "purple" leaves, and "scarlet" fruits over "dark red." In the second generation the variations were most marked, some plants resembling *B. Thunbergii,* others *B. vulgaris purpurea,* and the majority intermediate. Habit of plant and size of leaves were frequently correlated, as also were apparently colour of leaves and fruits. The most striking feature of the experiments was the leaf-colour character. In the first generation "green" was dominant over "purple" which was recessive. In the second generation 23 per cent. of the hybrids were as deep a "purple" as *B. vulgaris purpurea.*

The appearance of the recessive "purple" character in about the Mendelian proportion of one-quarter is very suggestive, and it is to be hoped that Dr. Saunders will test these extracted "purples" to see if they breed true in the third generation.

Bud Variation in the Strawberry Plant. By R. M. Kellogg, of Michigan.

An account of nineteen years' work in attempting to produce more fruitful types of Strawberry plants by propagating only from the most perfect individuals of a variety. In this way Mr. Kellogg claims to have increased the fruit production of a variety from 100 to 300 and 500 bushels per acre.

Bud Variation in the Apple. By G. T. Powell, of New York.

After ten years' experiments Mr. Powell claims to have succeeded in increasing vigour of growth, uniform character of fruit, and prolific tendency in two varieties of Apple by selecting certain scions which exhibited these superior characteristics in a marked degree.

Hand Pollination of Orchard Fruits. By H. C. Price, of Iowa.

The effects of different kinds of emasculation of the flowers in Apples, previous to crossing, are described. Low emasculation, in which all the flower but the style was cut away, gave only from 2 to 4 per cent. of successes; while high emasculation, in which only the corolla and anthers were removed, gave from 22 to 26 per cent. of successes. Pollen applied to the unripe stigmas immediately after emasculation gave better results than the usual method of waiting three or four days until the stigma becomes receptive, the proportion of successes being about 71 per cent. in the former case to about 15 per cent. in the latter. With regard to the question of application, the use of the camel's-hair brush gave slightly better results than when transferred by the fingers. Pollen taken from the anthers just before the opening of the flowers was found to be the best.

Methods of Cereal Breeding in Kansas. By H. F. Roberts, of Manhattan.

Professor Roberts reviews some of the efforts made in breeding Wheat and Indian Corn in Kansas since 1898. In 1902 an advantageous "mutation" form of Wheat was found in a field of supposed pure strain, having a decided "club" tendency: *i.e.* in the upper spikelets of the "head" five or more grains were found instead of the usual two or three. This form is now under trial, the object being to secure a variety in which the heads are more completely filled. As a result of crossing varieties of Indian Corn the nitrogen content has been decidedly increased.

Notes on Plant Breeding in Jamaica. By W. Fawcett, of the West Indies.

Notes on the breeding of tropical plants, such as Pineapples, Bananas, &c.

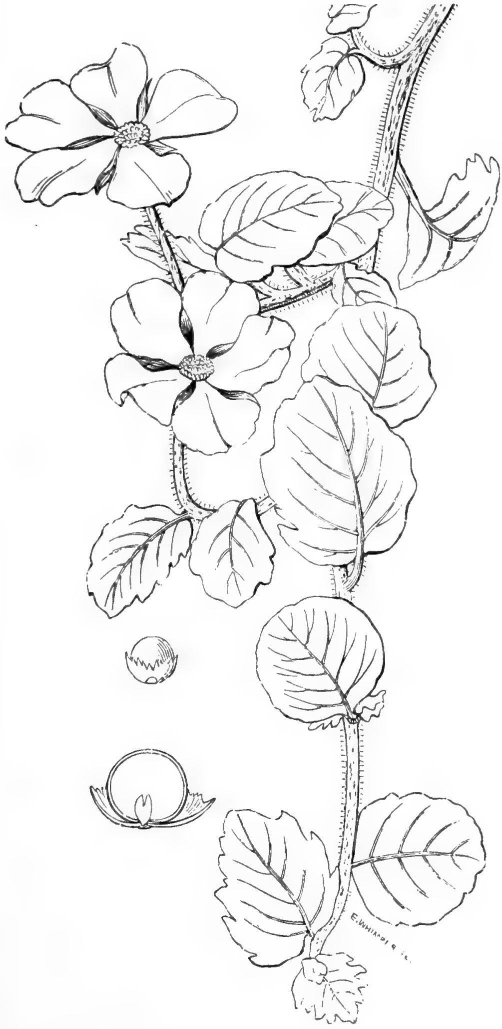
It appears that the Pineapple is self-sterile but cross-fertile. Experiments were made to breed an improved variety, combining the fine flavour of the 'Ripley' with the market qualities of the 'Smooth Cayenne.' Crosses between these varieties produced forty-three plants, which were variably intermediate in character. Recently 2,000 more seedlings have been raised which are yet too young to show their characteristics.

In the Banana the flowers are arranged in clusters; the lower ones are usually all females with long ovaries which ultimately become the fruit. The middle clusters are hermaphrodites with medium ovaries, and form short useless fingers on the bunch. The higher clusters with short ovaries are males. The pollen in both the hermaphrodite and male flowers appears to be perfect. Attempts to cross the Red Banana with the Common Jamaica have produced several seeds, which, however, failed to germinate.

Experiments in budding superior seed varieties of the Mango and the Avocado Pear (*Persea gratissima*) have been partially successful.

The Report of the Conference also contains a detailed account of the varied and interesting discussions which took place immediately after the reading of each paper.

An appendix to the Report contains the text of a number of short papers which were presented to the Conference and read by title, viz.—"Notes on the Breeding of Beans and Peas," by W. T. Macoun, of Canada. "The Improvement of Corn by Breeding," by C. P. Hartley, of Washington. "Experience in Hybridising Cannas," by A. Wintzer, of Pennsylvania. "Hybrid Plums," by F. A. Waugh, of Massachusetts. "The Musk-Melon," by F. W. Kane, of New Hampshire. "On Grape Hybrids," by N. B. White, of Massachusetts. "Breeding of Strawberries and Bush Fruits," by F. W. Card, of Rhode Island. "Hybrids and Diseases," by L. H. Pammell, of Iowa. "Hybridism *versus* Selection," by F. W. Burbidge, of Ireland. "Notes on California Plant Breeding," by E. J. Wickson, of California. "A Study of Grape Pollen," by N. O. Booth, of New York. "Some Hybrid Nicotianas and Ever-bearing Strawberries," by P. de Vilmorin, of France. "Some Possibilities," by C. L. Allen, of Long Island. "Artificial Pollination of Wheat," by W. B. Alwood, of Virginia.



ON A FUNGUS DISEASE OF *EUONYMUS JAPONICUS* LINN. F.

By Ernest S. Salmon, F.L.S., F.R.H.S.

Within the last five or six years a fungus disease has appeared on *Euonymus japonicus* Linn. f., a shrub extensively planted in the South of England, especially on the sea-coast. In the last-named situation it is an especially valuable shrub, on account of the peculiarity it possesses of withstanding the salt in the air, and on this account it is used extensively either for the making of borders or hedges in public gardens, &c., or trained against walls like a creeper.

The effects of the disease caused by the fungus soon become apparent, with the result that the use of the shrub as an ornamental plant is destroyed. The fungus causing the disease is a white mildew, known as *Oidium Euonymi-japonicæ* (Arc.) Sacc. In the early stages of the disease, the leaves of the affected plants bear small isolated, rounded, or irregularly shaped white patches (see Fig. 139). The patches are composed of interwoven branched thread-like *hyphæ*, which collectively form the *mycelium*, or vegetative part of the fungus. Towards the centre the hyphæ are often so numerous and so densely interwoven that the patch presents a sub-crustaceous appearance; towards the edge of each patch the mycelium is very thin and filmy, and is composed of young, very fine, branched hyphæ radiating outwards. From the under surface of the hyphæ a great number of minute suckers are produced. These suckers, or *haustoria*, are formed at short intervals by each hypha from minute lateral swellings, the *appressoria*, which have a lobed outline (see Fig. 140, 6 and 5*a*). From each appressorium a minute tubular projection grows downwards, pierces the cuticle of the epidermis, and swells out inside the epidermal cell, forming a rounded vesicle, the haustorium proper (Fig. 140, 5*h*). It is by means of these haustoria that the fungus maintains its parasitic life, the whole of its food being absorbed by the haustoria from the cell-contents of its host-plant.

As soon as suitable climatic conditions prevail, the mildew begins to form its spores. Short upright branches, the *conidiophores*, are produced on the upper surface of the hyphæ. Each conidiophore, when mature, cuts off from its apex one or more spores, or *conidia*. The conidia are white in colour and somewhat variable in shape; they are usually narrowly elliptic to cylindric, with rounded ends, and measure $30–38 \times 13–14\ \mu$; occasionally they are oblong, and about $30 \times 14–15\ \mu$; or rarely they are oval, and measure $27 \times 13\ \mu$ (see Fig. 140, 4). The conidiophores of the fungus gathered in the open show usually only one or two conidia at the apex; but if the fungus is cultivated on leaves surrounded by a damp atmosphere, a chain of conidia, six or more in number, is produced (Fig. 140, 3). The conidiophores are very quickly formed, so that at the end of a few weeks an actively growing patch of mycelium bears

Fig. 139.—Twig of E. japonicus, with the Upper Leaves bearing numerous White Patches of Mildew (Oidium Euonymi-japonicæ). Nat. Size.*

* I am indebted to Mr. George Massee for kindly taking this photograph.

(To face p. 434.)

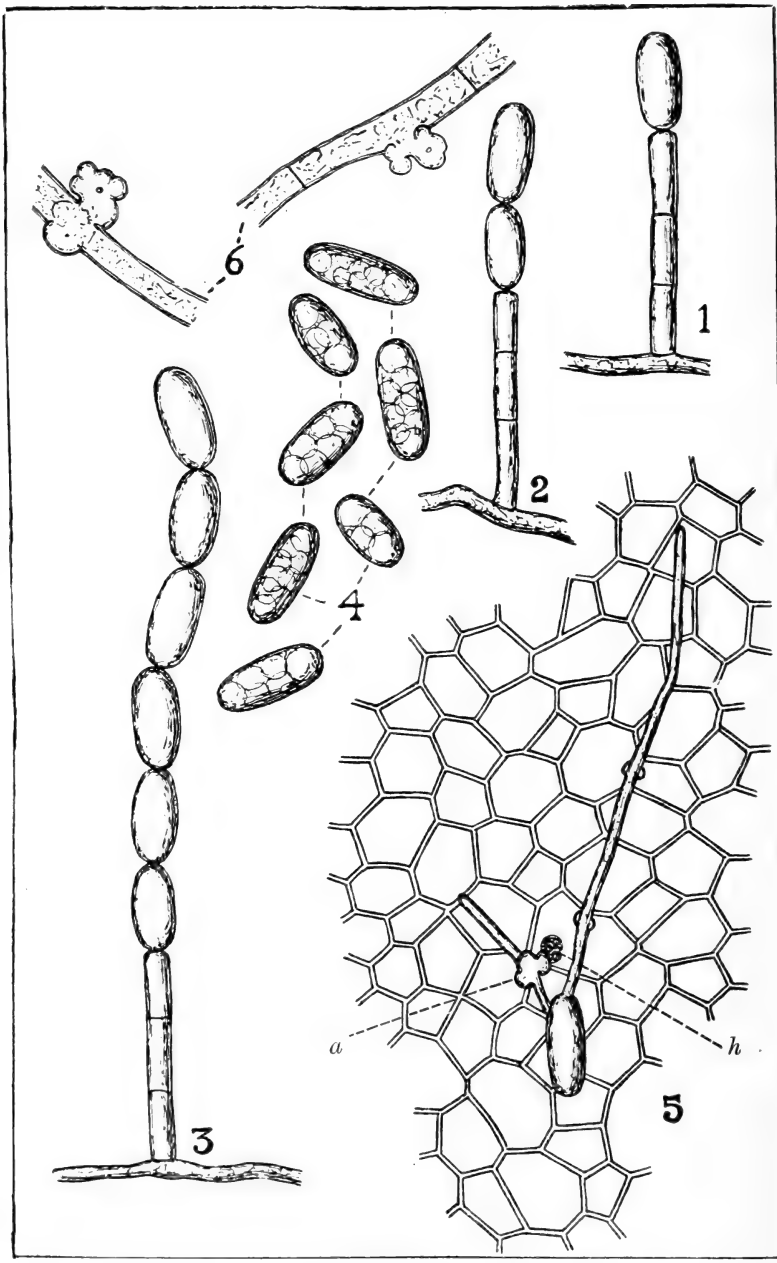


FIG. 140.—OIDIUM EUONYMI-JAPONICÆ (ARC.) SACC.

1, 2, 3, conidiophores bearing conidia, 1 and 2 from examples gathered in the open, 3 from an example cultivated in the damp, still atmosphere of a greenhouse. × 400. 4, seven ripe conidia. × 400. 5, a conidium germinating on the surface of a leaf of *Euonymus japonicus*, forty-eight hours after being sown: *a*, appressorium; *h*, haustorium. × 400. 6, two appressoria on the hyphæ of the mycelium. × 670.

over its surface many hundreds of densely clustered conidiophores, and the whole patch becomes powdery with the accumulated ripe conidia. An enormous number of conidia are produced: these are blown about by the wind, and quickly spread the disease. In damp shaded places, protected from the wind, the leaves of affected shrubs soon become coated with a dense floury mass of conidia, so that a thick clinging scale-like covering, or incrustation, is found over the greater part of the leaf. If the boughs of such plants are shaken, a shower of white dust-like conidia falls to the ground.

After a short time the separate patches of mycelium, which occur on both surfaces of the leaf, increase in size and become confluent. The affected leaves soon afterwards turn yellowish in the neighbourhood of the fungus, and, unless the disease is checked, they begin to fade and are prematurely thrown off. Instances often occur in which leaves bearing patches of the mycelium on the lower surface show groups of cells on the upper surface (exactly opposite the patches of mycelium) which have changed their colour, and appear as pale yellowish blotches on the dark green upper surface of the leaves. Besides the injury caused to the leaves, the fungus, in severe outbreaks of the disease, invades the young wood of the twigs, covering them for an inch or more with a continuous patch of conidia-bearing mycelium. In such cases the normal growth of the shrub is seriously interfered with.

Some experiments which I have recently carried out (7) have shown the high degree of susceptibility of the leaves of *E. japonicus* to the attacks of the present fungus, and the rapidity with which the fungus can spread from leaf to leaf. Leaves were inoculated by placing conidia on the epidermis, and then kept in a damp atmosphere. By the third day it became evident that infection had taken place, fine branched hyphæ, which radiated in all directions from the sown conidia, being now visible. By the fifth or sixth day the production of vigorous patches of mycelium, 2–3 mm. across, and bearing many hundreds of nearly ripe conidiophores, had taken place. In one experiment six marked leaves of a large potted plant were inoculated in the following way. A minute drop of distilled water was placed on the upper surface of the leaf, and a number of conidia were placed on the drop by means of a finely pointed glass rod. The plant was not covered over, but placed in a greenhouse at the temperature of 64° F.; the drops of water evaporated in the course of an hour or so, and the conidia were thus deposited on the epidermis of the leaf. By the second day four of the inoculated leaves showed clear signs of having become infected, minute radiating mycelial hyphæ proceeding from the sown conidia. By the third day all the six leaves showed signs of being virulently infected. By the tenth day each of the leaves bore several large radiating patches of mycelium, with many hundreds of ripe conidiophores and conidia, massed together towards the centre of each patch. All the control leaves were free. By the 16th day several of the young control leaves had become inoculated with conidia blown or fallen from the densely powdery *Oidium*-patches on the infected leaves. On a control potted plant, also, which had been placed by the side of the inoculated plant, two leaves had now become spontaneously infected from the same source. By the 29th day (June 1) thirty-seven leaves of the plant originally used for inoculation, and nine leaves of the plant standing by its side, bore large powdery *Oidium*-patches, frequently on both sides of the leaf. Some of the older mycelial patches were almost crustaceous in consistency, and covered with a dense layer of accumulated conidia. By June 30 nearly every leaf of both plants was virulently infected, and on one plant the very young wood of several of the twigs was covered continuously for a distance of 2–2·5 cm. with thin mycelial patches bearing conidiophores.

The disease has, apparently, only recently made its appearance in England, and indeed in Europe, and its history affords an instructive example of the introduction and gradual spread of a fungus disease.

The first published record, so far as I have been able to discover, is one by Arcangeli (1), who reported the occurrence of the fungus in Italy at Florence in 1899, and at Livorno (in great abundance) in 1900. I have seen examples collected at Padua in 1903, at Naples in 1904, and in the Botanic Gardens at Pisa in 1905. In 1903 H. and P. Sydow (2) recorded it from Görz, Austria, and specimens have been sent to me collected in the same year in greenhouses at Meran, South Tyrol. In Hungary it has occurred at Fiume. I have received reports of its occurrence in 1904 at Avignon, Alençon, Vernon, and in the neighbourhood of Paris. Thus during the past few years the disease has been appearing in Italy, Austria, Hungary, and France.*

As regards England, I have seen examples from Bexhill, Newhaven, Portobello near Rottingdean, Folkestone, Brighton, Seaford, Hastings, Woodnesborough near Dover, and from Ringmer, Iford, and Lewes (a few miles inland), on the South Coast; † from Felixstowe, Sandwich, Ramsgate, and Margate, on the East Coast; and from Weston-super-Mare on the West Coast. Inland, it has been noticed at a nursery midway between the South Coast and London; near the South-Eastern Agricultural College, at Wye; and on bushes in several private gardens at Kew. In many of the localities on the sea-coast the disease has already assumed the characters of an epidemic of such severity as to check the growth of the plants, and even, in those cases where the premature falling of a great number of leaves is caused, to threaten the life of the plant.

It seems probable, from the absence of any early record of this conspicuous fungus, that the *Oidium* has only lately attacked *E. japonicus* in Europe. On investigating the point I ascertained that the fungus is well known in Japan, the native home of *E. japonicus*. Prof. Shotaro Hori, of the Central Agricultural Experiment Station, Nishigahara, Tokio, has kindly furnished me with the following note on the occurrence of the *Oidium* in Japan:—" *E. japonicus*, either wild or when planted in gardens, is very susceptible to the attacks of a white mildew, during warm seasons, throughout Japan. As far as my observations go, the mildew appears on the leaves as early as the beginning of April and continues its growth until the autumn, but I have never seen the formation of perithecia. I have sometimes found, in shady places, the *Euonymus* entirely covered with white mildew, but the fungus does not seem to affect much the

* I have now received, from Professor Ed. Fischer, examples of the disease from Switzerland (Canton Berne, June 1904).

† It has been reported by a gardener as occurring in the Isle of Wight.

growth of the tree." Prof. Shotaro Hori sent examples collected at Nishigahara, Tokio, July 12, 1904.

It seems, then, more probable that the fungus may have been lately brought to Europe on diseased plants imported from Japan than that a European species of *Oidium* has of late years spread from its original host and attacked *E. japonicus* as a new host-plant. On the former theory we find an explanation of the fact mentioned above, viz. the epidemic character of the disease now beginning to be shown by the *Oidium* in Europe, since it is an established fact that a parasitic fungus on reaching a new country attacks its host-plant with exceptional virulence for several years after its arrival. Examples of this phenomenon have been seen in the historic case of the Vine-mildew, and also in that of the American Gooseberry-mildew, recorded in the last number of this Journal. As Bubak (3) has pointed out, it is probable that the importation of diseased Apple trees into Bohemia has recently been the cause of the introduction into that country of the Apple-mildew.

In those countries in which the Government most fully recognises the economic importance of vegetable pathology—as in the United States and New Zealand—the adoption of precautionary measures for the avoidance of fungus diseases has been enforced by legislation. In such countries the passing of Acts framed to prevent the introduction into the country of plant-diseases affecting orchards and gardens has safeguarded the interests of the fruiterer and horticulturist, in the same way as those of the animal-breeder have for a long time been protected by the various Acts prohibiting imports of diseased or suspected animals.

The earliest date of the occurrence of the disease in England, of which I have received information, is the year 1900, when the mildew was noticed by the gardeners on the shrubs of *E. japonicus* trained up against the wall at the east end of the Shelter Terrace in the Madeira Road, Brighton. The disease soon spread to the west end; and the fungus is now, as I observed myself in the autumn of 1904, extremely abundant on the plants along the whole sea-front for over a mile. It is noticeable that the disease is worst in places where the shrubs are growing in shaded, ill-ventilated situations. In such places the shrubs are often so virulently attacked that the fungus causes the premature falling of many of the leaves; it also affects the chlorophyll in the leaf-cells in the neighbourhood of the mycelial patches, producing a mottled appearance on the worst-affected leaves. During the particularly wet summer of 1903 the fungus was very prevalent in many gardens at Bexhill; * in 1904 it occurred in great quantity at Hastings, Ramsgate, and Felixstowe, and was also noticed during the same year at Sandwich, Folkestone, Woodnesborough near Dover, Iford, and Lewes.

With the object of gaining information as to the present distribution of the disease in Britain, I sent dried examples of leaves bearing the fungus to the leading firms of nurserymen in the South and North of England and in Scotland, asking whether the disease was known to them. With the single exception of a firm in the South of England, the fungus was not known. The firm of nurserymen referred to wrote as follows:

* A correspondent writes: "Working gardeners inform me that they do not remember having seen the disease in the neighbourhood before the summer of 1903."

"We first noticed the fungus on *E. japonicus* two years ago on a bed of young plants we had bought in for planting out for stock, and which we dug up and burnt. We believe the fungus appears principally on imported plants, as plants of our own raising are quite free from it."

The distribution of the fungus suggests either that the disease has been introduced on the South Coast by the planting of infected shrubs, and that the disease is now spreading inland, or that for some reason plants of *E. japonicus* growing near the sea are more susceptible to the disease than those growing inland.

A peculiarity of the present mildew is the capacity it possesses of persisting by means of hibernation of its mycelium. If the leaves of affected shrubs are examined in the winter months, many will be found on which the mycelium persists in the form of definite rounded or irregular patches. These patches of mycelium have an almost crustaceous consistency, and are completely barren. During the winter months these patches of persistent mycelium often become cracked, or even partially disintegrated in places, with the result that here and there the component hyphæ become indistinguishable. If leaves bearing these hibernating mycelial patches are placed in a damp atmosphere (*e.g.* on wet blotting-paper in a closed glass dish) in a greenhouse at a temperature of about 65° F., the fungus at once begins to renew its growth, and after a few days produces conidiophores and conidia. In nature the mildew appears able, by means of this compact hibernating mycelium, to exist continuously on the evergreen leaves of *E. japonicus*, the mycelial hyphæ remaining dormant through the unfavourable winter months, and (possibly through the stimulus of increased nutriment supplied by the haustoria at the supervention of favourable conditions) again producing conidia to infect the younger leaves in the spring. A vegetative hibernation effected by certain of the mycelial hyphæ has lately been recorded by Appel (4) in the case of the conidial stage—the well-known *Oidium Tuckeri*— of the Vine-mildew.

In the case of most mildews the formation of conidia ceases at the approach of winter, and the production of *perithecia*, containing *ascospores*, takes place (see 6). At this stage the vegetative mycelium dies, but the ascospores serve as resting-spores which carry the fungus through the period when deciduous plants are bare of leaves. In the case of the *Euonymus*-mildew the fungus seems to have taken advantage of the presence of evergreen leaves of its host-plant to try to produce conidia all the year round, for neither on the Continent nor in England has any production of perithecia been found to take place.

Experiments were carried out (see 7) to ascertain the susceptibility or immunity of various garden varieties of *E. japonicus*, as well as of other species of the genus. In these experiments the following varieties of *E. japonicus* were found to be fully susceptible: '*aureus*,' '*albo-marginatus*,' '*ovatus aureus*,' '*microphyllus*,' and 'President Gunter.' *E. radicans*, and its vars. '*microphyllus*' and 'Silver Gem,' proved also to be fully susceptible to the fungus, but the var. '*Carrièrei*' was found, as far as the experiments went, to be completely immune. *E. nanus* proved to be practically immune when uninjured leaves were inoculated; when, however, conidia were sown on leaves which had been injured by a cut with a razor, or by a bruise, infection resulted. The fungus proved unable to infect leaves of *E. europæus*, *E. chinensis*, and *E. americanus*.

If affected shrubs of *E. japonicus* are examined, it will usually be found that only the younger, brighter green leaves bear the fungus, and that the old dark-green leaves are not attacked. A number of inoculation-experiments which have been carried out have shown that the conidia are unable, under ordinary conditions, to infect these old leaves. I have proved, however, that such leaves, when wounded so as to expose the inner tissues, become susceptible to the disease. Two cases, out of a large number of experiments made, may be mentioned here. In the first experiment two oldish leaves, 5 cm. long, of *E. japonicus* var. *ovatus aureus* were inoculated, on May 5, with conidia sown on the uninjured upper epidermis. No infection had occurred at the end of twelve days. The same leaves were then inoculated again at another spot on the uninjured upper epidermis; no trace of any infection had occurred at the end of seven days. The two leaves were now wounded by removing a small piece of the upper epidermis with a razor, and conidia, from the same source as those previously used, were sown on the mesophyll cells thus exposed, and also on uninjured epidermal cells at a little distance away. On the twelfth day after inoculation one of the leaves was strongly infected at the cut place, the exposed mesophyll cells bearing a vigorous patch of mycelium with crowded clusters of conidiophores. No infection resulted elsewhere.

In the second experiment four young vivid-green leaves of *E. japonicus* were inoculated on the uninjured upper epidermis. Also four old dark-green leaves, from the same shoot, were inoculated (with conidia from the same source) in the following manner: On each leaf conidia were placed on a patch of uninjured epidermal cells on one side of the midrib, and opposite them, on the other side of the midrib, a cut removing a patch of epidermal cells was made with a razor, and conidia sown on the exposed mesophyll-cells. Inoculation was made on August 6. By August 13 virulent infection was apparent on the four young leaves, which now bore numerous large vigorous patches of mycelium with conidiophores. No infection had resulted on the uninjured epidermis of any of the four old leaves, but two of the leaves bore at the wounded place small patches of mycelium with numerous clusters of ripe conidiophores and powdery masses of accumulated conidia.

The chief interest for horticulturists in connection with the above fact is the proof it affords of the necessity of protecting plants as far as possible from all sources of injury. It cannot be doubted that the injury due to the attacks of animals, or occasioned by frost, hail, or gales of wind, may often be the cause which renders a leaf, hitherto resistent, susceptible to a fungus disease. I have frequently observed, in the case of the disease caused by mildew on Turnips, Roses, Grasses, Peas, &c., that the most severe outbreaks occur on plants which are or have been overrun by insect parasites.* I have recently shown (8) by inoculation-experiments that the attacks of slugs may cause injuries to Barley leaves which render them susceptible in

* A recent paper by J. R. Jungner in the *Zeitschr. f. Pflanzenkrankh.*, 1904, p. 321, may be consulted on the subject of the inter-connection, in many cases, of plant and animal parasites.

this way; and that other mechanical injuries—such as that caused by a bruise—tend to destroy, by affecting the vitality of the leaf-cells, the immunity to disease which a plant may have previously possessed. *

On many of the examples of mildewed leaves of *E. japonicus* which have been sent to me minute orange-coloured larvæ were to be observed among the powdery masses of conidia. These proved to be the larvæ of a dipterous insect belonging to a genus (probably *Mycodiplosis*) of the order *Cecidomyidæ*. These larvæ, which are very common on a great number of mildews (see 9), feed exclusively on the conidia. Notwithstanding their voracious appetite—for they appear to feed continuously on the conidia during their larval condition—these larvæ seem to be of little or no effect in stopping the rapid growth of the fungus when the external conditions are favourable. Their presence probably serves, rather, to increase the disease, since a great number of ripe conidia are usually found adhering to the bodies of the larvæ, and these conidia are sown over the surface of the leaf as the larvæ crawl about. The probability of such larvæ serving as agents in spreading a fungus disease has been pointed out by Lindroth (5) in the case of similar *Cecidomyidæ* feeding on spores of the *Uredineæ*.

With regard to the question of the best means of combating the present disease, it is obvious that, as the fungus is so conspicuous, it is possible to collect and burn in the winter months the leaves which bear the white patches of hibernating mycelium, before conidia are produced on these which would infect the new leaves in the spring. Since the fungus is wholly confined to the external surface of its host-plant, the destruction of all such leaves would lead to the complete extirpation of the disease. Where, however, such means are not practicable, fungicides must be used. Although in the case of the present disease no trial of the efficacy of any special fungicide has up to the present been made, it is safe to predict, from the successful results obtained in dealing with other mildews belonging to the same family, that sulphur will be found the most valuable agent in destroying the fungus. The sulphur should be applied either in the form of the dry powder known as "flowers of sulphur," or as potassium sulphide ("liver of sulphur"). The "flowers of sulphur" should be well dusted over the affected leaves, and the application should be made on a still day *during sunshine*. The potassium sulphide (1 oz. to 2 gallons of water) is to be used as a spray, and the application should be repeated about every ten days. Should heavy rains occur, the fungicide should be at once applied again immediately fine weather sets in. Trial should be made, too, of the fungicide lately recommended by Halsted and Kelsey (10) as being specially efficacious against the powdery mildews. The fungicide is a kerosene emulsion, made as follows:—Kerosene, 2 pints; soap (any good hard kind), 1 oz.; water, 8 gallons. The soap is first dissolved in about a gallon of boiling water, and after removing from the fire the kerosene is added. Ten minutes' vigorous mixing will produce a creamy mass that will not separate. After adding the proper amount of water the emulsion is ready for use. The plants should be sprayed once in ten days, using a nozzle

* In this connection it may be pointed out that in many districts the leaves of *E. japonicus* are much subject to injury from the attacks of a caterpillar.

which produces a fine mist. The treatment must be continued until the mildew has completely disappeared from all the parts.

Since the above was written an article by Peglion (11) on the present mildew has appeared, in which several interesting facts in connection with the occurrence of the present disease in Italy are given. It is mentioned that a few years ago an epidemic of an injurious mite, *Chionaspis Evonymi* (belonging to the family *Coccidæ*) occurred in Italy, which resulted in very serious injury being done to plantations and shrubberies of *E. japonicus.* Notwithstanding the employment of insecticides, the attacks of the mite caused in many cases the destruction of whole plantations. At length a minute hymenopterous parasite appeared, which has in some districts completely checked the spread of this animal parasite of the *Euonymus.* The mildew then appeared, and quickly invaded the plantations and shrubberies, until it is now widely spread over Italy and France.* In localities where damp hangs about, as in the shady parts of the Park at Aventi, Ferrara, the mildew has occurred in such abundance that the least shake given to the affected bushes caused a shower of conidia which covered the soil beneath with a thin white opaque layer. In such severe outbreaks of the disease a complete defoliation of the plants ensued. The author has used as a fungicide cupric sulphur, *i.e.* "flowers of sulphur" to which 3 per cent. of copper sulphate has been added, and states that, even in the most serious cases, the repeated application of this solution restores the vegetative growth of the plant to a satisfactory condition. In cases where the plant has been perceptibly weakened by the disease a small dose of nitrate of sodium should be given to the soil. The presence of large hibernating haustoria (often almost filling up the lumen of the cell) in affected leaves during the winter months is noted.

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* It would be interesting to ascertain whether it was at this time, when the vitality of the plants was affected by these injuries, that the *Oidium* first appeared in Europe, or at any rate in Italy.

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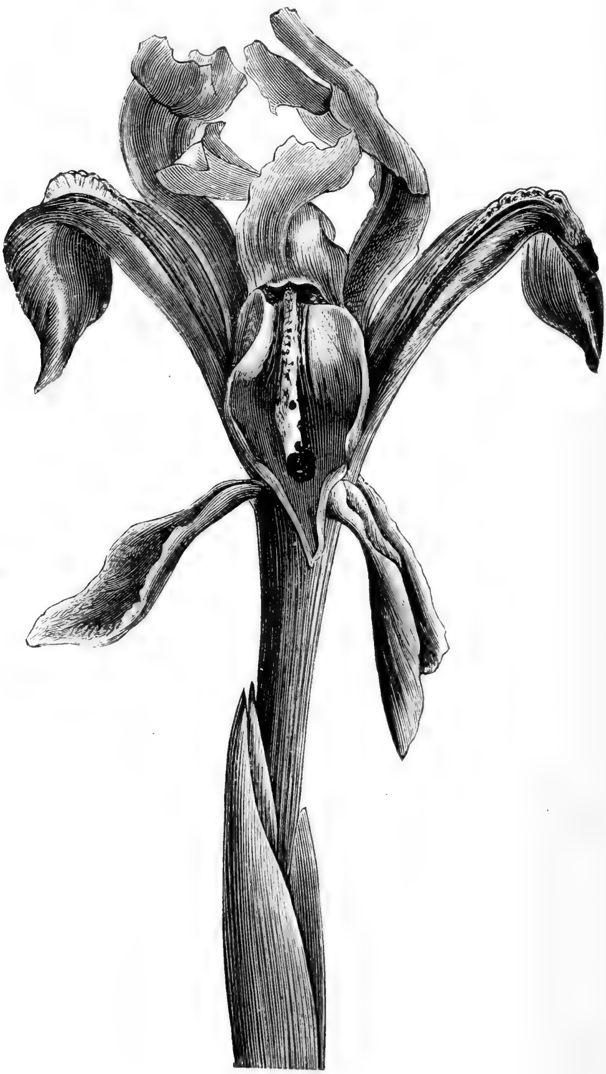


PLANT CONSCIOUSNESS.

By Captain Arthur Smith, F.R.H.S.

The modern student of plant-life no longer regards the objects of his study as so many things which merely demand classification and arrangement, and whose history is exhausted when a couple of Latin or Greek names have been appended to each specimen. On the contrary, the botanist of to-day seeks to unravel the mysteries of plant-life. For him the plant is no longer an inanimate being, but stands revealed as an organism exhibiting animal functions, many of which are certainly well-defined, as are the analogous traits in the existence of the animal. Plant physiology has therefore become a distinct branch of natural science, and every biologist who has followed it feels the difficulty which confronts him in attempting to draw a line of demarcation between the animal and vegetable kingdoms. This difficulty is clearly shown by the fact that there are certain organisms that are claimed by both zoologists and botanists as belonging to their respective departments of natural science.

Every living body, both plant and animal, consists in its embryonic form of a single cell; and not only this, but the lowest plants and the lowest animals are, in their full-grown mature state, merely minute single cells. From this comparativly neutral starting-point, in the sense of presenting the minimum amount of differentiation, one important feature, generally stated to be evolved only by members of the animal kingdom, is the specialisation of structure that enables animals to feed on organic matter taken into the body in a solid form. But this, as I shall show, is not confined to animals only. A second supposed mark of distinction is the possession by animals of a nervous system which has culminated in the higher groups of animals in the development, not only of special senses, but of sense-organs. But at the same time it must not be forgotten that many of the lower groups of organisms universally classed as animals are entirely destitute of every structural trace of sense-organs or nervous system.

Although no trace of nerve-tissue has been found in any member of the vegetable kingdom, yet examples of the possession of a nervous system, sensibility, and consciousness are to be found in it. Many plants manifest distinct movements which are responsive to external agencies, these movements agreeing in important and essential points with similar movements shown under similar circumstances in connection with animals, and which in the latter are the outcome of nervous excitement or brain-power.

Some will naturally exclaim, "How can plants be possessed of brain-power if they have neither brains nor nerve-tissue!" And yet, amongst those who have devoted any time to the observation of plant-life, few, if any, will deny the existence, not only of instinct, but of a power much higher, which runs very closely to that faculty of reasoning which no one disputes is found among at least the higher groups of animals. A few words on the mechanism connected with animal consciousness may at this point not be out of place.

Including the genus *homo*, each individual of the higher genera is, in a greater or less degree, the owner of a mass of grey and white matter, generally contained in the head, known as the brain. This brain is the seat of all its energy, movement, and sensibility. It is divided into centres, each of which is an area for the conscious perception of the different forms of sensory impressions, and also for the transmission of energy to the various muscles. Ferrier, Horsley, and others have mapped out the brain into motor areas and centres. The term "centre" involves the following mechanism:—A sensitive surface; a nerve going to a nerve-cell or group of nerve-cells, from which passes a nerve-fibre to a muscle. These nerve-cells discharge impulses to, and receive impressions from, the nerve-fibres. Each centre has nothing to do with transmitting to, or receiving impulses from, any other part of the body than that to which it is connected. For example, it has been proved that the nerve called the pneumogastric is the sensory to the muscles of the heart, lungs, and stomach, and for these only. Similarly the olfactory nerve is entirely devoted to the sense of smell, the optic nerve is the nerve of sight, and so on, every portion of the brain has been proved by experiment to have exclusive functions. So the brain may be looked upon as a motor or engine, which keeps the wonderful machinery going that produces all the various complicated movements of the animal frame. But all motors must, in the first instance, be under the control of some power. In the mechanical world we have the powers of steam, water, and electricity. What, then, is the power at the bottom of the movements, &c., of organised beings? Its existence and effects cannot be doubted. It permeates not only the animal but also the vegetable kingdom, and may be described, in a word, as brain-power. It must be quite evident that the brain itself is not the source of this power, but merely acts, I repeat, as an intermediate motor. This motor is absent in plants; but does it follow that the power or force is itself non-existent? It is entirely absent in some members of the animal kingdom; but in these cases it is admitted that the power is present. For instance, none of the creatures known as *Protozoa* have any signs of specialised nerves or brains, and the same remark applies to the next more highly organised sub-kingdom —*Cœlenterata*. But we do not dispute that these lowly animals have a certain amount of consciousness, or even that they can develop that accumulated experience of theirs which we call instinct.

It is, perhaps, sometimes difficult actually to define whether a given action is instinctive or intelligent. A great authority tells us that instinct is only "blind habit or automatically carried-out action." If this be so, then instinctive actions only move in one direction, and cannot adapt themselves to circumstance. Again, it has been defined as "reflex action into which there is imported an element of consciousness." But where one finds variation in action according to varying circumstances, a state of things which is seen over and over again throughout the plant-world, there seem ample grounds for believing that plants are capable of intelligent action, and are endowed with consciousness to perceive and feel the variation in their environment, and so are able to vary their actions accordingly.

The commonly adopted opinion that plants cannot be classed among conscious agents has never been proved, although perhaps to most people it may seem self-evident. Wordsworth did not think so, for he said:

> It is my faith that every flower which blows
> Enjoys the air it breathes.

But those acquainted even superficially with the habits of plants will scarcely deny that they have the power of adapting themselves to circumstances, and have many movements that are the very reverse of automatic, which point to the idea that they are endowed with a power something higher than mere instinct. Numerous instances will occur to their minds of sensibility as fully developed in the plant as in the animal, which in the latter is, without doubt, the outcome of conscious perception and thought brought into action through the medium of the brain.

Take, for instance, that wonderful plant, the Mimosa, sensitive not only of the most delicate touch, but, like most other genera, of the approach of darkness or of even a shadow thrown upon it, of which the poet says:

> Weak with nice sense, the chaste Mimosa stands,
> From each rude touch withdraws her timid hands;
> Oft as light clouds o'erpass the summer glade,
> Alarmed she trembles at the moving shade,
> And feels, alive through all her tender form,
> The whispered murmurs of the gathering storm;
> Shuts her sweet eyelids to the approaching night,
> And hails with freshened charms the rising light.

Many species of Mimosa possess this property, and, indeed, most of the genus in a greater or less degree. They have their leaves beautifully divided, again and again pinnate, with a great number of small leaflets of which the pairs close upwards when touched. On repeated touching, the leaflets of the neighbouring pinnæ also close together, and the fact that when the touch is given to one of the pinnæ the movement is conveyed to the others, until at last the entire leaf sinks down and hangs as if withered, points to the power of transmitting impulse; after a short time the leaf-stalk rises and the leaf expands again. It is noteworthy that a touch on the upper side of the leaf has no effect. This appears to be an analogous trait to that which is found in many insects, and, in fact, in all parts of the animal kingdom, of feigning death at anyone's approach or when slightly touched.

The Mimosa, too, goes to sleep when night comes on; even a cloud passing over the sun will cause its leaves to fold up and sink down; in fact the whole plant appears to go to sleep. In going to sleep the Mimosa is not, however, at all singular, as most species of plants close their leaves and flowers at night. On the other hand, there are some which, like the beasts of the forest, hail the setting sun as a signal for activity. This sleep of plants, which without doubt is physiologically the same as animal sleep, does not exist without a reason. The act of sleeping is, in the higher animals, symptomatic of repose in the brain and nervous system, and the fact of plants sleeping is one proof of the existence of a nervous system in the members of the vegetable kingdom. Plants sleep at various hours, and not always at night. Light and heat appear to have, in many instances, little to do with plants sleeping, as different species go to sleep at different hours of the day. Thus the coming Morning Glory, *Ipomœa purpurea* syn. *Convolvulus purpureus*, opens at dawn; the Star of Bethlehem, *Ornithogalum umbellatum*, about ten o'clock; the Goat's-beard, *Tragopogon pratensis*, opens at sunrise and closes at mid-day, and for this reason is also known as 'Go-to-bed-at-noon.' The flowers of the Evening Primrose, *Œnothera biennis*, open at sunset, and those of the night-flowering Cereus, *Cereus grandiflorus*, when it is dark. Aquatic flowers open and close with the greatest regularity. The white Water Lily closes its flowers at sunset, and sinks below the surface for the night; in the morning the petals again expand and float on the surface. The *Victoria Regia* expands for the first time at about six o'clock in the evening and closes in a few hours; it opens again at about the same time the next morning and remains so until the afternoon, when it closes and sinks below the surface. This sleep of plants is not, of course, confined to their flowers, as leaves open and shut in the same manner; indeed it is so conspicuous a phenomenon that it was commented upon as long ago as the time of Pliny.

Continuous attempts have been made to elucidate the phenomenon of sleep without success. Many theories have been promulgated, but they have fallen short of explaining it. We know that sleep rests the mind more than the body; or, to put it in another way, the mere mechanical, as apart from the nervous, portion of the organism can be rested without sleep. Negatively, the effect of sleeplessness proves the value and necessity of sleep. Electric light has been used to stimulate the growth of plants, and, coupled with other means of forcing, a continued period of growth secured, thereby obtaining earlier maturity than would have been the case under ordinary circumstances. In most cases plants treated in this way were prevented from sleeping, the result in the case of perennials being to greatly weaken their constitution, the following year's growth being poor and scanty, and in some cases they were scarcely alive.

The carnivorous plants afford further evidence of the existence of consciousness in plants, among which the Venus' Fly-trap (*Dionæa muscipula*) —which Linnæus called the "miracle of nature"—is the most elaborate, and is the climax of the order *Droseraceæ*. The leaves, about four inches long, consist of a spatulate stalk, which is constricted to the midrib at its junction with the broad blade. The halves of the blade are movable on each other along the midrib. Round each margin are twenty to thirty long teeth, which interlock in rat-trap fashion with those of the opposite side. The centre of the leaf bears numerous rose-coloured glands, and there are on each half three sensitive hairs. The blades shut up in from eight to ten seconds when one of the sensitive hairs is touched. When an insect alights or a piece of raw meat is placed on the leaf the blades close up, and the rose-coloured glands pour out a fluid which is practically the same as the gastric juice of the animal stomach in its digestive properties. The matter of the insect body or of the meat is thus absorbed into the substance and tissues of the plant, just as the food eaten by an animal is digested. The animal digestion can only be carried on by the brain-force acting by means of a nerve on the gastric glands. We may therefore concede that it is the action of the same power in the plant that produces the same effect. The motor is absent, but the motion is there. Further, in this connection the idea becomes stronger from the fact that if grains of sand be placed on the leaf the glands do not give out the digestive fluid.

The *Hedysarum* of Bengal is an example of movement without external cause. This plant gyrates the central leaflet of its pinnule. Its lateral leaflets are, however, the most remarkable, for they have the strange power of jerking up and down. This motion will sometimes stop of its own accord, and then suddenly, without any apparent cause, commence afresh. The leaves cannot be set in motion by a touch, though exposure to cold will stop the movement. If the movement be temporarily stopped by the leaf being held, it will immediately resume action after the restraint is removed, and, as if to make up for lost time, will jerk up and down with increased rapidity.

The power of spontaneous movement is also seen in the seed-spores of seaweeds and other lowly plants. These spores move about in water with freedom, and the filaments of many of the Liverworts exhibit a capacity for extraordinary motion. In the spores of the Potato fungus, *Phytophthora infestans*, we have a well-marked instance of the power of movement according to circumstances. When the spore-cases burst, a multitude of little bodies escape, and if these gain access to water—a drop of dew on the Potato leaf for instance—they develop a couple of curious little tails by means of which they swim about after the manner of tadpoles. The power of locomotion possessed by the antherozoa of Mosses, Ferns, &c., is again another example of this power of movement. It is not so very long ago since these were classed as animalculæ, and in those days it was not disputed that these so-called little animals moved consciously and intelligently. Then there are those microscopically beautiful unicellular plants, the Desmids and Diatoms, which dart about hither and thither in water. A mere cursory observation of their movements leads one to believe them possessed of consciousness.

It is not only in the fully developed vegetable organism that we find evidence of the existence of brain-power, but this power begins to display itself with the germination of the seed. In the commencement of plant-life we find, as in the case of grain (to give an easily tested example), that the root or radicle emerges at one end of the seed, and the shoot or plumule at the other. What causes the former to descend and the latter to ascend? If the seed be so placed that the root comes out at the top, the result is the same, for the root at once turns round and grows downward, and the shoot *vice versa*. This cannot be caused by gravitation, although Darwin once thought so, as the force of gravity would have the same effect on the shoot as on the root. There can only be one answer, that is, the existence of a directing force or brain-power. There is no structure in plants more wonderful in its action than the tip of the root. Darwin wrote: "It is hardly an exaggeration to say that the tip of the radicle, endowed as it is with such diverse kinds of sensitiveness, acts like the brain of animals."

A study of the habits of climbing plants affords further evidence of the existence of nervous energy in them, of which perhaps the strongest is the sensibility of tendrils. If a pencil or rod be rubbed on the inside of the terminal part of a tendril, it will almost immediately show signs of curvature, and will be fully curved in a couple of minutes. A perfectly smooth body, such as a dust-free, gelatine-coated rod, will not produce curvature. These tendril-bearing plants may be looked upon as among the highest in the scale of plant organisation. A plant of this kind first places its tendrils ready for action, just as a polypus places its tentacles. During several days the tendril searches for something to cling to, revolving the while with a steady motion. On striking a suitable object, it quickly turns round and firmly grasps it. In two or three hours the tendril contracts into a spring and drags up the stem. Movement on the part of this particular tendril now ceases, it having completed its work in an admirable manner.

The effect of light on plants is a striking example of their consciousness, and is in many ways similar to its effect upon animals. The bending of plants towards light is well known, but it has been proved that there is no close parallelism between the amount of light which acts on a plant and its degree of curvature. One's own personal experience shows us that the retina, after being exposed to a strong light, feels the effect for some time; and, in some experiments carried out by Darwin, a plant continued to bend for half an hour towards the side which had been illuminated. Some plants which had been kept in the daylight during the previous day and morning did not move towards an obscure lateral light, as did others which had been kept in complete darkness, thus showing an analogy with the fact that the retina cannot perceive a dim light after having been exposed to a bright one.

One striking element in plant consciousness is the localisation of sensitiveness, and the power of transmitting an influence from the excited part to another, which consequently moves. In the case of the *Drosera*, when the tip of a gland is irritated, the basal and not the upper part of the tentacle bends. The sensitive filament of *Dionæa* also transmits the stimulus without itself bending.

The power of movement for a specific purpose—movement, too, which is unaffected, and cannot be caused, by outside stimulus—is strikingly seen in the many examples among plants of conscious sexual intercourse.

This was observed as long ago as the time of Erasmus Darwin, who wrote a poem called "The Love of Plants."

The vegetable passion of love is seen in the flower of the *Parnassia* (Grass of Parnassus), in which the males alternately approach and recede from the females. In the *Nigella*, or Love-in-the-Mist, the female flowers grow on longer stalks than the males, and, to use Darwin's words, "in which the tall females bend down to their dwarf husbands."

The *Gloriosa superba*, or Creeping Lily, a South African plant, is another well-marked illustration of this power of conscious movement. In this plant, first one set of three stamens come to maturity, and then three others, of which Darwin in the above poem wrote:

> Proud Gloriosa led three chosen swains,
> The blushing captives of her virgin chains,
> When Time's rude hand a bark of wrinkles spread
> Round her weak limbs, and silvered o'er her head;
> Three other youths her riper years engage,
> The flatter'd victims of her wily age.

It is unnecessary to adduce further illustration in proof of plant consciousness, and of the fact that brain-power can, and does, exist apart from a visible brain. When we see the irritability of the Sensitive Plant transmitted from one part to another, exhausted by repeated artificial excitation, and renewed after a period of repose, it is difficult to dissociate it from a conscious organism. Still less can we witness certain organs taking determinate positions and directions, surmounting intervening obstacles, moving spontaneously, or study the manner in which they are affected by stimulants, narcotics, anæsthetics, and poisons, and yet declare these phenomena to be brought about by a power different from that which produces similar actions and effects in animals. Vital activity is the rule, and inertness the exception, in plant-life; and this fact seems to impress upon us the error of that form of argument which would assume the non-existence of the higher traits of life in plants merely because the machinery is invisible.

It has already been mentioned that the lowest forms of both animals and plants are individuals whose bodies are merely single cells, and it is, also, worthy of note that the earliest embryonic state of all the higher animals is merely that of a single cell, and the highest powers of the microscope are unable to trace any distinction between the embryos of plants and animals, birds and beasts, fish and fowl, the Mimosa and Man; all are exactly similar. From an evolutionary point of view, there is nothing in this latter circumstance so very wonderful after all.

If there were no signs of intelligence in the vegetable kingdom the cause for wonder would be greater. If thought is the product of evolution it must have had its beginnings. For anything we know it may have taken as many thousands of years to evolve the intelligence of the Mimosa as it has that of Man, although of course the latter is an incalculably greater distance ahead. As Drummond said, "Mimosa can be defined in terms of Man, but Man cannot be defined in terms of Mimosa."

GOURDS AND CUCURBITS.

By John W. Odell, F.R.H.S.

There is probably no group of plants cultivated in the gardens of to-day so historic and antique as the Cucurbits and Gourds. They can be traced back to the remote periods of the Old Testament, where they form the subject of such narratives as those of Jonah and of Elisha at Gilgal.

There is, I know, some doubt as to the true meaning of the Gourd in connection with the Jonah narrative; but, as Dr. Tristram points out in his "Natural History of the Bible," there is a strong probability of its being *Cucurbita Pepo* and not *Ricinus*. The reason is one that to some extent forms the basis of my paper.

"The Gourd," Dr. Tristram says, "is very commonly employed in Palestine for the purpose of shading arbours. Its rapid growth and large leaves render it admirably adapted for training on a trellis-work."

The exact genus or even species referred to in connection with the visit of Elisha to Gilgal is again not quite precise, but as there are three Cucurbits common to that part of the Holy Land we may, I think, fairly conclude that it was one of them.

The three are the Colocynth (*Citrullus Colocynthis*), the well-known drug, the Squirting Cucumber (*Ecballium Elaterium*), and the Prophet's Cucumber (*Cucumis prophetarum*). The evidence is, I think, strongly in favour of the Squirting Cucumber, because we are told by Dr. Tristram that the word "*pakkuoth*, from a root signifying to burst," is translated "wild gourds" in 2 Kings iv. 38–40; and, as the Colocynth is so common and plentiful in Palestine, one would naturally suppose that the prophet's servant would have some knowledge of its poisonous properties.

Professor Henslow, speaking of the antiquity of the Cucumber (one of the best known and commonest of the Cucurbits), says * "the Cucumber has been cultivated in India for 3,000 years"; that it "was introduced into China B.C. 200"; and, further, that "Cucumbers were grown in Pliny's time, who, however, appears to have mixed up Gourds and Melons with them."

From those remote and far-away times up to the present day Gourds have been favourite subjects of cultivation in all lands. Climate has of course been a great factor in the amount of enthusiasm displayed in their culture.

In the sunny climate of the French and Italian Rivieras, Spain, and the Southern States of North America they have been widely grown and treasured. Indeed the well-known horticulturist Mr. O'Brien, of Orchid fame, has a firm conviction that in those remote days Gourds were as extensively grown and as popular as Orchids are to-day.

The reason for this long-sustained interest in the Gourd family is, I think, very obvious when one sees a really good collection of Gourds and Cucurbits.

* Journal R.H.S. vol. xvii. p. 125.

In form and size there is every possible modification, from the tiny succulent red fruits of the *Bryonopsis* to the huge mottled club-like Gourds of the *Lagenaria* of five and six feet in length, from the Gooseberry Gourd to the huge Pumpkin, weighing nearly a hundredweight.

Again, the colours are most attractive, and in some species even brilliant, every conceivable tint of yellow, whilst the most vivid scarlet and orange tints of *Coccinia, Momordica*, and *Trichosanthes* can be contrasted with the pale ivory and green of the Malabar Gourd.

Nor does the attraction stop at colour and contour. There is hardly a fruit in cultivation which has not its counterpart in some Gourd; thus we have Apple, Orange, Pear, Gooseberry, Grape, and other Gourds, all wonderful instances of superficial resemblance. This trait is not confined to a mimicry of fruits, for Gourds may be seen in the form of many articles of useful and domestic character, this is more especially the case with those grown in the United States of America, and may to some extent account for the enthusiasm Nathaniel Hawthorne expresses for Gourds in "Mosses from an old Manse," in which he says: "A hundred Gourds in my garden were worthy, in my eyes at least, of being rendered indestructible in marble. If ever Providence (but I know it never will) should assign me a superfluity of gold, part of it should be expended for a service of plate, or most delicate porcelain, to be wrought into the shape of Gourds, gathered from vines which I will plant with my own hands. As dishes for containing vegetables they would be peculiarly appropriate. Gazing at them, I feel that by my agency something worth living for had been done. A new substance was born into the world. They were real and tangible existences which the mind could seize hold of and rejoice in."

One naturally asks the question, Why this variety? Why these quaint and fantastic forms? And the reason, I think, is not very obscure.

In the first place there is the undoubted fact that for ages these fruits have been cultivated both for their use and beauty, and it is only natural to suppose that those ideals have been valued by the ancient cultivators, as well as by the more modern gardeners of later years.

Then, again, we must remember the ease with which the sorts cross and recross. This is particularly so in the genus *Cucurbita*, the species of which, as well as varieties of individual species, easily cross. I am unable to say to what extent, if any, genera cross; so far I have not succeeded in raising a true bigeneric hybrid, although I have induced fruits of *Momordica* to form, by using the pollen of *Trichosanthes*; but the seed was not fertile and would not germinate. Curiously enough, there is no mention of Cucurbitaceous hybrids in the Conference Report of 1900.

The home *par excellence* of the Gourd and Cucurbit family is the Riviera, where the climate is exactly favourable to their rapid growth, coloration, and hardening of the rind, so essential in the Gourds grown for bottles &c. The variety grown there is enormous, and comprises hundreds of different sorts varying in size and colour.

The main groups are those known as *Cucurbita Pepo*, with the varieties *C. P. aurantia, C. P. mitriformis*, yellow and green forms, *C. P. oviformis, C. P. pyriformis, C. P. turbaniformis, C. P. radiata, C. P. rotunda alba*, and dozens of other varieties of *C. P. verrucosa*, the warted Gourds.

Another group, more useful than ornamental, perhaps, is *C. maxima*, the Pumpkin and Squash sections—huge fruits, veritable giants in the vegetable world.

Lagenaria vulgaris is a favourite Gourd ; there are several varieties grown, from which the peasants make bottles, flasks, jars, ladles ; and pipe-stems may sometimes be made from a small variety of this genus.

Indeed, to such a degree of importance have the Cucurbits attained that an annual fair or fête is held every spring at Cimiez, where Gourds of every kind are displayed ; and, not content with nature's decoration and colouring, the natives further enhance their beauty by designs and painting, and by devices cut into the rind.*

In passing, it is not altogether uninteresting to compare the art of Gourd decoration on the Riviera with that of the West Coast of Africa. The natives of Sierra Leone are quite adepts at decorating the large Calabash Gourds. The decoration is done both by carving and cutting the rind and by burning the design with a hot iron.

During a short residence in Georgia and Florida, some years since, I was particularly struck with the importance of the Gourd from an economic point of view.

Every farmhouse, whilst paying but little attention to the growth of flowers or fruit, had its patch or corner devoted to Gourds, and these grew with a luxuriance only seen where the sun attains semi-tropical power.

Hardly a domestic operation there is complete without the aid of the Gourd in some form. The commonest use to which the Gourd is put is that of a drinking ladle, or, as it is locally known, a "dipper." A long-necked fruit of *Lagenaria* is the variety used. A slice is cut off the side of the Gourd (a tangential section, so to speak), the end of the neck is stopped, and then you have the most commonly used drinking cup of the rural South, always to be found hanging near a pail of water under the veranda of every Southern house.

It would occupy too long to enumerate the various uses of the Gourd in those parts. Briefly, Gourds are used for carrying operations and as receptacles for every purpose ; the larger Gourds are used even as cradles for negro babies.

No cleaner or sweeter utensils for the dairy can be devised than a properly prepared set of Gourd milkpans.

There is one use to which the small short-necked Gourd is put that should appeal to all naturalists. It is a common practice in the South to hang up in the poultry yard several dipper Gourds with a small hole cut in just large enough to admit what is commonly called in the South a "martin." These little birds nest and reside in the Gourds. For this protection they, in response to this kindness, mob unmercifully the hawks, and other birds of prey that worry the young chickens, ducks, and turkey chicks, and so act as protectors of the poultry yard.

A feature of Gourd cultivation, both in the Northern and the Southern States is the number grown for winter consumption.

* A drawing was shown of the Riviera decorative art as a typical example of treating the smaller forms of Bottle Gourds (*Lagenaria*). Especially beautiful were the blue tints, inspired, no doubt, by the proximity of the blue waters of the Mediterranean. A vase-like outline is obtained by inserting handles of split cane.

Pumpkins and Squashes are grown extensively for winter use, and are stored in the autumn before any serious frost occurs, in dry frost-proof sheds; the varieties are selected for their good keeping qualities, and they constitute a valuable addition to the winter menu.

In this country we have not attached much importance to this branch of Gourd culture; indeed, after the first few days of autumn frost one rarely sees Gourds of any description for use.

With the newer American and French varieties there is no reason why we should not augment our not too elaborate stock of winter vegetables. The Pumpkins are most excellent in pies with a few apples, or for soups and purées, whilst Squashes and Custard Gourds are delicious in midwinter cooked as ordinary Vegetable Marrows.

I want, however, rather to advocate the more extended use of Gourds as decorative subjects than to press their claims to culinary consideration.

For house decoration in winter months ornamental Gourds are useful and durable. In a front hall, for example, a group placed on a salver or large metal dish and artistically arranged is a great acquisition. A group of the miniature varieties, daintily contrasted on a high dessert dish and placed on the sideboard of the dining hall, will form a most charming addition, and will have the merit of lasting a long time in perfect condition.

For church decoration, too, at harvest festivals they are very acceptable. Such varieties as the red and yellow Turk's Cap, Bishop's Hat, Hercules' Club, the Orange, Apple, and Pear Gourds, and the large handsome green and ivory white fruits of the Malabar Gourd (*Cucurbita ficifolia*) are very appropriate, adding variety to the flowers and foliage common to house decoration.

Garden Decoration.

For lending interest to the most picturesque garden, Gourds are unrivalled. A long and wide herbaceous border can be rendered even more attractive by the addition of a few well-selected Gourds of the smaller type, growing on poles at the back of the border. As the summer wanes and the earlier flowers like the Monk's-hood and Aconite and other early flowering species die off and the yellow *Compositæ* become more evident the charming fruits of the Gourd plants will serve to keep up interest in the border and to invest it with an attraction altogether wanting when there are only Dahlias and other tall *Compositæ* to keep the border gay.

Arbours and Screens.

For covering small arbours and trellis-work, plants of the medium and miniature Gourds are very effective. The Gourd plants can be trained so as to cover the whole structure very quickly, but some little judgment will be needed to ensure a crop of attractive Gourds.

For this purpose the flowers should be set, that is, pollinated with pollen from other flowers (staminate).

By this means the Gourds can be obtained where they are most seen.

One of the best and quickest growing Gourds for this is *Cucurbita ficifolia*, the Malabar Gourd. Its rate of growing is very rapid, it is a free setter, and perhaps one of the hardiest of all the tropical Cucurbits. Others equally as useful and interesting are *Thladiantha dubia*, a perennial Chinese Cucurbit, and *Abobra viridiflora*, another perennial Cucurbit having pale green, sweet-scented flowers, and small oval scarlet fruits.

Pergolas.

Few objects in outdoor gardens are so fascinating as a shady, well-covered Italian pergola, and to obtain a really good one requires considerable care and experience; even then some years must elapse before the pergola is well covered.

A Gourd pergola, however, can be constructed and brought to full perfection in one season, given a reasonable amount of sunshine and some little care in the early stages of construction and growth. (Fig. 141.)

The site for such a pergola must, of course, depend on the space at command. Perhaps the best position for it is in the kitchen garden, where, for instance, you have a gravel path with parallel borders on either side. Along these borders strong poles can be erected about every five or six feet: these should be let into the ground and stand quite seven feet high, clear of the path, and more if the material will admit of its being even a foot or so higher. The tops of the poles should be connected or arched with stout rods or thick bamboo canes; poles and rods can then be nailed lengthwise between the upright poles connecting them, and so a continuous archway is constructed throughout the length of the path.

The material used should be fairly stout for the upright poles, but the cross poles or rods need not be much more than good thatching rods, to which the Gourd plants can be easily tied.

The Gourd seedlings should be planted about three feet apart, and carefully started on the framework of the pergola with a light cane or rod.

Much of the success of the pergola will depend upon first getting the woodwork covered early in the season, and second, having a good variety of fruits evenly placed over the pergola. The first condition can be better ensured by planting, alternately with the ornamental Gourds, Vegetable Marrows of small fruiting varieties such as Pen-y-byd and the Malabar Gourd. The Marrows should be pinched and cut back as the Gourds develop. The Malabar Gourd is one of the most handsome Gourds in cultivation; it is in addition a very rapid grower. It is always the first Gourd to reach the top of the pole or pergola, and is invaluable for covering in wet and sunless weather. If the pergola be a fairly large one, a plant here and there of the large Club Gourd *Lagenaria vulgaris*, 'Clava Herculis,' will give variety and add to the picturesque appearance of the structure.

As the summer advances a daily tying and cutting out of superfluous shoots and tendrils will be necessary, as well as a judicious thinning of some of the fruits.

The object to be attained is to secure enough fruits to give the pergola a good appearance; too many will be fatal when the September gales begin.

It is a good practice to get all the small-fruited sorts as high as possible and on the top, keeping the large-fruited sorts on the sides.

Fig. 141.—Arch of Cucurbita ficifolia.

Care, too, will be necessary with those fruits that hang from the roof of the pergola: they will need supporting and keeping in position with raffia or bast ties, to prevent them swaying and breaking in a high wind.

Cultivation.

The first essential to success is good, hardy, and sturdy plants. The seed must not be sown too soon, otherwise the plants become spindly before they are planted.

Exactly when to sow must depend upon circumstances; when a frame with some gentle heat can be requisitioned, the first or second week in April is a good time.

The author of that interesting book "Riviera Nature Notes" says "the right moment for planting Gourd seeds, in the opinion of the peasants, is while the church bells are ringing on Easter eve"; and adds: "I suppose a chapel bell would do just as well. Some chapel bells make noise enough on a Sunday morning to start any Gourd seed germinating. Still one could hardly expect the jangling of schismatical bells to have the same effect as the orthodox carillon."

Germination is very quick in nearly all Cucurbits, and especially so in the genus *Cucurbita*. Care should be taken to pot off the seedlings before they get drawn up, using for this purpose light soil.

For the small varieties and miniature Gourds I find one potting sufficient, but with the larger varieties, Turk's Caps, Squashes, and varieties of *C. maxima*, a second potting, some time early in May, will be necessary.

As soon as the plants are established in their new pots, they should be gradually hardened off in cold frames, and finally the lights of the latter should be taken off during the daytime. Aphides are a great drawback to young plants in their early stages, and if these pests appear they should be vigorously exterminated by fumigation. It sometimes happens that the plants receive during the hardening process a slight check, and mildew is the result. This pest must be got rid of before planting-out time, otherwise the plant is liable to this fungoid trouble all through the summer. Any trace of it must be destroyed with sulphur or some other fungicide.

By the last week in May or very early in June, should the season be a very cold one, the majority of the plants will be hardy enough for planting out. I need scarcely add that the soil into which the Gourds are to be planted should be as rich as possible. Should the soil be heavy, it is a good plan to give each plant a little light soil to make a start with. Subsequent culture will be tying the shoots to the poles and thinning out the laterals and superfluous points. Stopping the shoots will be necessary to produce fruits low down on either the poles or the pergola. Of course with the latter the first care is to cover well the framework; this done vigorous stopping will become necessary.

Plenty of water is a *sine quâ non* to a good crop of fruits, and as the latter swell an occasional watering with liquid manure greatly assists the producing a good crop.

In gardens where the glass accommodation is limited. It is quite possible to have Gourds without the trouble of raising them under glass; the seed can be sown where the plants are intended to remain, care being taken to dig in, previous to sowing, some partly decayed stable manure and to obtain a fine seed-bed with sifted soil.

By this plan good strong plants are obtained, the only difference being that, when the plants are raised under glass, they are got into a fruiting stage somewhat earlier than when sown out of doors.

Two or three Cucurbits are hardy or partially so. These are capital plants to decorate low trellis-work or to adorn the outside of summer-houses, or even potting-sheds and other buildings, which, though indispensable in the garden, are not always so ornamental as they could be made with a little trouble.

Bryonopsis laciniosa is a plant very much resembling in appearance our only British Cucurbit, the white Bryony (*Bryonia dioica*), and, although a native of Ceylon, grows and fruits most profusely during the summer months.

In such a position as I have indicated it makes a very attractive screen, its red and silver-marked fruits being very ornamental. As a companion plant, *Cyclanthera pedata* makes by contrast a good variety: this small-growing Mexican Cucurbit has bright green fruits and grows well in any ordinary soil. Both these plants must be raised during April under glass, hardened off, and finally planted out early in June. For the same purpose and situation, the Californian Bigroot, *Megarrhiza californica*, is the most useful and hardy Cucurbit I know. It has a perennial root, and so one gets the plant year by year without the trouble of annually sowing seed. Its foliage is very distinct and effective, and during a fairly good summer it produces a crop of burr-like fruits that resemble the spiny fruits of the Spanish Chestnut more than a Cucurbitaceous plant.

Gourds and Cucurbits as Stove and Greenhouse Climbers.

Outside the large glass-houses of the Botanic Gardens it is rather unusual to see Gourds used for stove and conservatory decoration, yet I venture to suggest that for brilliant effect and attractiveness few plants can equal many of the tropical Cucurbits and Gourds. Their weird and fantastic shapes, with the added beauty of colour, serve to give either a conservatory or stove-house an interest otherwise wanting in the summer if only filled with the orthodox foliage and flowering plants.

The culture of these plants under glass in no way differs from that required for any ordinary quick-growing tender climber. Careful thinning and tying of the shoots, pollinating the pistillate flowers as they open (for nearly all the Cucurbits are monœcious or diœcious), and keeping the foliage free from the ordinary insect pests of the greenhouse, comprises the attention needed.

Selection of Plants for Indoor Cultivation.

One of the most effective Gourds for this purpose is the Indian Snake Gourd, *Trichosanthes Anguina*. The flowers are pure white and of a beauty that is rare; unfortunately the corolla, very soon after fully opening, begins to curl up, so that one does not often see the fully expanded flower, which must be seen to be appreciated. Its delicate fringed petals, and its exquisite shape and delicious odour, constitute a flower that, were it not so fleeting, would be indeed a floral gem of the first water. The fruit is most attractive. In its young state it is bright green, irregularly splashed with satiny-white; when it arrives at maturity, and a few fruits are hanging from the roof of the stove, the bright orange-red colour and snake forms are highly decorative and picturesque.

In India this Gourd is extensively used by the natives for culinary purposes, curries, &c.

Trichosanthes palmata, said to be a common plant in India, has a much larger flower, about four inches in diameter, with white fringe hanging from the margin—a most exquisite flower. (Figure in "Bot. Mag." vol. cxii., t. 6873.)

The bath-glove or dish-cloth Gourds (*Luffa ægyptiaca*) are very interesting plants when hanging from a stove roof. The Gourds are at first not unlike Cucumbers, with foliage of a more graceful habit. As the Gourds come to maturity and ripen, the outer shell or rind breaks and can be easily detached, showing the well-known "luffa," which is practically the fibro-vascular skeleton of the fruit.

These Cucurbits are very easy of cultivation, and a plant with several fruits in various stages of development is a perpetual source of interest.

Perhaps the most gorgeous-coloured tropical Cucurbit is the orange-coloured Balsam Apple (*Momordica Charantia*), a native of India, Malaya, and tropical Africa. The foliage is small and elegant. The plant can be grown in the smallest house, where its graceful climbing stems and elegant leaves constitute a most charming plant. It is, however, the fruits that are so very striking, having the most vivid orange-coloured pericarp, which dehisces by three valves, exposing large crimson claret-coloured seeds hanging like pendants from the inner walls of the fruit. This plant can be successfully grown in 10-inch pots, in which size they make very decorative conservatory plants.

Benincasa cerifera is a large Marrow-shaped Gourd of singular appearance. It has somewhat larger foliage than the preceding Gourds, and when convenient should be trained at the end of the house. In this position the fruits can be better supported than when they hang suspended from the roof. The Gourds are large oval-shaped fruits, not unlike a well-formed Vegetable Marrow, but densely covered with a white waxy secretion, and further adorned with spiny hairs. This Gourd forms the principal ingredient in many of the Indian confections and sweetmeats, whilst the young immature fruits are used in curries and pickles. It is a widely distributed plant, and is said to have been cultivated for such a long period that its true native habitat cannot be determined. It is, however, noted in the "Flora of Cochin China," by M. Ed. André.

There are several Cucurbits and Gourds that lend interest to the cool greenhouse, when grown as roof plants; indeed as shade plants some of them are useful as well as ornamental.

All the varieties of *Lagenaria vulgaris* are useful in this direction. Grown in large pots (10-inch) and run up the roof with a single stem with one or two fruits (more of the small varieties) they present a very quaint appearance; the curious-shaped fruits hanging from various parts of the house more than compensate for want of colour.

Cyclanthera explodens is a small graceful Cucurbit that is easily accommodated in the smallest house. The little fruits freely set and appear in quick succession through the summer and autumn. They are small green spiny fruits which, when touched just before they are ripe, explode, and eject the seeds, exposing the inner surface of the capsule. An interesting plant worthy of a place, if only for this jerky habit.

Fig. 142.– Gourds on the Roof of Stove, The Grove, Stanmore.

I have now very briefly to point out the importance of this natural order of plants to horticulture generally.

In this country, apart from the economic importance of Melons, Cucumbers, and Marrows, we have not unduly favoured the culture of

Cucurbits. On the other hand, the gardeners of the Riviera and our cousins across the Atlantic attach great importance to the *Cucurbitaceæ*.

In America, Gourds of all descriptions are commonly grown, whilst the cultivation of Water-Melons is immense and constitutes a very large trade between the Southern and the Northern cities. Squashes and Pumpkins, too, are highly esteemed and largely used in American cookery.

Another and increasing addition to the useful Cucurbits is the Chayote, the fruit of the *Sechium edule*. These are imported from the West Indies, and have been seen this season in Covent Garden.

The Department of Agriculture, U.S.A. (Div. of Botany), has quite recently issued a list of sorts bearing varietal names similar to our Vegetable Marrows.

The importance of Gourds to the peasantry of the Riviera, too, can be estimated by visitors to that sunny clime.

Not only do the Cucurbits furnish us with useful fruits and some drugs, but they contribute, or should do, a number of plants that certainly add interest and, to some degree, beauty to our gardens. They require but little culture beyond that bestowed upon ordinary tender annuals, and what little attention they do require is certainly well repaid by the added charm they give to any garden, great or small.

In conclusion I should like to point out two or three rare or new Cucurbits that are very desirable.

A most brilliant Gourd is *Coccinia Dinteri*, having large, long, oval, scarlet fruits, and deeply lobed leaves. It is figured in the "Revue Horticole," 1900, p. 268, from plants grown in Sir T. Hanbury's gardens at La Mortola.

Another most attractive Gourd figured in the same Journal ("Rev. Hort." 1894, p. 108) is *Sicana atropurpurea*, with Vegetable Marrow-shaped fruits of the deepest maroon colour.

Two Cucurbits having really beautiful flowers are *Hodgsonia heteroclita* (syn. *macrocarpa*) and *Telfairia pedata*.

The former (*Hodgsonia*) is a native of Sikkim, found at an altitude of 5,500 feet, and from the figure in the "Flore des Serres," xii. p. 153, is a singularly beautiful flower.

Telfairia pedata, known also as *Fevillea pedata*, is a native of Zanzibar, has large purple-coloured flowers with fimbriæ, and is not unlike some of the larger Stapelias.

Selection of Varieties for Growing.

On Poles or to cover Rustic Fencing and Trellis-work.

White Egg, Apple, Orange, Lemon, Ostrich Egg, White, Green, Warted, and Bicolor Pear, Striped Onion, Golden Bell; varieties of *Cucurbita Pepo*.

Miniature Bottle Gourd and Warted Bottle Gourd; varieties of *Lagenaria vulgaris*.

For Arbours and covering Rustic Summer-houses.

Red, Green, White and striped Turk's Cap, Melopepo and Stradella; Malabar Gourd (*C. ficifolia*), Musk Gourd (*C. moschata*)

For covering a Pergola.

In addition to the above-mentioned, Siphon, Spoon, Dipper and Club Gourds; varieties of *Lagenaria vulgaris*; Flat Corsican and Yokohama Gourds.

For Winter Culinary Use.

Golden Crookneck, Red Étampes, Ohio Squash, Patagonian Squash, Golden Hubbard Squash, Scalloped White Bush, and Burpee's Golden Oblong Pumpkin.

Note on the Cooking of Gourds by Mrs. Frances Hardin Hess.

The preparation of Pumpkins for food is very easy, but requires time. If the weather is very cold a large quantity can be prepared, as it keeps well. If the weather be not frigid, then one must prepare only a limited quantity—say five or six pounds of the raw material.

Peel the amount required and discard the seeds. Cut into bl cks about the size of a Plum. Put into a receptacle which has a *thick* base (as the Pumpkin burns very easily). Pour a small amount of boiling water over it, and bring the whole quickly to a boil. More boiling water will have to be added from time to time, and after the real cooking has begun the receptacle may be set back from the hot fire and allowed to simmer four to six hours. When thoroughly cooked it has a pulp-like consistency, and may be served as a vegetable with meats. It must be seasoned generously with butter, salt, and pepper. Many prefer the pulp put into a frying-pan where bacon has been cooked, so that the bacon flavour is imparted to the Pumpkin-pulp. This latter method is preferable when the pulp has become cold or has stood over for a day or two.

For the New England Pumpkin-pie, take one cupful of the Pumpkin-pulp, one egg beaten thoroughly, sugar enough to make a very sweet custard, nutmeg (grated) for flavour, and milk enough to form a custard consistency. Beat all together thoroughly and crush out any lumps that may still be lurking in the mixture.

Line a pastry-dish with light, delicate pastry rolled very thin. Pour in the mixture until it is one inch deep. Bake in a hot, quick oven. *Do not cover the top of the mixture with pastry.*

These pies are considered good to be eaten hot or cold, and are favoured for the Thanksgiving (the last Thursday in November) and the Christmas dinner. Indeed, they are a staple pie in the Northern States of the Union.

In the Southern States Pumpkins attain a large size, but are not of so delicate a quality as those of the North, and have therefore never been so largely used as an article of food for human beings. They are used chiefly as a food for cattle, and when cows are fed with them, they cause an extra flow of milk of a richer quality.

In the South we have a winter Squash (Kershaw or 'Cushaun') which is cut into large segments and baked without peeling, but discarding the seeds. Served with drawn butter sauce.

We also have summer Squashes of two kinds—one white, flat, and disc-like, the other yellow, known as the 'Crook-neck.' These are cooked like the English Vegetable-marrow, and also are prepared like fried Egg-plant. Indeed, when substituted for Egg-plant they are most easily disguised.

The balsam (described by Mr. Odell) is often formed into a liniment by placing half-a-dozen of the fruits—seeds and rind—into a pint of whiskey or brandy. It is an excellent remedy for cuts, burns, and rheumatism.

FLORAL COLOURS AND PIGMENTS.

By JOHN BIDGOOD, B.Sc., F.L.S., F.R.H.S.

A KNOWLEDGE of floral pigments and their colour effects should be very useful to anyone who is concerned with plant hybridisation for flower production, because without some knowledge of these subjects the operator is to a great extent working in the dark. For it is material substances which are inherited, and not qualities or properties unattached to matter. A plant does not inherit colour or colours from its parents, but the pigments which possess colour or colours as their most distinctive properties; and it does not necessarily follow that, inheriting the pigment, it inherits the parental hue of that pigment. Or it may inherit from one parent an uncoloured substance which, being present in the hybrid with a pigment derived from the other parent, may modify the pigment so that its colour is altered. Or it may even inherit from each parent an uncoloured substance, which in the hybrid may react on each other and produce a pigmented substance.

Some knowledge of the subject is also most useful to the selector. For although nature produces colour varieties by the suppression or even occasionally the production of pigment, and the horticulturist can do nothing but wait and take advantage of each variation as it appears, yet such knowledge might prevent much time being wasted, and hopes being vainly entertained of getting colour varieties which may be in the nature of things impossible.

The subject is a large and a difficult one, with physical, physiological, chemical, and biological sides, and much work has been done and much written about it. The chemistry of the pigments is especially difficult, and commences with the great difficulty of isolating most of them from other plant products, so that they may be obtained in a state of purity. The physics and physiology of colour, colour effect, and colour perception have been greatly advanced of late years, principally in connection with photographic processes, but there are still many problems to be solved. The biological side of the subject is chiefly concerned with questions of the inheritance of pigment, and the losses and gains of pigment which constitute colour variation, and here great confusion exists, for both Mendelists and Anti-Mendelists have concerned themselves very little about the inheritance of pigment, and much about the inheritance of colour, which is quite another matter.

As this paper is chiefly a *résumé* of what is known of floral pigments and their colour effects, there is no need to discuss the question of the uses of pigments to the plant. It is sufficient to say that "they have for the most part solely a biological significance, being commonly used for attractive purposes in floral organs, &c., and in leaves and young stems serving as a protection against excessive insolation. In other cases the colour is simply an accidental property of certain products of metabolism." *

* Pfeffer's *Plant Physiology* (English translation), vol. i. p. 495.

Physical.

By passing white light through a suitable prism, or through a diffraction grating, it is decomposed into its constituents, which show as a band of various coloured lights the well-known spectrum. By recombining the coloured lights of the spectrum white light is again produced—by recombining certain portions of it various coloured lights are produced. But white light may be produced by combination of some only of the spectral coloured lights, and although it will not be physically the same as the original white light, it will produce the same effect on the eye. Similarly, a coloured light of a particular hue may be produced by more than one combination of spectral lights, and whilst physically they may be different from each other, physiologically they will be similar.

There is, however, another way of decomposing compound light, whether white or coloured. If white light be allowed to impinge upon or to enter certain substances, a portion of it may be selectively absorbed, and the remainder reflected from the surface or transmitted through it. The portion absorbed is lost as light, and the remainder, usually compound, gives the substance its particular hue. If the substance absorbs all, or nearly all, the light which falls upon it, it is black; if it absorbs only a portion of it, but all the spectral colours in the proportion in which they exist in white light, the substance is grey or white. There is no substance which, if present in sufficiently large quantity, does not absorb all the light which may enter it. Thus no light reaches the bottom of the deep ocean.

The colour of a substance when viewed by the light reflected from its surface is not always the same as its colour when viewed by the light which is transmitted through it. Such substances are said to be dichroic. There are more than one dichroic pigment occurring in plants, but as they do not exist there under such conditions that their dichroism is effective it need not concern us here.

There are three well-known characteristics of a colour:—

1. The hue, often called the tone of a colour, whether a simple spectral colour or a mixture of spectral colours, is determined by the wave-length or the refrangibility of the coloured light or lights, in conjunction with the quantities of each in its composition if the light be compound. Thus, in the case of simple colours, all the colours of the spectrum differ from each other in hue. In the case of a compound colour, such as lilac, it may incline to the blue or the red side, according to the predominance of red or blue in its composition.

2. The luminosity or brightness of a colour is determined by the actual amount of light of its particular hue which is given off from the coloured surface, or which is transmitted through the coloured substance. Thus, of two blues of the same hue, one may be brighter than the other. In general, the same dye will cause more or less brightness in the colour of a dyed fabric according as the dyeing solution used has been weaker or stronger. And if there be two flowers both containing the same pigment in different quantities, their colours will, in general, be of the same hue but one will be brighter or more luminous than the other.

3. The purity, fulness, saturation, or tint of a colour is determined by

its freedom from admixture with white light. Thus a small amount of violet light mixed with a large amount of white light will barely tint the latter, whilst unmixed the colour is pure or very decided in tint, though of slight luminosity. By the admixture of white light we get chalky blue and reds &c.

The colour of a solid pigment is not always the same as that of its solution, and the tone of the solution may vary according to its strength and the presence or absence of other even uncoloured substances in solution with it. Thus there are plant pigments which are yellow in weak solution, orange in stronger solution, and red in still stronger solution. There are also plant pigments which are red in a solution with free acid, and blue in a solution without acid or with an alkali. The solvent also has often an effect on the colour of the solution. These phenomena are connected with the modern physico-chemical theory of the electrolytic dissociation of molecules in solution. The theory is that the molecules of many substances, when they enter into dilute solution, are decomposed into positive and negative ions, and that the light absorption of such a solution, and therefore its colour effect, is made up of the combined absorptions of the ions. The solid is wholly made up of undissociated molecules, whilst in a stronger solution dissociated and undissociated molecules are present together. When the undissociated molecule is coloured the tone of the ion is often different. It therefore follows that the hue of the solid is sometimes different from that of a strong solution which contains both ions and complete molecules, and the hue of a weak solution which may contain none but completely dissociated molecules is again different. The addition of various substances to the solution, especially of acids or alkalis, may cause the dissociation to advance or retreat, and so alter the colour.

A good example is to be found in the well-known substance, litmus, which is a plant product used as an indicator in chemistry. In this, both the undissociated molecule and the ion are coloured, but in different ways. The solid neutral substance is blue. In stronger aqueous solution it is also blue. If an acid be added to the blue solution the dissociation of the molecules is increased, and the free ions thus produced are red. If an alkali be now added to neutralise the acid the dissociation retreats and the solution is again blue. The presence of acid, alkaline, and other substances in solution in the cell-sap of plants, together with pigments, has a great influence on the colours of the pigments.

Flowers are viewed by the light which is given off from their surfaces, much of it after having penetrated to a greater or less extent, and not by that which is transmitted through their tissues. In a white flower the cell-walls and the cell-contents are all colourless and transparent. Of the white light incident upon such a flower, a portion is reflected, from the outer walls of the epidermis. If these walls be at all papillate and striated, as is usually the case, then this portion is scattered in all directions, or is irregularly reflected, as it is called; if they be smooth, this portion of the incident light is regularly reflected and the surface is polished or shiny, as is the case with the floral segment of a Buttercup, the skin of a Bean, and the surfaces of many leaves. The rest of the incident light enters the epidermal cells, passes through their contents—

some of the light being scattered if there be solid particles present—and meets the inner walls of the cells. Here some of it is reflected and passes out of the cell again into the air; the remainder passes into the subjacent cells and there goes through the same course as in the epidermis. The consequence is that the light coming from the petal of a flower, and by which we view it, has passed through the walls and contents of one, two, or more layers of cells before it reaches our eyes. The flower appears white, although made up of transparent, colourless elements, for the same reason as the mass of bubbles which constitute foam appears white, although made up of water, because we view it by the light which, impinging upon it, is scattered and thrown back by the numerous reflecting surfaces it meets. Whilst the white flower absorbs white light, so that in sufficient thickness it would be opaque, it exercises no sensible selective absorption.

Now consider the case of a flower which has a dissolved red pigment in its cells. The white light incident on its outer surface is partly reflected there as white light. As this is invariably the case, the colour of no flower can be saturated or pure. The rest of the light passes into the coloured cell-sap, where a portion of it is selectively absorbed, and the remainder, reflected from the various cell-walls it meets, or scattered by the solid particles in the cells, emerges from the surface and gives its hue to the flower. In this case it would be an unsaturated or impure red.

Next consider the colour effect when two pigments are present in the cells, and take as examples cases where a yellow pigment in solid particles (*a*) underlies, (*b*) is evenly mixed with a dissolved red pigment.

(*a*) Some white light is scattered from the outer surface. The remainder enters the red cell-sap, suffers selective absorption, and is deprived chiefly of its violet, blue, and green constituents, and even of the yellow and orange if the solution be very strong indeed—the character and amount of the light absorbed depending on the strength or depth of the red solution. The residue, as a rule consisting chiefly of red, orange, and some yellow light, then meets the yellow particles, where further absorption of nearly the same constituents takes place with some of the red. The light reflected out of the cells then consists of red, orange, and yellow, not, however, in the same proportions as they exist in white light, together with some white light, and the resultant colour effect varies from orange to red-brown according to the nature and strength of the pigments.

(*b*) If the yellow particles be evenly mingled with the dissolved red pigment, more yellow light will be reflected out of the cells by the particles nearer the surface, and the colour effect will be a more decided orange. It will also be more luminous.

Should the overlying dissolved pigment be of a crimson, purple, violet, or any other colour compounded of red and blue, then, in addition to some absorption at both ends of the spectrum, there will be a broad absorption band in the orange and yellow. The colour effect of such a solution of pigment overlying solid yellow particles would vary according to the strength of the solution, but would be in general a dark chocolate.

Should the pigmented particles be green chlorophyll corpuscles underlying the red solution, then the chlorophyll would absorb all, or nearly all, the light passed by the soluble pigment, and little or none would reach the surface again. The effect would be a dark neutral brown or black.

I can recall but one instance of a blue dissolved pigment overlying yellow particles in a flower. This condition may be produced artificially, however, by placing a flower containing soluble red pigment overlying a yellow in an atmosphere of ammonia. By this means the dissolved red pigment becomes blue, and where the soluble pigment is in large quantity the resultant colour effect is black; where it is in slight concentration the induced effect is green.

I know also of one instance of a blue dissolved pigment overlying a yellow pigment in solution. In this case, which will be described later, the combined effect is green.

It must not be forgotten that the extent to which selective absorption takes place is dependent on the amount of pigment present. The presence of solid particles of pigment which have separated out from a saturated solution always greatly increases the absorption of light. And in cases where pigment has separated from solution and formed compounds with other cell constituents, such compounds being of a different colour from the solution, nearly all the light may be absorbed, and a black be produced.

There is no instance among plants, so far as I am aware, such as is frequently found in animals, of subjective colours produced by the interference of light in thin films, and without the presence of pigmented substances. Nor is there any example in the plant world of pigmented bodies "expanding with diffusion of pigment, and contracting with intensification of tint, from yellow to orange, or from orange or red to brown or black," such as is to be found amongst fishes and other animals.*

Floral Pigments.

So few of these pigments have been obtained in a state of purity, and so little is known of their composition and constitution, that no classification of them on a scientific basis is possible. Since, however, some classification is necessary for orderly reference, it has usually been made on their colour, and their solubility in water. In the present state of our knowledge this is, perhaps, as good as any other. There are, therefore, two main classes :—

1. Those which are insoluble in water and in the cell-sap of plants.
2. Those which are soluble in water and in the cell-sap of plants.

1. *Insoluble Floral Pigments.*

This class contains pigments which are always found contained in, or which, at any rate, have been formed in, certain specialised bodies of a proteid nature, of minute size, called plastids. In early life the plastid is always colourless, and in some cases it remains so throughout life. Then it is called a leucoplastid, and is more often to be found in the subterranean parts of plants. The plastid may, however, develop a green pigment and become a chloroplastid or chlorophyll corpuscle, and may

* Bridge, *Cambridge Natural History*, Fishes, Ascidians, &c., p. 109.

subsequently, by the decomposition of its chlorophyll, or by the development of a new pigment or pigments, of a yellow, orange, or orange-red colour, become a chromoplastid. This has been proved to be often, and is probably always, the course of development of chromoplastids. Courchet * followed their development in the flowers of *Genista tinctoria*, *Helianthemum vulgare*, *Cacalia coccinea*, many *Cruciferæ*, *Berberideæ*, and others, and found that the plastids were first uncoloured, then green, then yellow, and when development went further, as in *Cacalia coccinea*, orange-yellow, and finally orange-red.

Plastids follow an almost independent life in the cells of plants, increasing in number by division of pre-existing plastids, and never being formed *de novo* from the protoplasm of the cells. The very rare absence of chromoplastids from the flowers of a variety which normally contains them has no ill effects on the plant or its flowers. They are heritable and inherited, and are more rarely found wanting in the progeny of chromoplastid-containing parents than any other pigment. On the other hand, the production of a plant containing chromoplastids in its flowers from parents wanting these bodies is hardly thinkable.

The vast majority of yellow, orange-yellow, orange, or orange-red flowers owe their colours to the presence of chromoplastids in the cells. Occasionally the chromoplastid is uniformly coloured by a pigment evenly distributed throughout it, but in most cases the pigment occurs in the plastid in the form of small amorphous granules, or of small crystals. It is possible that the granules may be composed of more than one substance; the crystals are pure and are composed of a substance called *carotin*, because first prepared from the root of the Carrot, which owes its colour to this pigment.

There is carotin in the corona of *Narcissus poeticus* in the form of rhombohedral plates of a carmine-red colour, in the root of the Carrot and the fruit of the Tomato also in crystal form, as amorphous particles in the fruits of *Arum* and *Taxus baccata*, and in a great number of flowers as well as other fruits. It appears to be always present in chlorophyll corpuscles. Arnaud † extracted it from the leaves of Spinach, and found that it formed flat rhombic crystals with a metallic lustre; that they were dichroic, being greenish-blue in reflected light and orange-red in transmitted light; and that it is dissolved in concentrated sulphuric acid to a blue solution which was at first momentarily violet. He found that it was a hydro-carbon, and gave to it the formula $C_{26}H_{38}$. The pigment extracted by him from Carrots was identical with this. According to Immendorff, the development of carotin is the cause of the autumnal coloration of leaves.‡ From the corona of *Narcissus Tazetta*, 'Grand Soleil d'Or,' carotin with other pigments may be extracted by strong alcohol, and on the evaporation of the solvent the carotin first separates out in the form of orange-red crystals. From solutions in ether the crystals are blood-red. The solution in alcohol is yellow to orange, according to concentration; the ether solution, in which carotin is more soluble than in alcohol, is of a deeper orange colour. Carotin is also

* Courchet, "Recherches sur les Chromoleucites," *Ann. des Sci. Naturelles*, série 7.
† Arnaud, *Comptes Rendus*, 1885, p. 751; 1886, p. 1119.
‡ Zimmermann, *Botanical Micro-technique*, p. 102.

soluble in chloroform, forming an orange-red solution, and in carbon bisulphide to a blood-red solution. As already stated, concentrated sulphuric acid dissolves it to a blue solution after turning it momentarily violet. Iodine in potassium iodide solution turns it green, while alkalis have no effect upon its colour.

The pigment, which, however, occurs most commonly in chromoplastids, is yellow or orange-yellow in colour, according to its concentration, and has not yet been obtained in the crystalline form. It is soluble in alcohol to a yellow solution, and on evaporation of the solvent the pigment is deposited in oily globules of a yellow colour which on complete evaporation form a greasy yellow layer. This is turned blue by concentrated sulphuric acid after a momentary green; it first becomes green, and is then immediately bleached by strong nitric acid; it becomes green by solution of iodine, and it is unaffected in colour by alkalis. Its reactions are therefore very similar to those of carotin. This is the pigment which was named *xanthin* by Frémy and Cloëz.* It is not by any means certain that xanthin is a single or even a distinct pigment. There are indications that it may be a compound of carotin, or some substance allied to carotin, with a fatty body.

Carotin and xanthin constitute the *xanthic series* of pigments constituted by A. P. de Candolle in his "Physiologie Végétale." A. Hansen † called them lipochromes—colouring matters belonging to the fatty group—and this name is retained by zoologists for a series of pigments, red, orange, or yellow, with similar properties found in animal bodies.

The presence of xanthic pigments in a flower may be demonstrated by placing a drop of concentrated sulphuric acid on the spot to be tested. If either or both be present a blue colour will result—often, however, a green, owing to the presence of another substance giving a deep yellow colour with the acid.

Since nearly all yellow flowers owe their colour to chromoplastids containing xanthin, it is not necessary to furnish a list here.

Courchet describes, in the article already referred to, the chromoplastids of the flowers of *Aloë*, which contain amorphous pigment granules which are neither carotin nor xanthin. The pigment dissolves in alcohol to a currant-red solution which becomes rose-red on concentration, and on evaporation gives up red globules. These are coloured a yellowish-green by concentrated sulphuric acid.

Marshall Ward and Miss E. Dale ‡ examined microchemically the pigment from the chromoplastids of the flowers of *Gasteria formosa*, a genus closely allied to *Aloë*, and found the pigment to have essentially the same reactions as Courchet found for that of *Aloë*.

The floral axis of *Neottia Nidus-avis* contains chromoplastids which enclose crystals of a brown pigment. Very little is known of this pigment.

* Frémy and Cloëz, "Note sur les Matières colorantes des Fleurs," *Journal de Pharmacie*, t. xxv., p. 854.

† A. Hansen, *Die Farbstoffe der Blüthen und der Früchte*, Würzburg, 1884.

‡ On *Craterostigma pumilum*, *Transactions of the Linn. Soc.*, Botany, vol. v. part 10.

2. *Soluble Floral Pigments.*

This group may be divided into two sub-classes, namely :—

(*a*) The pigment or pigments which are in colour red or blue, or some combination of red or blue, such as purple, crimson, lilac, heliotrope, violet, &c. This is the *anthocyan* of Ch. Maquart. It constitutes the *Cyanic series* of A. P. de Candolle.

(*b*) The pigments which, being soluble in the cell-sap of plants, colour the sap yellow, orange-yellow, orange, or orange-red. There are certainly several of these pigments, and they may be said to constitute a *Xantheïc series* of pigments.

THE CYANIC SERIES, OR ANTHOCYAN.

Anthocyan was the name applied by Maquart * so long ago as 1835 to that pigment which becomes red by the action of acids, and blue again by the action of alkalis. In flowers it is almost entirely confined to the epidermal cells ; where it is found in leaves and other organs, it is situated, as often as not, in deeper lying tissues.

There has been in the past a considerable difference of opinion as to whether the substances of various colours, which are classed together as anthocyan, are a single pigment whose colour depends on the acidity, neutrality, or alkalinity of the cell-sap, or whether there is a number of such pigments. A. Hansen distinguished between the colouring matter which gives red tints and those giving blue and violet tints. N. J. C. Müller † was of opinion that there is a great variety, but he gives no evidence that he experimented with pure pigments. On the other hand, Krukenberg ‡ regards them as identical. The fact is that there is no certainty, and not even a strong probability, that the pigment has been ever obtained completely separated from other substances, and until that has been done nothing certain can be said about it. Since it has not yet been proved that there is more than one cyanic pigment, there is no need to consider it as other than a single substance, especially as we have a colouring matter in litmus, whose composition is known, which also becomes red on treatment with acid, and blue again on treatment with alkalis.

There is no question about the red reaction of anthocyan with acids, but it is generally stated that under the action of weak alkalis it becomes blue, and of stronger alkalis first blue, then green, and then yellow. For example, Van Tieghem § says : " Some cell-sap holds in solution various nitrogenous colouring matters. The commonest is anthocyan. The aqueous extract of *Viola*, for example, becomes bright red with acid ; cautiously neutralised it is blue ; excess of alkali makes it green." Zimmermann ‖ says that the solution of anthocyan in water has, according as its reaction is more or less acid or alkaline, a red, violet, blue, blue-

* Ch. Maquart, *Die Farben der Blüthen*, Bonn, 1835.

† N. J. C. Müller, *Jahrbüch für wiss. Bot.* xx. 1889.

‡ Krukenberg, *Grundzüge einer vergleichende Physiologie der Farbstoffe und der Farben*, p. 116.

§ Van Tieghem, *Traité de Botanique*, p. 535.

‖ Zimmermann, *l.c.* p. 107.

green, green, or yellow-green colour. Newbigin * says that alkalis change anthocyan from red to blue, green, and yellow successively; an excess bleaches it. And N. J. C. Müller says that solution of caustic potash on various red pigments gives blue, blue-green, green, yellow, and brown colours.

This much is certain, that alkalis acting directly on the coloured plant tissues, as well as when they are applied to the crude residue of an alcoholic or watery extract of the tissues, nearly always show some such series of colour reactions as those stated above. I will endeavour to show the reasons for this presently.

Naylor and Chappel † separated a substance from the petals of *Rosa gallica* which they took to be the pure red pigment of the flower. This was a red amorphous substance which deepened in colour on the addition of dilute sulphuric acid, but with solution of potash it gave a deep red with a green fluorescence, and with an excess of potash a yellowish-brown. Senier ‡ also claimed to have isolated the anthocyan from this flower. He found it to be an acid compound which formed crystalline salts with the alkalis and amorphous salts with certain of the heavy metals.

Now solution of potash does not give a deep red colour when applied to the petals of *Rosa gallica,* but first a blue and then a green, or a green at once, according as the solution of potash is weaker or stronger, and it therefore appears that Naylor and Chappel were not dealing with anthocyan in their experiments, not at any rate as it exists in the flower.

There exists in the cell-sap of most flowers a substance or substances —in some cases glucosides, in others carbohydrates—which give a deep golden-yellow colour with alkalis and with concentrated mineral acids. The consequence is that the application of an alkali to an anthocyan-containing flower very often gives a green colour due to the blue colour of the alkaline anthocyan *plus* the yellow colour also produced at the same time by the alkali with the other substance. If the reagent be weak the anthocyan is first turned blue and the yellow comes later; if the alkali be strong the green colour is produced at once. Presently the anthocyan is destroyed by the alkali and the yellow colour remains. This may easily be tested by placing suitable flowers for a short time in an atmosphere of ammonia, or in a solution of soda or potash. The gas, however, acts more evenly. But there are floral tissues containing anthocyan which become only blue with alkaline solutions. The epidermis and hairs of the inner surface of the labellum of *Cypripedium Spicerianum* contain such pigment. And there are even others which with an alkali give first a green colour and then a blue. It may be laid down as a general rule that the alkali test is not trustworthy when applied to the tissues or the crude extracts of them, and the results ought to be checked by microchemical tests and by the use of other reagents.

The actual colour of the anthocyan in flower cells depends upon the reaction of the cell-sap. If this be decidedly acid, the colour is red; if weakly acid, the colour is something between red and blue, and this is

* Newbigin, *Colours in Nature.*

† Naylor and Chappel, "Note on the Colouring Matters of *Rosa gallica,*" *Pharm. Journ.* August 13, 1904.

‡ Senier, *Pharm. Journ.* [3], 7, p. 650.

generally the case; if neutral, the colour is blue. Anthocyan, in fact, behaves towards acids and alkalis like litmus, and no doubt for the same reason. Protoplasm appears to be always alkaline in reaction, and when an anthocyan-containing cell is killed the pigment stains the protoplasm of the cell blue. This is especially the case if tannins be present, for then the dead protoplasm is tanned, and this makes it specially conditioned to absorb pigment.* There is a general impression that the sap of a cell containing blue anthocyan must have an alkaline reaction. Detmer † says, concerning the blue pigment in the cell sap of the corolla of *Myosotis*, that the reaction of the cell sap here is slightly alkaline, for the pigment becomes red by the addition of acid. And Pfeffer ‡ makes the cautious statement that the blue coloration of the Hyacinth, Blue-bell, or Cranberry shows that the cell sap is neutral, or slightly alkaline. I have not found an alkaline reaction in the cell sap of any flower, although I have found acid and neutral sap, nor do I find any record of an alkaline reaction ever having been specifically detected. So that there is no reason, so far as I know, for assuming that the sap of a cell in which there is blue anthocyan is other than neutral. In some plants, notably among the *Boraginaceæ*, the flower when first opened is red, and then the cell-sap is certainly acid. It shortly, however, becomes blue, showing that the acidity has disappeared. The blue variety of the common Primrose is not a variety containing a pigment different from the red anthocyan of the plants from which it was obtained. It is merely a variety with less acid in its cell-sap. The blue colour is only an accident

Not infrequently cells are so gorged with anthocyan that some of it separates out in the solid state, and this leads to much greater light absorption, and therefore to lessened luminosity. This is the case in *Delphinium Ajacis*, the cells of which contain needle-like crystals of the blue pigment, some of the cells of the petals of *Anagallis arvensis*, *Delphinium Consolida*, *Delphinium formosum*, and others. The black marks on the skin of the Scarlet Runner Bean are due to solid blue pigment in the epidermal cells. In cases where cells containing red dissolved anthocyan deposit solid blue particles, as in the epidermal cells at the base of the petals of *Papaver Rhœas*, and in certain cells of the petals of *Cytisus Laburnum*, the latter probably consist of a compound of anthocyan with a proteid substance, or perhaps a tannin. The solid particles are reddened and dissolved by acids, but they do not dissolve in water.

Little or nothing is known as to the chemical nature of anthocyan. Pfeffer is of opinion that it is a tannin or a compound allied to the Phenols. Wigand has shown that red sap is peculiarly characteristic of tannin-containing plants, and that the pigment arises from a substance giving tannin reactions. Pick describes a large number of cases of developing shoots whose cells, which a little later are filled with red cell-sap, abound in a tannin-reacting substance, the disappearance of which is followed *pari passu* by the advent of the red pigment.§ The presence of

* Gardiner, *Proc. Camb. Phil. Soc.* 1883, p. 388.

† Detmer, *Physiologie Végétale* (French translation), p. 259.

‡ Pfeffer, *l.c.* I. p. 490.

§ Quoted by Keeble, *Science Progress*, vol. i., new series, p. 406.

sugar seems to have some effect. Ewart observed that immersion in sugar solution may induce a formation of red pigment in cells of certain aquatic plants, and Overton confirmed this observation.*

The immediate precursor of anthocyan in plant tissues is most probably a soluble colourless compound. It frequently happens that the colourless sap of the cells of flowers takes a bright red colour with an acid, the red colour being converted to a blue one by the subsequent use of an alkali. I find such colourless cells near others containing anthocyan, in some albino varieties which normally would contain anthocyan, and in the colourless unopened buds of some flowers which later would contain anthocyan.

In most cases, although not in all, light is necessary for the development of the anthocyan pigment. Many flowers do not develop any colour in darkness, nor do many fruits, such as Apples and Pears, unless, they are in strong light. On the other hand, the flowers of *Tulipa Gesneriana* and *Pulmonaria officinalis*, as well as Red Grapes, assume their normal coloration in complete darkness.

Anthocyan is inherited except in the comparatively rare cases of complete albinism. On the other hand, cases are recorded where two plants with white flowers have had progeny with anthocyan-pigmented flowers. Bateson and Saunders describe cases of this happening with species of *Matthiola*.†

THE XANTHEÏC SERIES.

This is at present the most suitable name for the series of pigments which, being soluble in the cell-sap of flowers, colour it yellow, orange, orange-red, and even a bright brick-red. When the dissolved pigment is not present in strong solution it is not difficult to select on inspection flowers containing one of these pigments from amongst others which owe their colour to xanthin or carotin. In the former case the colour is more delicate and transparent than in the latter, and it may be said generally that all floral colours of a primrose or sulphur yellow are produced by dissolved pigments. Where, however, the colour is a stronger yellow, or inclines to orange or orange-red, the microscope or reagents must be used.

Frémy and Cloëz designated the soluble pigments of flowers; which become a reddish-brown with sulphuric acid, xantheïn. I include all these pigments, for convenience, in the xantheïc series, although very few of them give a red-brown colour with this reagent.

The pigments of this series are not common in flowers; yet there is a fair number which owe their colours to them. It appears that all the colour effects from yellow to red may be produced by one and the same pigment, according to its degree of concentration in the cell-sap.

They may be divided, probably quite artificially, into two subdivisions according as sulphuric acid produces an orange or red colour with the pigment, or has little or no effect upon its colour. There is no doubt that here, as with anthocyan, the effects of reagents upon the pigment *in situ*, or upon a crude extract of the tissues, are complicated by the

* Pfeffer, *l.c.* I. 496, footnote.

† Bateson and Saunders, Royal Society, *Report to the Evolution Committee.*

frequent presence of other, often colourless, substances which also react with strong acids, and with alkalis.

Only two, so far as I know, have been isolated, and these because they are easily crystallisable. As they are typical in their reactions of the two subdivisions I have mentioned, I give an account of them here. Courchet obtained, by the action of strong alcohol on the flowers of *Linaria vulgaris*, a golden-yellow solution which on concentration deposited deep-red needle crystals grouped in spherules. They dissolved in strong sulphuric acid, forming a blood-red solution, and in strong solution of potash to a pale yellow solution. Sulphuric acid on the floral segments gives the same red colour, and on the palate of the flower, where the yellow colour is very intense, this reagent gives a red so deep as to appear nearly black.

The same observer also obtained in very small quantity from the flowers of *Eschscholtzia californica* a pigment which crystallises in yellow needles grouped in spherules, and which dissolves in strong sulphuric acid to a clear yellow solution. I find this same pigment in very large quantity in flowers of *Narcissus Tazetta*, 'Grand Soleil d'Or.' If these flowers are exhausted with strong alcohol and the solution set to evaporate spontaneously, there first separate out red crystals of carotin, then oily drops of xanthin, and finally the yellow needle-crystals of the pigment in question, and to a very large amount. These crystals may be easily separated from the xantheïc pigments by the action of ether, which dissolves the latter, but has no effect on the former. They are slightly soluble in cold water, easily in hot water, and by means of the latter, therefore, they may be purified. Their solution gives a greenish colour with ferric chloride, indicating a tannin character, and a yellow precipitate with basic lead acetate, and the substance does not reduce Fehling's solution on boiling. On long boiling, however, with dilute sulphuric acid, the substance is hydrolysed with the production of a reducing sugar and a red crystalline compound insoluble in cold water. The pigment is, therefore, a glucoside. It is worthy of note that there are varieties of this very variable *Narcissus* which contain the three pigments named, others with two, others with one, and the variety called 'Paper-white' contains none of them.

Of the flowers which owe their colours to xantheïc pigments the following may be noted. In all of them the pigment is contained in the epidermal cells of one or both surfaces of the floral segments. In this respect, therefore, it is like anthocyan.

The cultivated varieties of *Antirrhinum*. The pigment which gives the deep yellow colour to the palate of this flower, even in otherwise white varieties, is of the same kind, although in greater concentration, as that which colours the petals generally in the yellow form, or which forms the yellow stripes in some forms. Strong sulphuric acid, as well as alkalis, convert the yellow to a deep orange or orange-red colour. In some varieties there is a peculiar brick-red colour which is almost certainly due to an admixture of anthocyan and the xantheïc pigment in the same cell. De Vries,* speaking of striped Antirrhinums, says:—"In some the ground colour of the flowers is yellow, in others it is white. On

* De Vries, *Species and Varieties: Their Origin by Mutation*, Chicago, 1905, p. 315.

these ground colours the red pigment is seen lying in streaks of pure carmine, with white intervals where the yellow fails, but combined with yellow to make a fiery red, and with yellow intervals when that colour is present." But, since the yellow pigment is always in the epidermal cells when present, it can hardly be said to form a ground colour to the red so that the latter lies on it.

The yellow colour of the *Dahlia* is due to a xantheïc pigment in the epidermal cells. Strong sulphuric acid and alkalis applied to the yellow petals produce a brilliant red colour. By appropriate treatment a yellow, waxy, amorphous substance may be extracted from the petals which reacts with strong acids and alkalis as the petals do.

The flowers of *Lotus corniculatus* also owe their yellow colour to a dissolved pigment in their epidermal cells. This becomes orange with strong sulphuric acid and with alkalis. Courchet, who examined this pigment, was unable to obtain it in crystals. The flower almost always contains anthocyan as well.

The Cœlogynes appear all to contain xantheïc pigment, which varies in colour from light primrose-yellow through orange to brown, and even a dead black. The epidermal cells of the fringes in the throat of *Cœlogyne cristata* contain a yellow pigment in solution, together with a very few solid particles of a yellow and others of a red colour, where the flora colour inclines to orange. The red particles are apparently carotin; the yellow particles are of the same nature as that dissolved in the cell-sap. In the form *C. cristata Lemoniana* the carotin is wanting to the cells. In the form *C. cristata alba* all the pigment is absent. Strong sulphuric acid turns the yellow tissue first an orange and then a red approaching crimson; alkalis turn it orange. The pigment may be extracted with alcohol, but no crystals can be obtained from the solution.

In *Cœlogyne ocellata* the orange-brown markings on the flower are due to orange cell-sap in the epidermis, each cell of which contains also an irregular lump of a bright-red granular substance. Strong sulphuric acid turns the pigment a very deep red colour and dissolves the lumps of pigment, which are composed of the same substance as that dissolved in the sap. Potash gives the same colour reaction.

The flowers of *Cœlogyne tomentosa* have solid brown markings on the lip and yellow fringes in the throat. Both are due to dissolved pigment, and apparently the same pigment, for their reactions with strong sulphuric acid are similar. The brown colour is due to a very concentrated solution.

Cœlogyne Dayana has stripes and blotches of brown on the labellum of its flowers. The colour is due to cell-sap which is clear yellow in weak solution. Sulphuric acid produces the same colour reaction as with the pigment of the other Cœlogynes.

The palate of *Cœlogyne pandurata* is of a dead black colour. The pigment, which is present in enormous quantity, is yellow in thin layers, There is every reason to believe that the xantheïc pigments of all the Cœlogynes are identical.

The petals of *Rhinanthus Crista-galli*, which contain also yellow chromoplastids, the yellow Hollyhock, the yellow Carnation, and the yellow Iceland Poppy are all coloured by dissolved pigments which belong to that subdivision which gives an orange or red colour with concentrated sulphuric acid. Courchet notes that the petals of *Centaurea collina*, and the staminal filaments of *Dianella* also, have xantheïc pigments belonging to the same subdivision. The cell-walls of the epidermis of the callus masses in the throat of the flower of *Phaius Humblotii* are stained by a yellow pigment which becomes orange on treatment with strong sulphuric acid.

Xantheïc pigments of the other subdivision, those which are unaffected in colour by concentrated sulphuric acid, or which become a clearer yellow colour with that reagent, are moderately frequent.

Courchet notes that the portion of the petal of *Anagallis arvensis* which lies just above the claw owes its colour to an orange-red cell-sap, which becomes a clear yellow on treatment with mineral acids and alkalis. The claw contains anthocyan, and where the xantheïc pigment borders on the cyanic, both pigments are present in the same epidermal cells. Here alkalis produce a green colour due to the blue anthocyan *plus* the yellow xantheïc pigment. The same observer notes that the ovary of *Salpiglossis* contains an orange-red cell-sap which is unchanged in colour by solution of potash, but becomes a clear yellow colour by strong sulphuric acid.

The common yellow Crocus of the garden owes its colour to a yellow epidermal cell-sap which, *in situ*, gives no evident colour reaction with mineral acids and alkalis. The pigment may be extracted with alcohol, and on evaporation of the solvent the amorphous residue, of a clear orange-red colour, dissolves in strong sulphuric acid to a fine green solution, and in potash solution with a greenish-yellow colour. The pigment which gives the stigmas their fine red colour is identical with that of the perianth segments, but it is present in much greater quantity.

The yellow Primrose owes its colour to yellow epidermal cell-sap in the upper part of the petals, to yellow chromoplastids in the portions close to the corolla tube. No variety of this Primrose has lost this central yellow pigment. The xantheïc pigment is slightly deepened in colour by mineral acids and alkalis. In a slightly flushed form of the flower epidermal cells containing yellow sap may be seen lying side by side with others containing rose-coloured anthocyan.

All the yellow Roses which I have been able to examine owe their colour to xantheïc pigment dissolved in epidermal cells. Strong sulphuric acid gives a deeper yellow colour to this, as also to a very light yellow Lupin which I have examined.

Strasburger * points out that the epidermal cells of the staminal filaments of the flowers of *Verbascum nigrum* contain, immersed in a yellow sap, irregular lumps of a cinnabar-red pigment.

From the foregoing notes it will be evident that the xantheïc series of pigments consists of several distinct substances. The soluble pigment which can be obtained from *Narcissus Tazetta*, 'Grand Soleil d'Or,' as well as from *Eschscholtzia californica*, is certainly a glucoside, and that obtained by Courchet from *Linaria vulgaris* appears to have properties similar to some of the Flavone group of Phenolic colouring matters which have in recent years been isolated by A. G. Perkin and others from various parts of plants, including flowers.† These colouring matters are obtained by

* Strasburger, *Practical Botany* (English translation), p. 41.

† *Chemical Society's Journal*, 1896, *et seq.*

the hydrolysis of glucosides which exist dissolved in the cell-sap of the plant. From the petals of the yellow Wallflower—which, however, owes its colour wholly or mainly to chromoplastids—Perkin obtained, by the decomposition of a glucoside, the yellow colouring matters quercetin and isorhamnetin. From white Hawthorn blossoms he obtained quercetin; from the yellow flowers of *Delphinium Zalil* he got the same colouring matters as from the Wallflowers; from the flowers of *Gossypium herbaceum* a yellow colouring matter called gossypetin; and compounds of the same class have been obtained from flowers of *Delphinium Consolida*, *Butea frondosa*, *Robinia Pseud-acacia*, and others. In all these cases the colouring matter exists in the flowers in the form of glucosides which are colourless or only slightly coloured. They are hydrolysed by dilute mineral acids with the production of a reducing sugar and the colouring matter. It is known, however, that many glucosides are decomposed by ferments existing in plants. Glucosides are so frequently to be found in floral segments as to be almost universal, and it does not seem unreasonable to suggest that it may yet be shown that many other of the xantheïc pigments are glucosides, or the products of the decomposition of such compounds.

It is worthy of note that when, within the limits of a single species, red or blue, yellow and white varieties are known, the yellow pigment is always xantheïc, according to the varieties I have been able to examine. Indeed, so often does anthocyan disappear and a dissolved yellow pigment appear in its place that there is probably a close connection between them. Carnations, Iceland Poppies, Antirrhinums, Hollyhocks, Lupins, Primroses, Stocks, and Hyacinths have already been mentioned. Roses and Dahlias, although hybrids of many species, have, I think, no yellow ancestors other than those whose pigment is xantheïc. The common Primrose and the Hyacinth are most remarkable in that they exhibit blue, red—and every hue formed by the admixture of blue and red—white, and yellow varieties, the central yellow xantheïc pigment of the Primrose being, however, always present. The experience of the selector is, I believe, that the yellow variety is the last to arrive; so that the course of colour variation in flowers is from red or blue to albinism, and then from the white form to the yellow.

If this variation course hold good for all, then xantheïc-coloured flowers may be placed at the extreme limit of colour variation, and, for example, the universal yellow Primrose is a colour variety of a red or blue-coloured type. But it is well known that many such yellow-flowered plants develop anthocyan in some individuals. This may be looked upon by some as cases of regression or atavism, and the modern blue Primrose may be regarded as a reversion to a blue ancestor, or, at any rate, an anthocyan-containing ancestor. But it is as well to remember, as de Vries has pointed out, that individuals amongst most species of plants are subject to the production of anthocyan in their organs, and in such cases the colour is not a character belonging to any single organ or cell, nor is it bound to a morphological unit. It is a free physiological quality, not localised, but belonging to the whole plant.* Although this is true of the red and blue Primrose, that anthocyan is produced to a greater or less

* De Vries, *l.c.* p. 144.

extent in all their organs, and it is equally true of many other plants, the statement is not of universal application. There are numerous plants in whose flowers anthocyan is certainly localised and bound to morphological units.

Crocus chrysanthus furnishes an example similar to that of the Primrose. S. Arnott, writing of this species, says that the typical flower is of a uniform rich orange colour. White, sulphur-yellow, and lilac varieties are known, as well as others which have the outer segments suffused with rich brown, or feathered with brown.* The brown colour is no doubt a combined colour due to anthocyan and a yellow xantheïc pigment.

On the flowers of *Faba vulgaris* there are small dark brown markings which are due to a dissolved pigment in the cell-sap of the epidermal cells. This appears to be truly brown, not a yellow pigment in large quantity. Neither concentrated sulphuric acid nor solution of potash gives any colour reaction with it.

Combined Colour Effects of Pigments.

The commonest instance of the production of such combined effects is that due to the admixture in the same cell of blue and red anthocyan. The undissociated molecule of anthocyan is blue, the dissociated ion is red. Where in slightly acid cell-sap there are undissociated and dissociated anthocyan, the colour effect is due to a mixture of blue and red.

Mention has been made of anthocyan and xantheïc pigment in solution together. Such instances are very rare, but are to be met with in Antirrhinums, some Iceland Poppies, and in some Roses. The colour effect varies from a reddish-brown to a flushed yellow. Many yellow Rose petals take on this flushed colour in drying.

Differently coloured pigments, closely contiguous to each other, produce a combined colour effect. The peculiar lurid colour of some garden varieties of *Delphinium* is due to their mosaic structure. Epidermal cells of the corolla, lying side by side with each other, contain some red and others blue anthocyan. These plants are said to be of hybrid origin, amongst their parents being the scarlet *D. nudicaule* and the blue *D. cashmerianum.* Slightly flushed Primroses have epidermal cells containing rose-coloured anthocyan side by side with others containing yellow xantheïc pigment. Both colours, however, are so unsaturated in this case that only a very washed-out effect is produced.

It has already been pointed out that when a portion of a pigment separates from solution in the cell the light absorption is largely increased. When, as is the case with some of the xantheïc pigments, the separated solid pigment is of a different hue from its solution, not only is the absorption increased, but its character is altered. Instances of this occur in *Cœlogyne cristata, C. ocellata, Verbascum nigrum,* and some others.

But most frequently combined colour effects are produced by anthocyan in one of its many hues overlying chloroplastids or chromoplastids. The effect varies with the concentration and hue of the anthocyan, the hue and number of the plastids, and the distance which separates the two pigments.

* *Gardeners' Chronicle*, March 11, 1905, p. 14 .

Macfarlane notes the dull stone-white colour of the dorsal sepal of *Cypripedium Spicerianum,* and explains it by saying that the inner surface is copiously and uniformly beset with gland-tipped hairs, which in all cases spring from colourless cells of the epidermis, but have some or all of their cells often filled with a rich ruby pigment, the presence of which in the hairs gives the dull stone colour to the sepal.

The flower of *Masdevallia Veitchiana* owes its colour to the presence of abundant orange chromoplastids in the epidermal and subjacent cells. In the throat of the flower there are also abundant unicellular glandular hairs full of purple cell-sap. The effect is peculiar and difficult to describe in words. Were the purple anthocyan evenly spread in a thin sheet over the orange xantheïc pigment the result would certainly be a brown. As it is, the colour effect is that due to the addition of some purple to orange light, and not entirely to the absorption by orange pigment of the residue from white light after passing through the purple pigment.

In many Odontoglossums, Oncidiums, *Tropæolum,* and numerous other flowers there is crimson anthocyan in the epidermal cells, and yellow chromoplastids along the inner walls of the same cells as well as in the subjacent cells. The colour effect is orange in such cases if the anthocyan is in small quantity; where it is plentiful the effect is brown, warmer or colder according as the anthocyan is more inclined towards red or blue, In *Geum coccineum* the anthocyan is very red, and the result is a bright scarlet.

In some Wallflowers the yellow chromoplastids are fairly evenly distributed throughout the crimson sap of the epidermal cells instead of lying along their inner walls, and the increased effect of the yellow is evident in the floral colour.

When the backing chromoplastids have a tinge of green, or when chlorophyll corpuscles are present as in many Cypripediums, the colour is a darker brown as in *C. Boxallii,* brownish-black as in *C. insigne,* or almost quite black as in *Cypripedium* × *Argus,* for examples.

In this connection mention may be made of the black blotches on the leaves of *Arum maculatum,* and of the black stripes on the leaves of *Ranunculus Ficaria,* which are the result of crimson anthocyan overlying green chlorophyll.

In some forms of yellow Tulips the inner sides of the bases of the perianth segments and the staminal filaments are green in colour —in some places an evident green, in others a green so dark as to be almost black. The colour is caused by blue anthocyan in epidermal cells overlying yellow chromoplastids. Where the anthocyan is in small quantity the green is bright and luminous; where it is in very large quantity the combined light absorption is almost complete. In the upper portions of the same segments there are splashes of bright scarlet, and here the overlying anthocyan is a brilliant red. On testing, it is found that the epidermal cell-sap of the base of the segments is neutral in reaction, whilst higher up it is strongly acid.

When the outer sides of the bases of the flowers of *Crocus aureus* are examined, green stripes are to be found there. The colour is due to the combined effect of blue anthocyan in the epidermal cells of that side, and the yellow xantheïc pigment on the other side. These are the only instances I know of green being a combined colour effect.

I found in a flower of *Lælio-Cattleya* × *Warnhamiensis* that the epidermal cells contained yellow chromoplastids, whilst some of the hypodermal cells had crimson anthocyan. In this case, therefore, the yellow overlay the red, and the result was that the sepals and petals were of a bright orange-red. The parentage of this plant is not recorded. It would be interesting to examine the parents.

The description of colour effects in words is notoriously difficult and unsatisfactory. The same name is commonly given by different persons to colours of different hues; we are not all equally gifted at distinguishing and remembering hues, and it takes an expert correctly to name the colour of a substance which to many of us appears black. Thus I remember showing some Scarlet Runner Beans which were blotched with what appeared to me to be black, and which Mendel and other writers have always called black, to an artist. He unhesitatingly said that the blotches were blue, and in cutting sections I found that the epidermal cells, which had slightly brown walls, contained dry blue anthocyan. The blotches were therefore of a blue colour of such slight luminosity that all ordinary persons call them black.

Bentham says in the "British Flora" that the flowers of *Atropa Belladonna* are purplish-blue, while Bateson and Saunders call them brown. Courchet examined these flowers and found that the pigments are a purplish anthocyan in the epidermal cells, and in the same cells chromoplastids whose stroma is of a uniform yellow, but which contain red granules. Certainly the combination is such as to produce a brown. There is a partial albino variety of this species which has no anthocyan, and is therefore of a yellow colour.

I mention this difficulty of description because many will probably disagree with me as to the names which should be given to some of the hues I have spoken of in this paper. Any description, however, is better than none, except perhaps calling the dorsal sepal of *Cypripedium Spicerianum* a dull stone-white colour, which can have no meaning to a person unacquainted with the flower.

RETARDED POTATOS.

By T. J. Powell.

In dealing with this subject it will be well just to consider briefly what is meant by the "retarding process," for it is astonishing to find that many practical men do not understand or value as they should the advantages gained by using this means of obtaining more appreciated returns of some things which we as gardeners have to control. The idea is general that retarding means freezing, or placing in properly constructed chambers where the temperature is reduced considerably below freezing point. Although this may be correct in the case of some plants and roots, it does not follow that all want treating alike, as indeed I have proved in the matter now before us, a regular even temperature of 45° being quite sufficient for Potatos. In searching for the correct meaning of the word "retard," I find it is "to hinder, obstruct, or delay; to diminish or render more slow the progress of anything." To "retard," then, is not to stop the action of plants or roots entirely, or even to arrest it indefinitely, but only so to modify the rate of development that its fully matured state is rendered later than would otherwise be the case under natural conditions.

By keeping old Potatos beyond their usual season and rubbing off all signs of growth, we can hinder or prevent the normal working of nature up to a certain limit. But when the extreme point of endurance has been reached, nature resents our treatment, and takes the only possible way left to reproduce itself under existing conditions, and forms small new Potatos close up on the old ones. Many people cannot understand why there is no leaf growth, but this is easily understood when we consider how Potatos grow naturally. In my first experiments one old tuber was allowed to make a shoot, and it was most curious to find that where leaves should have been under natural conditions a Potato formed at every joint. A stick was put in the old tuber and the shoot secured. This was taken to several meetings of gardeners, causing a great deal of interest. I sincerely regret no photographs of these curious developments were taken, as they would now have been most interesting. Sometimes the old tubers will split, the small ones coming from the inside.

What has impressed me most in the different experiments is the enormous amount of vitality stored in some tubers compared with others; for instance, with 'Windsor Castle,' as the little ones form the old tuber dries up, whereas with late Maincrops the tubers seem to get firmer. Some 'Lincolnshire Maincrop' which were harvested in 1903, and exhibited before the Society with tubers on them in November 1904, are now as firm as when freshly dug up—over seventeen months from the date of storing. This alone should set us thinking; to my mind future possibilities are great. Several years ago I exhibited a tray of 'Windsor Castle,' with the small ones, at the Wargrave Gardeners' Chrysanthemum Show. The hall-keeper was so interested that I gave him two tubers: these he put carefully in a drawer, forgetting all about them till the following spring. To his surprise, the old ones had dried up, while small ones were beginning to grow. These he planted in his garden with most unexpected results, and the second season he had such a fine lot that he came to see me on purpose to describe what had taken place.

The question is often asked, "What made you begin these experiments?" Some six years ago we had an extraordinary crop of Potatos, and when the family was tired of using them there were large quantities left in store. Having a continual demand for fresh dishes of young vegetables at all seasons, one has to rack one's brains to know what to get for a change. To allow nature's bounty to run to waste is a sin, and it troubled me for some time as to what to do with these old Potatos, till one day in September, when they were almost past thinking about, I attended a Mutual Improvement Society's meeting at Reading, the lecture being on "Potatos." In answer to a question during the after-discussion, the lecturer remarked, "If a few old tubers were put in a Mushroom-house with dry soil in August, a dish of new ones could be had for Christmas." To me this seemed a long time about—still the hint was the key to my thoughts. Next morning I made a start, and in a short time could easily see how to convert old Potatos into new. The first dish was sent to the kitchen in October, and in return we had the disappointing complaint that when cooked they were black. The next experiment had to be in cooking, as it was useless troubling about them if they were of no good when sent in. The trials that followed showed that when the Potatos were cooked in an iron saucepan they were black or rather dark, while if an enamelled one were used they were perfectly right, nor did they require so much boiling; in fact, steaming was the most successful way of treating them. Such good results certainly encouraged fresh efforts, and the next season we were rewarded with much more success. Plenty of old tubers had been prepared: the first batch were started in August, and when dishes were sent in for a dinner party on October 2 they caused so much excitement that a flash-light photograph was taken of the crop growing on a bench in a chalk cave, with little or no soil, the variety being 'Windsor Castle.'

So many inquiries were made about these little Potatos that I felt sure there was a great deal more behind it than we had at that time any idea of, and I at once set to work trying other varieties, each time using more soil and different positions. 'Up-to-date,' being a large tuber, suggested itself as being suitable, but failed to show any small ones in dry soil, although the tubers kept very firm. Thinking this over, I was prompted to put them in the ground outside. The time was October and the autumn exceptionally wet; instead of the old tubers decaying, as I felt sure they would, they gave us some good dishes of new Potatos which were perfectly fresh and nice when cooked. From this departure we were eventually taught how to get the flavour of fresh-grown new Potatos, which could be easily cooked.

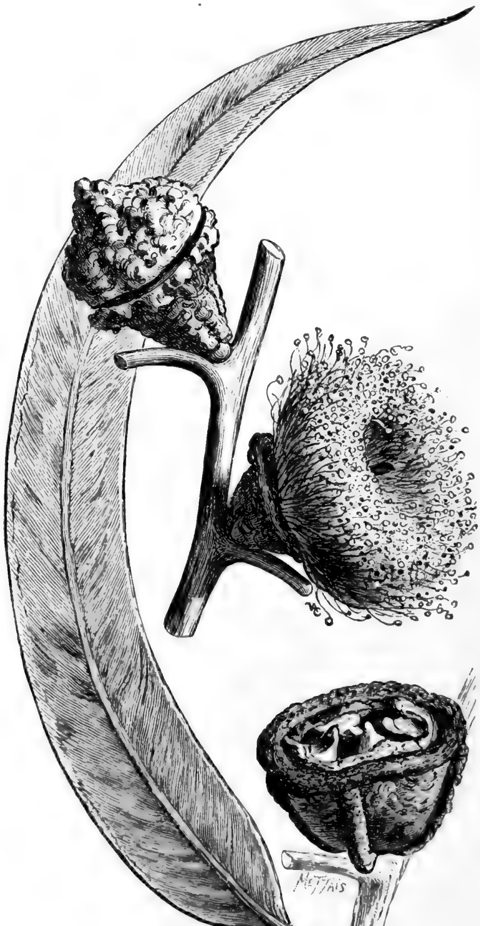
Last autumn we started on a south border, laid out the tubers on the surface and just covered them with fine leaf-mould; and though the early frost was very severe, no harm came to the little Potatos, which turned out splendidly; indeed, our Christmas supply was taken from outside. A few of these were overlooked, and when preparing the border for this season's work on February 1 we found several good dishes, samples of which were sent to gentlemen able to give a fair judgment, and they said "The young Potatos are excellent." This proves to me that we have as yet only made a beginning, and I feel sure many will be surprised at future possibilities of this system of producing good young Potatos at a season when they cannot be had by any other reasonable treatment.

In selecting the tubers for retarding, a start should be made in autumn when the crop is harvested, picking out the largest and best matured. Personally I prefer to grow a few varieties separately, so as to leave them in the ground as long as possible without harm. Store in a dry place where the temperature varies as little as possible and where the Potatos can be easily overhauled. Remove all signs of growth as soon as seen, to prevent unnecessary waste in the tubers, as future success depends on keeping them quite firm. This must be done thoroughly until July, when with varieties like 'Windsor Castle' all signs of leaf growth will cease. Late Maincrops will require this treatment longer, according to the condition of the crop when stored. During August the young ones will begin to form; sort over and pick out all of one even stage for the first batch. Repeat this at intervals as required, allowing about six weeks to develop a crop. The early supplies can be treated outside on any vacant piece of ground; level the surface and lay out the tubers so that they almost touch; cover with fine leaf-mould or any fine soil (potting-shed siftings will do well), as the small Potatos may then be picked without disturbing the bulk. They may also be treated in cellars, Mushroom-houses, heated frames, in shallow boxes under stages, in caves, &c. I can truthfully say we have succeeded in every instance mentioned.

'Windsor Castle' is certainly the best variety to begin with, but other Maincrops are needed to keep the supply going till they can be had from pots and frames; a continual supply may thus be had the whole year through. My best results have been from a late Maincrop grown in Lincolnshire, and the most interesting part of my gardening career has been the last six years' experimenting with Potatos. I should like to add that I most fully value and appreciate the award given by the Royal Horticultural Society to our exhibit in this hall in November last.

There is no reason why this system should not be of value to large growers for market, according to their discretion. There are times when the supply of old Potatos is greater than the demand, some growers having a lot on hand when the public are tired of them. Instead of being a dead loss, they could be treated as described and put on the market as new ones—or rather those resulting from them. There would not be the same bulk, of course, but the price they would realise would well repay for the extra keeping and prevent the waste of a well-earned crop. What would perhaps be better still would be to create a fresh market by keeping them till August, and then bringing them along as described and selling them as retarded tubers. Experiments have proved to me many other possibilities, but they are not yet sufficiently worked out to detail them here.

The knowledge that young Potatos can be formed out of old ones has been known to keen observers of them ever since their first cultivation, but the idea of working out a regular system by which good crops may be had is, I think, quite new; and in thinking it out and bringing it forward I am indebted to the generous help of my employer, who has always appreciated my efforts to add anything fresh to the kitchen supply. Other gardeners to whom the treatment has been explained, and who have practised it, have also been equally pleased with the results, and it is hoped these remarks will encourage others to try the method, and by so doing add a little fresh interest to the kitchen supply of private establishments during the dullest months of the year.



FRUIT-GROWING IN BRITISH COLUMBIA.

By the Hon. J. H. Turner, Agent-General.

It must be of importance that those who take an interest in fruit-growing in the Mother Country should be informed of the conditions existing in the Colonies which in the future may have an important effect on the industry in the old land, and that all people in this—the centre of the Empire—should know much more of Britain beyond the seas than they do at present. All the great colonies should be looked upon, not as disconnected members of the Empire, but as practical parts of the same country. Almost in the same way as the various counties of this little island united make England, so these possessions beyond the seas, bound together by common ties of language, law, and religion, should be united with the Mother Land and make one Empire, not separated, but made easily accessible by the ocean.

I always look on British Columbia as the Britain of the Pacific: it has, perhaps, a better climate than the great mother, it is much larger than the old home, and it claims a share in all the historic glories of old Britain.

Treating of the province as a fruit country, not very many years ago it was only known on account of its mines and timber, but about 1894 attention was gradually turned to its possibilities for agriculture. It is true, however, that when the Hudson Bay Company took possession of the country in 1842, the English and Scotch families that settled there, like all old-country people, soon commenced gardening and planting orchards. These proved very productive, but were—so far as fruit was concerned—not planted with much care or with proper selection of varieties, and, generally speaking, not much attention was bestowed on them. But about eight years ago practical fruit-growers were impressed with the suitability of land and climate for the growth of fruit, and experimented accordingly, achieving good results. Very soon the attention of the Government was called to the desirability of aiding the industry, and accordingly Acts were passed to encourage it. Practical men at once saw the importance of keeping the orchards and gardens of the province free from the destructive insect pests that had caused such heavy losses to the fruit-growers of Oregon, Washington, and California in the United States. The Dominion and Provincial Governments accordingly appointed officers at every port where fruit or fruit trees could be brought into the country, who had full power to examine all trees and fruit, and if found to be infected with fruit pests, in the case of the fruit, to prevent its entrance, and either to compel the importer to re-export or to have it destroyed, and in the case of the fruit trees, after a thorough inspection if they were found to be infected, to have them thoroughly fumigated and disinfected or to destroy them. At the same time the Provincial Government inspectors went through the province examining all the growing fruit trees, and where they were found to be suffering from woolly aphis or other injurious pest they had power to order a thorough course of spraying, and in especially bad cases to have the trees cut down and burned, as it was found that many of the earlier orchards, to which I have already referred, were in a bad state and would prove to be breeding-grounds whence these dangerous diseases of trees would be spread all over the country.

These regulations caused a good deal of trouble at first, and many complaints were made to the Government of the hardships they caused, and some relief was asked for; but the danger to the business was so imminent that the rules were insisted on, and as a result to-day the whole of that great province is practically free from the trouble. Before British Columbia began to grow fruit for mercantile purposes, very large quantities of Apples were imported from Oregon and Washington, and inspectors soon found that much of the fruit was infested with what is known on that coast as Codlin Moth. Hundreds of acres of orchards in those States had to be destroyed in consequence of this—the worst form of fruit pest. Very strict precautions were therefore taken to prevent its introduction to the province. Many thousands of boxes of Apples were refused admission, and, as a result, that great destroyer of fruit has been kept out of British Columbia.

The produce of the enormous acreage under orchards in the United States created in some years a glut of Apples, and the growers resorted to the system adopted by American manufacturers elsewhere with respect to the Mother Country—namely, dumping the surplus crop into British Columbia and selling at almost any price there, so as to keep up the price in their own market. This, however, was before the British Columbia growers had advanced far enough to supply their own home requirements, or before they were so organised as to make it possible for them to put their product regularly before the public. This dumping was successful for the foreign grower, and unless steps had been taken to counteract it the industry in British Columbia would never have made way. But here the Dominion Government stepped in and by means of a duty on the imported fruit gave the home growers encouragement and assistance, and at once put heart into our horticulturists so successfully that in a very few years British Columbia had so far advanced as to produce fruit much better than that from foreign countries, and was able not only to supply much of its own home demand but also to export into the neighbouring provinces of the Dominion—those great wheat-growing districts where fruit is not cultivated. Of course the American growers highly approved the old system of an open market. They publicly praised it and congratulated the Britishers on their liberal methods, but in their homes they laughed at the folly of a country encouraging foreigners and neglecting its own interests.

As an indication of the growth of the fruit industry in British Columbia I may mention that in 1902 some 1,956 tons of fruit were exported, principally to the North-West Territories and Manitoba; in 1903 the export had increased to 2,663 tons, and in 1904 it went up to over 3,000 tons, all sold at good remunerative prices. It is very questionable whether there would have been—at any rate for many years—a great development of this important industry but for the encouragement given to the beginner in the profession by the imposition of the Canadian duty; whereas now the vast regions of the province that are suitable are being speedily brought into cultivation (during last autumn at least half a

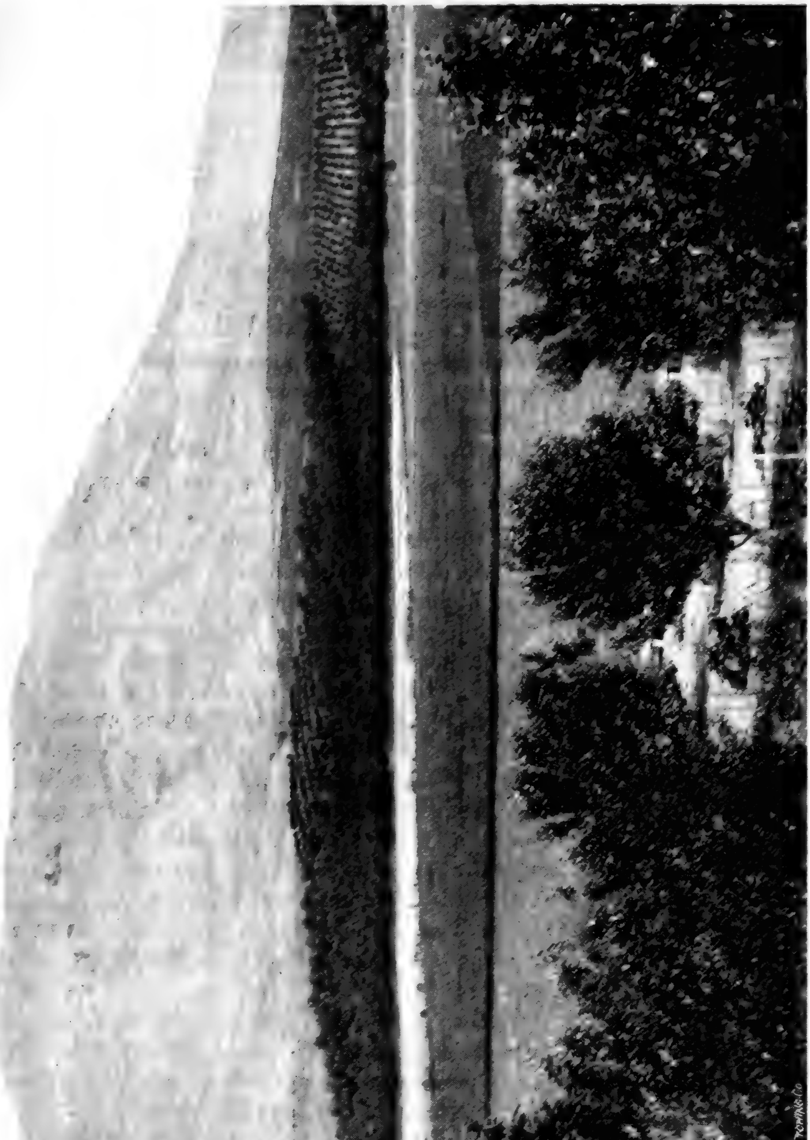


FIG. 143. FRUIT FARM IN BRITISH COLUMBIA.

million more fruit trees were planted), and there is no question but that British Columbia will in the future be one of the most important centres of horticulture and of the accompanying industries of dairying and poultry farming in the Dominion of Canada.

Quite recently a great American authority on horticulture, Mr. S. B. Green, Horticulturist to the Minnesota University, travelled through British Columbia. He made a report to Mr. W. W. Whyte, Vice-President of the Canadian Pacific Railway, on the capabilities of the province, to the effect that the country is particularly suitable for fruit-growing; that the produce is very fine; and that in addition to the orchard fruits the growing of Melons, Tomatos, Sweet Corn, and other garden products promises to be very profitable. Mr. Green travelled over several hundred miles in British Columbia south of the Canadian Pacific Railway and found much land well adapted for horticulture. Another American authority says that both in Vancouver Island and on the mainland there are great stretches of country particularly adapted for fruit-growing, and it should be remembered that the area he visited, roughly speaking, covers an extent of 120 miles wide by 250 miles in length. One writer on the subject says that most of the orchards at present are situated on the lower land, near rivers and lakes, which was selected principally on account of the richness and great depth of the soil, whilst large areas of what is known as "bench lands" were rejected owing to the opinion of agriculturists, who had generally no experience of fruit-growing, that the soil was not deep enough, the surface soil only perhaps being about eighteen inches over a subsoil of alluvial silt, boulder clay, and granite pebbles. These level "benches," which in some parts of the country form perfect terraces at various heights above the lower land that surrounds the lakes or forms the banks of rivers, have been formed by the action of glaciers from the higher ridges grinding up granite and other rock; but it is now beginning to be recognised that this substratum is eminently adapted for producing the healthiest and finest fruit. The best growers in California and Oregon fully realise this, and have taken advantage of it in their own country. The elevation and character of soil give perfect drainage as well as thorough ventilation. This latter is of much importance, though it is not generally acknowledged; such land, particularly when situated near the lakes of British Columbia, has the great advantage of the effect produced on the temperature by these large bodies of water the temperature of which is higher than the normal air temperature in winter and lower in summer, and so prevents any danger from excess of cold or of heat. The eminent horticulturists of the United States universities thoroughly recognise the ameliorating effects of such large expanses of water.

A very important matter in connection with fruit-growing for commercial purposes is the correct grading and the proper and careful packing of the fruit. The Government sends competent men round to the different fruit districts to give advice and instruction as to the best form of package, the method of placing the fruit in the boxes so as to preserve its beauty and quality, and the important point of having one grade of fruit only in each box, not the old-fashioned way of the Strawberry pottle, fine perfect fruit on the top and rubbish underneath. In fact the Government is now arranging for definitely marking the grade of the fruit on the outside of the packages as numbers 1, 2, or 3 quality. This has been found so satisfactory in some markets that buyers of Canadian fruit so marked have been quite satisfied to buy without opening the package, knowing that the fullest reliance may be placed on the quality of the fruit as designated by the Government mark. This method is nothing new in Canada as regards other natural products, such as Wheat, flour,

Fig. 144.—Fruit Farm in British Columbia.

salt fish, &c., which have for very many years been sold simply by the grade indicated by the Government mark.

The inspectors of fruit, in their visits to orchards, also give instructions and advice on planting, pruning, and spraying, and it has occurred to me that such officers, if fully qualified, would be of great advantage in the Mother Country. In my short trips here in the old country I notice hundreds of acres of fruit trees that would not be allowed to stand in British Columbia. They are simply waste of ground and opportunity. They remind me of some small orchards in British Columbia where the trees were stuck in without system, perhaps forty years ago, and have been left entirely to their own sweet will ever since—the result being that they have grown up worse than uncared-for gutter children, no use to themselves and a detriment to their neighbours. It seems almost a disgrace that this beautiful land of England, which is thoroughly suited by climate and soil for the production of the finest Apples, Pears, and similar fruits, should be so neglected in this respect. There is no doubt about its capabilities, as they are fully demonstrated by the magnificent English-grown fruit exhibited at recent shows of this Society.

Now it may be thought that with the very rapid increase in the acreage under fruit in British Columbia there will be an over supply; but there is little fear of this for very many years, for the market grows far faster than the fruit. The rapid increase of population on the vast fertile Wheat-lands of the North-West Territory and Manitoba, approaching 200,000,000 acres in extent (of which not one tenth is yet taken up, but on to which farmers from all parts of the world are pouring by thousands, all of whom are or will become large consumers of fruit), provides an ever-increasing market; for while these lands can produce the finest possible Wheat at an average of twenty to twenty-five bushels an acre, and in a few years will grow millions of bushels more than are required in Great Britain, the country and climate are not adapted for fruit-growing. The Province of British Columbia adjoins these Wheat countries that are now so rapidly filling up, and is already connected by one railway with its great towns, and in a short time two more railways that are now being built will still further facilitate the transport of fruit to these markets. In addition to this, British Columbia does not yet fully supply her own wants or the wants of the shipping or of the countries on the Great Pacific connected with her by these steadily growing lines of ships, so that British Columbian fruit-growers may work by day and sleep by night in the full confidence that they will for a very long time have fairly profitable markets. As indicating what the present conditions in this respect are, I may mention that a friend in British Columbia who is thoroughly informed on fruit-growing and a successful grower himself, and knows all the orchards in the country, informs me that the fruit-growers in 1904 made a net profit of £20 to £40 an acre. He can thoroughly vouch for the higher figure in some cases.

In visiting the fruit shows in this country one is impressed with the difficulty the growers must experience in deciding, out of the enormous number of varieties of Apples that are shown, what are the best ones to grow; for it is important in a mercantile orchard to have only a few really good varieties, so as to be able to supply in quantity those which are the favourites with the public. I notice that what appears to be the favourite Apple in London this year is the Newtown Pippin. This taste seems to me to be either a fad or a change in the taste of the British public; for, in comparison with Cox's Orange or the old Ribstone Pippin of my boyhood, it is dry, chippy, and altogether inferior. Possibly it will be said that the people who think this are old fossils with no æsthetic taste—and it may be so.

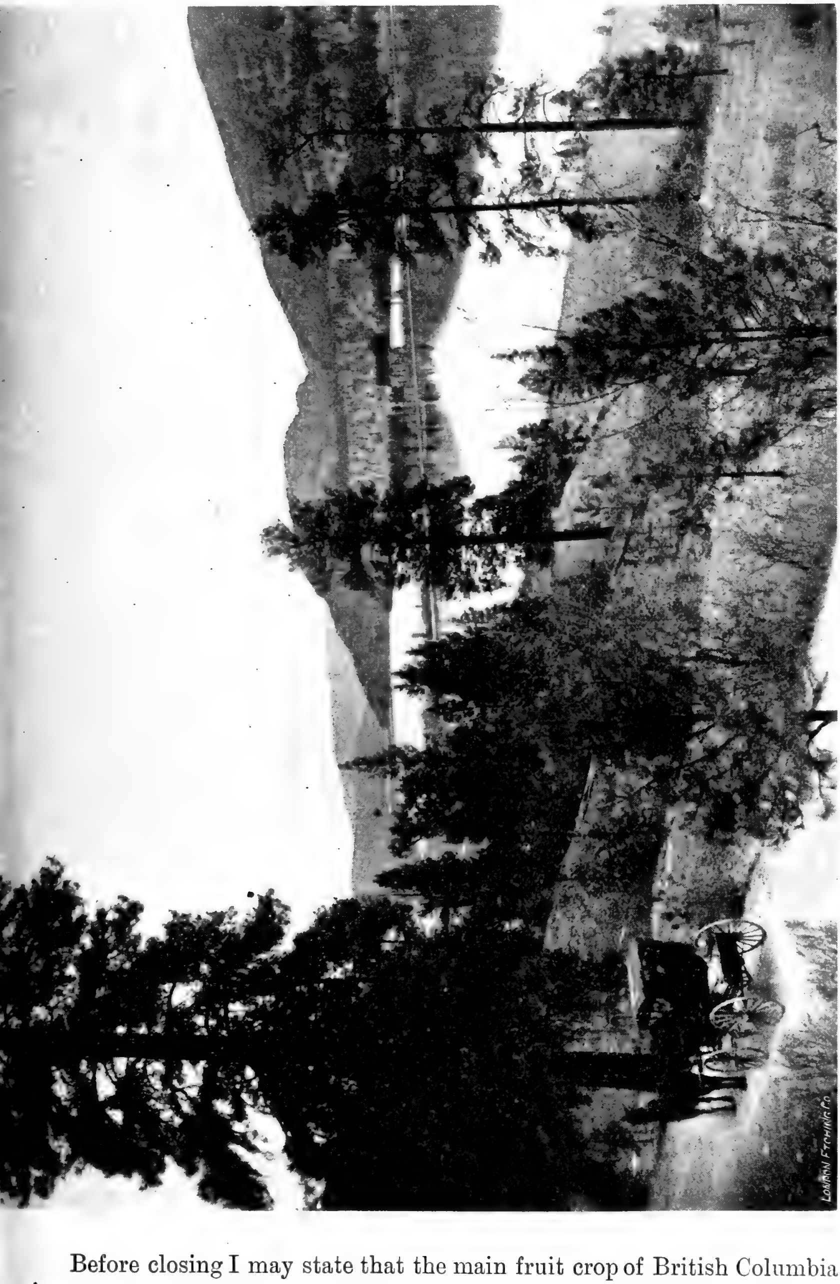


Fig. 145.—Land suitable for Fruit Farming.

Before closing I may state that the main fruit crop of British Columbia is at present Apples, the prevailing varieties being 'Wealthy,' 'King of Tompkins,' 'Northern Spy,' 'Cox's Orange,' 'Newtown Pippin,' and

'Baldwin'; but Pears also attain great perfection, particularly 'Bartlett's Flemish Beauty,' 'Winter Nellis,' and 'Louise Bonne.' As for Cherries, Strawberries, Prunes, and Plums, the crops are enormous and of fine quality, and some districts are now growing Peaches with great success, and this delicious fruit is likely to prove a most profitable crop. Grapes have recently been tried and have done well, and I understand that a French community is about taking up land in the province for the planting of vineyards.

I have so far only referred to the Island of Vancouver and the part of the mainland lying south of the Canadian Pacific Railway, but in addition to this there is an enormous extent of country north of that line, and there are the numerous islands of the Straits. A very large part of this vast country is eminently suitable for horticulture, and experienced men believe it to be the richest part of the province. In a few years' time the new line, the Grand Trunk Pacific, will cross this splendid country, probably at a point 200 miles north of the Canadian Pacific Line, and will, with its main road and branches, open up millions of acres of land that will be capable of supporting a large population.

I need hardly add that the province is very beautiful: it is a land of fruit and flowers, and the climate is most healthy and exhilarating.

ON TABLE DECORATION FOR EXHIBITION AND THE HOME.

By Miss H. C. Philbrick, F.R.H.S.

[Read before the Chelmsford Gardeners' Association.]

> Who loves not Knowledge? Who shall rail
> Against her beauty? May she mix
> With men and prosper!

So sang one of our greatest poets. And who will not echo it? "Knowledge is power," and if we will take Nature for our teacher and guide, the true Knowledge will be ours, the commonest things will grow beautiful, and while we sit at her feet things practical will be invested with a new delight.

It has been said, and wisely too, I think, that wherever flowers grow wild the effect is always charming, the grouping, massing, and blending being perfect. In due sequence all flowers are a delight and a refreshment: their office, however, is to soften and soothe by contrast. For grouping, let us take Nature as our guide, watch her in the hedgerow and the coppice, and see how marvellous are her effects. Note also in the sky the wondrous lessons taught us in the grouping of the clouds and their perfect harmony of colour.

> Nature never did betray
> The heart that loved her; 'tis her privilege,
> Through all the years of this our life, to lead
> From joy to joy.

Linnæus (and to his everlasting honour and glory be it recorded) once came suddenly upon "a host of golden Daffodils," and burst into tears.

And now you will want from me a few hints as to arranging flowers, for exhibition and in your own homes. Well, if, as I hope, you have drunk something of the spirit of Nature before you set about your work, you can not go far wrong. It is those who pack flowers close together, or without foliage, or who form unnatural associations like Primroses and Orchids, Snowdrops and Allamandas, who go so egregiously astray. Think as you set out to arrange your flowers, "What would Nature suggest?" and then the result can hardly be anything but good.

And first as to the mingling of flowers and foliage. Nature never gives Roses Fern-*leaves*, or Carnations Rose-leaves; and whilst admitting that all rules have exceptions, there are wondrous few exceptions to the rule that no foliage suits a flower so well as that which Nature gives it.

Be very careful, also, how you mix different flowers together. Different varieties of the same flower almost always mingle well, but it is rare indeed to find a vase of mingled kinds surpass or even equal a vase confined to one kind only. The very idea, for example, of Roses and Cornflowers mixed together makes one shudder, whereas few things are more beautiful than either of them alone.

Another absolute rule should be: Never try, under any circumstances, to combine hothouse and hardy flowers; you may mingle them, but they refuse utterly to harmonise. Imagine, if you can, Daffodils and Stephanotis, or Cattleyas and Ox-eyed Daisies. I purposely mention flowers that are beautiful—beautiful separately—but combined, impossible.

Bear in mind also that as a rule all single and *small* double flowers lend themselves best for decorative art. Study colours which will look well by artificial light, unless your designs are for daylight only. The seasons, too: each season, as it comes, brings with it the particular flowers you need. Your field is wide, and the door opens to all lovers of arranging flowers upon a vast area. Do not rest satisfied with copying others, but strike out for yourself, and let your arrangements be original.

Always avoid overcrowding, and in dinner-table decorations, especially, study lightness, harmony of form and colour, and "balance," by which I mean the breaking-up of lines. "Billowing," or Table Centres, if used, must be used with great caution. So many people spoil an otherwise good decoration by introducing table centres with colours entirely out of harmony with the flowers they use, and so spoil the effect. All yellows and pinks light up particularly well; Daffodils, "which ever take the winds of March with beauty"; Cowslips and Irises, single and double; Pinks, Wild Roses, single or garden Roses, Sweet Peas, Carnations, and a host of others rise up in our imagination. Mauves and blues, as a rule, are ineffective by artificial light. Let the thermometer also guide you somewhat in your selection. On a broiling hot summer's day, do not treat the brain-worker and bread-winner, when he comes home to dinner, with scarlet Geraniums or bright red Roses, but give him pale and restful coloured flowers with mossy greens about.

The fashion of stands and glasses varies, sometimes taller or shorter, and silver, china, glass, or metal may be used. It is almost, if not quite, impossible to arrange flowers in bowls and baskets without some means of artificial support, but those means should be rendered as invisible as possible. Unless the schedule distinctly specifies the contrary, you are safe in employing them in exhibition contests, but care must be taken that the stalks of the flowers reach and dwell in the water or damp sand, as the case may be. In passing let me say, never use sand if water will do as well—nor coloured glass vases. There is a modicum of beauty in seeing the stems of the flowers in the clear glass and sparkling water. The Royal Horticultural Society and the Midland Daffodil Society allow wire supports, but add this caution to exhibitors—"but the less in evidence, the greater the merit of the arrangement." The Japanese used narrow strips of lead to hold their flowers upright—the simplest thing in the world—long before we did in fact; they introduced them into England, and these pieces of twisted lead, worth perhaps a halfpenny, were quickly bought up in London at 1s. each. Another method is to use a lump of clay, which has been properly tempered, at the bottom of your receptacle; it is easily covered with moss, and you have at once an invaluable support: this will apply to baskets and china bowls, not to glass vases, of course. Happily glass vases often have thin necks, and in that case you will need nothing more than pure crystal water and your own taste in the arrangement. Clear and transparent glass harmonises so admirably with the soft colouring of the flowers and foliage, and lights up so brilliantly at night, that it is preferable to every other material, though real silver and old porcelain have formidable claims. Again, it is the self-sufficient "entourage" or "setting" which so often destroys the effect of the flowers. In inherent beauty nothing equals them for the short time they last, and their reign should be supreme and absolute.

You will not, I trust, misunderstand me as to the different modes of treatment suggested, but do bear in mind when decorating that transparent glass is best, almost always best, for cut flowers; that silver, metal, and opaque ware are more suitable for planting flowers with their roots; and that the character and habits of the flower should be studied in the selection of its receptacle, *i.e.* branches and long-stalked flowers in high vases, while little creeping plants and short-stalked blooms should be arranged in shallow vessels.

Now let me give you an illustration of luncheon and dinner tables. Let us take the luncheon-table first. You will remember what I said about not overcrowding the flowers: the number of the receptacles you need must vary with the size of the table you are decorating; six or eight will be sufficient for ten or twelve guests, and the luncheon-table will, I think, admit of somewhat larger and heavier flowers than the dinner-table; the lighter, smaller flowers seem in the fitness of things best to accord with artificial light. Iris, blue, mauve, or violet, in fact any colour or shade of colour is suitable for the luncheon-table. Cowslips are very charming, and look best with their own foliage, or the young tender copper-brown shoots of the Oak (cut long on the old wood) associate well with them. I was staying with friends in the heart of Suffolk a year or two ago, and found a wealth of Cowslips to conjure with, and used the copper-brown foliage of the Oak in the decoration. My hostess was charmed, and she did not forget the arrangement, though she did forget the guest who designed it, for the next time I stayed there she told me how beautiful the arrangement was, and recommended me to try it. I was of course very pleased and not a little amused too. The dinner-table you must treat for the soft evening light (artificial), and I cannot lay down any hard-and-fast rule, but advise you to use flowers which are smaller and light up well. And here I would add a hint as to your surroundings, the colouring of the room, wall decoration, &c. If you should find yourself in a dining-room with oak panelling, you must not use dark flowers, as the walls will naturally absorb too much of the light; again, where the paint or paper is white or very pale, you can use flowers of a deeper shade and colour; clear transparent pale green glass accessories with yellow or orange flowers lend themselves excellently to and are in perfect harmony with such wall decoration. The "wild Marsh Marigolds," which shine like fire in swamps and hollows grey, I would commend to you: let them open their hoarded treasures and enrich you. If you employ water-plants, such as Water-lilies, or blue Forget-me-nots, with a mirror for centre-piece, arrange them so that they may be reflected, and keep them close to the mirror; never place them high. Get them as low as possible, so as to be as near to Nature as you can. My advice to you, however, is to avoid all mirrors whenever it is possible. No skill in the arrangement can make them anything but hard and unnatural upon a dinner-table.

Break up lines of hardy herbaceous plants with grasses. Let the terminals leave off with fine grasses, so as to leave no break, but lead away into space. At the same time, do not think that all decorations must needs have grasses. The use of grasses may easily be overdone, and then it has the same effect upon the eye which a constant and fidgeting little noise has upon the ear.

Another point. Do not try to improve your flowers; let them be as Nature made them. I remember, at Holland House last year, the R.H.S.'s Summer Show, a grand, bold, and striking arrangement of Lilies came for judgment, but was absolutely spoilt by the golden centres of the flowers having been cut away for fear of the beautiful yellow-brown pollen staining the flowers! The Lilies evidently had been lovely, but, as one of the judges remarked: "If you saw a man with his nose cut off could you call him a handsome man?" You might as well do so as expect to gain a prize for mutilated flowers.

Strict adherence to the rules as laid down in the schedule I would commend to all exhibitors; many and many a prize has been lost, not by inferiority of the flowers, but simply through not obeying the rules. An arrangement, beautiful in itself, is disqualified by judges because of the introduction of things other than those specified, as you doubtless will have seen.

At an Essex Agricultural Show some years ago I showed a design for a dinner-table. Another lady had entered the lists with me with a very beautiful arrangement, but, alas for her! she had introduced fruit with her flowers (the schedule specified flowers only), and so the cup fell to me. On another occasion (this time I was one of the judges), at a County Show, no fewer than three tables were disqualified by the introduction of small pot plants (Ferns) being covered up with moss or sand. Here again the rules were ignored. I mention these things in order to illustrate a warning, without which my paper would not be complete.

The general principles I have been trying to lay down are, I think, of abiding significance, but there is such a thing as fashion in table decorations (in what is there not?), so that what is best now may not be considered so a few years hence. Before taking up judging, I had had some experience in exhibiting and in arranging dinner-tables, and I have had the honour of decorating the dinner-table for the then Prince and Princess of Wales, now our gracious King and Queen (whom God preserve!), and of also making a bouquet for the then Princess Alexandra. In those days the decoration of the table for their Majesties consisted of a combination of fruit and flowers, the centre-piece bearing Grapes suspended from the top, flowers occupying the base and rising above the fruit, the side vases being arranged entirely with flowers. This was an arrangement which deserved no criticism *then*, but now we have learned better, and no longer mix up fruit and flowers together.

Another instance or two I will give you of not adhering strictly to rules. Only last summer, at a large show in the sister county—when five judges had a long and pleasant task, so many lovely arrangements met our view and came for judgment—in one arrangement of flowers dried seed-vessels were employed as well, and, alas! it brought disqualification and disappointment. And in a very beautiful basket of Sweet Peas instead of the stalks being led into wet sand or water, a number of little specimen glasses held them mounted up in the basket in which they were supposed to be. This also shared the same fate. The year before, at a show in Hertfordshire, some very lovely tall vases had to be disqualified because they exceeded the 18 inches in height laid down in the rules. A foot-rule is part of a judge's stock-in-trade, and almost as necessary as a spike is in a walking-stick to a mountain climber.

In conclusion, I would ask you who grow flowers to grow them for the love of them, and not alone as decorations for your tables or your persons. Decorate your tables because you love the flowers, and with reverent gratitude to Him "Whose breath perfumes them, and Whose pencil paints."

GARDENS OF ROSES.

By GEORGE GORDON, V.M.H., F.R.H.S.

EXTREMELY fortunate are those who, in obedience to Shenstone's behest, made nearly two centuries ago,

> Bid careless groups of roses bloom,

or, in other words, liberally furnish their gardens with bold groups of Roses and allow Nature to have some share in the fashioning of their contour. I am afraid they are but few in number, for we hear but little of such gardens, and the true rosarian is not selfish, or filled with a desire to keep the enjoyment of his favourite flowers wholly to himself. Shenstone, like many another great man, was far in advance of his times, and his advice failed to obtain the attention it so well merited. It would be a truly delightful garden in which both wilderness and the trimly kept parterre are, in the season of Roses, illumined by the colour and redolent of the perfume of the large number of varieties that are now at the command of the cultivator.

If there would be happiness in having groups of Roses growing more or less naturally in suitable positions in the wilderness, there would assuredly be an immense amount of pleasure in having masses of free-growing and profuse-flowering Roses in the less highly dressed parts of the grounds, and beds and groups of the finer varieties in the more formal parts of the gardens that are constantly under the eye, and at all times kept neat and trim. This, indeed, is the only way by which we can make our gardens really beautiful with Roses, and happily there is setting in a strong trend of opinion in favour of a fuller recognition of the value of Roses in the ornamentation of the garden. It may be vain to say with George Eliot:

> I wish
> The sky would rain down Roses, as they rain
> From off the shaken bush. Why will it not?
> Then all the valley would be pink and white
> And soft to tread on. They would fall as light
> As feathers, smelling sweet; and it would be
> Like sleeping and yet waking, all at once!

It would be a delightful sensation to see the Roses in their varied hues falling "as light as feathers," provided—and this is an important provision—Nature is not so generous with its showers of Roses as was the Roman emperor Heliogabalus, who, it will be remembered, so developed Nero's idea of causing showers of Roses to fall upon his guests from openings in the ceiling that on one occasion several were suffocated owing to their inability to extricate themselves from the profusion of blossoms showered down upon them by their host. Truly this was to

> Die of a Rose in aromatic pain.

If we cannot realise George Eliot's wish—and I am not sure that its realisation would be good for us—we can enjoy showers of Roses, and happily without the risk of the disaster that befell some of those who

Fig. 146.—Group of Rosa polyantha grandiflora

took part in the Roman festivities. Let us rear aloft tall standards, such as those in the gardens of Hodsock Priory; take them over walks on arches and pergolas, as in so many gardens, notably at Downside and Kew; carry them in festoons alongside walks of grass and gravel, as at Milton Court; train them up tall pillars, as at Aldenham House; and let them climb deciduous trees, and send their flowery shoots in riotous growth among the branches, as at Ascott and Syon; and clothe tall walls and trellises with their verdure and blossom, as in the case of so many gardens. It may be that, as we watched the dismemberment of the blossoms, we should ask of them, Why do ye leave us so soon? But it would be impossible to avoid watching with considerable interest the white, pink, or ruddy petals falling silently in clouds on the smooth-shaven lawn or neatly kept walk, or sent here and there by the eddies of the soft winds which add so much to the pleasures of our gardens during June and the following months. We may have showers of Roses; but the rain must be of our own making—a fact that will make them all the more enjoyable to those who have within their breasts the true love of the Rose.

The increasing popularity of more natural methods of arranging and cultivating Roses can hardly fail to give much pleasure to those who, like myself, are desirous of seeing them more largely employed in beautifying the gardens and grounds of the country house, and in a manner that will display their distinctive character. I rejoice to find evidence of this on all sides, because it justifies the hope that at no distant date we may see these flowers represented in gardens on a scale commensurate with their surpassing beauty and absorbing interest.

Standard Roses.

I have suggested that to attain a certain object we may raise aloft standards in the garden; but the standard I have in mind is not the standard that has fluttered in the breeze for so many years past. This standard, which has for so long a period had so large a following, has led not a few of its followers astray, and thereby proved in some degree a hindrance to the extension of Rose culture. The Rose is not to blame, nor can any blame be attached to either the trade growers or the horticultural press. The standard is not a form for which many Roses have a liking; the trade growers must of necessity grow that for which there is a demand, and the writers have not failed to give sound advice on this aspect of Rose culture. It might then well be asked, On whose shoulder does the blame rest? I am not disposed very seriously to blame anyone; it is the fault of a system rather than any group of persons. Owners of gardens who love Roses, but have not had opportunities for becoming acquainted with the great difference in the constitution and growth of varieties, visit the Rose shows and closely scrutinise the boxes. They are attracted by certain blooms staged in, it may be, the trophy class. They make note of these varieties, and when the time comes round for planting they send their orders for them to their nurserymen, or instruct their gardeners to buy them. The Roses are received and planted, and, as the varieties producing the finest blooms for exhibition purposes are for the most part the least vigorous, the majority make a poor growth; and, after a comparatively short struggle, they succumb to the inevitable, and are rooted out to make way for others. Consequently the garden that is largely furnished with standards of varieties selected from exhibition boxes has much that is disappointing associated with it, and is wanting in the attractiveness a Rose garden should assuredly have.

In writing and speaking on the cultivation of Roses for beautifying the garden I have again and again urged that varieties for growing as

Fig. 147.—Lawn Group of Rose 'Electra.'

standards should be selected in the nursery during the season of flowering, so that due account may be taken of their constitutional vigour as well as of the form and colour of the blooms; or, failing that, trust to the advice of some well-known authority, or ask the nurserymen to make a selection. There are sufficient Hybrid Perpetuals of vigorous habit to furnish any one garden. But I would not limit the selection to these, or to the Teas, or the Hybrid Teas. They should have full representation, and the representatives should consist exclusively of those endowed with a robust constitution. But there should also be standards of certain of the Ayrshires, the evergreen Roses, and the Ramblers, and cultivators would do well to remember that we have our rambling Roses other than Crimson Rambler, some of which are specially adapted for cultivation as standards. We know that the single Polyantha makes a magnificent standard, and it is not unreasonable to assume that several other varieties belonging to the same section are equally suitable. Finely developed standards of some of the best of these, planted in suitable positions, would assist in no small degree in making gardens beautiful.

Groups of Roses.

The more general use of groups of Roses on the lawn would largely contribute to the same end. This form of Rose culture is as yet in its infancy, and it is difficult to convey an adequate idea of the beautiful effects that are produced during the season of flowering by bold masses, each mass consisting of one variety. These groups should not be limited to any one class, nor should they be planted to the exclusion of mixed beds of Teas, Hybrid Teas, and Hybrid Perpetuals ; but they should, where the space will permit, be sufficient in number to produce a distinct feature. Of wondrous beauty in June are bold well-furnished groups of the single Polyantha and its large-flowered form, *polyantha grandiflora*, of 'The Dawson,' of 'Electra,' of 'Una,' of 'Leuchstern,' of 'Purity,' and 'Longworth Rambler.' Very effective also are great masses of 'Paul's Carmine Pillar,' which rising to a height of ten or twelve feet, and as much through, is in the flowering season bespangled with its brilliant scarlet flowers. Unhappily, the variety is somewhat ephemeral, but the flowers afford an ample recompense for the space occupied by the plants, which, by the way, are extremely elegant in appearance when the branches are allowed to extend as Nature would have them. Not less remarkable in their way are groups of that magnificent Rose, 'Conrad F. Meyer,' which is robust in growth and very free in blooming, and large groups of them should have a place in every garden in the United Kingdom. The Penzance Briers are also of much value for the formation of bold groups of tall Roses.

Climbing and Rambling Roses.

So many beautiful varieties have been added to the list of climbing or rambling Roses that a most delightful feature may be formed with them. Much might be accomplished by erecting a few uprights of wood or iron along one or both sides of a broad walk, and then connecting them together with chains or slender iron rods. The latter may be quite straight, or be bent with the bow upwards, and the ends resting on the uprights, as in the case of the festoons alongside one of the principal walks in the pleasure grounds of Milton Court. It is purely a matter of taste, but it may be useful to point out that the series of bows will be more pleasing to those who have a strong objection to severe formality. When chains are used, they may be suspended loosely, to form a series of festoons, and

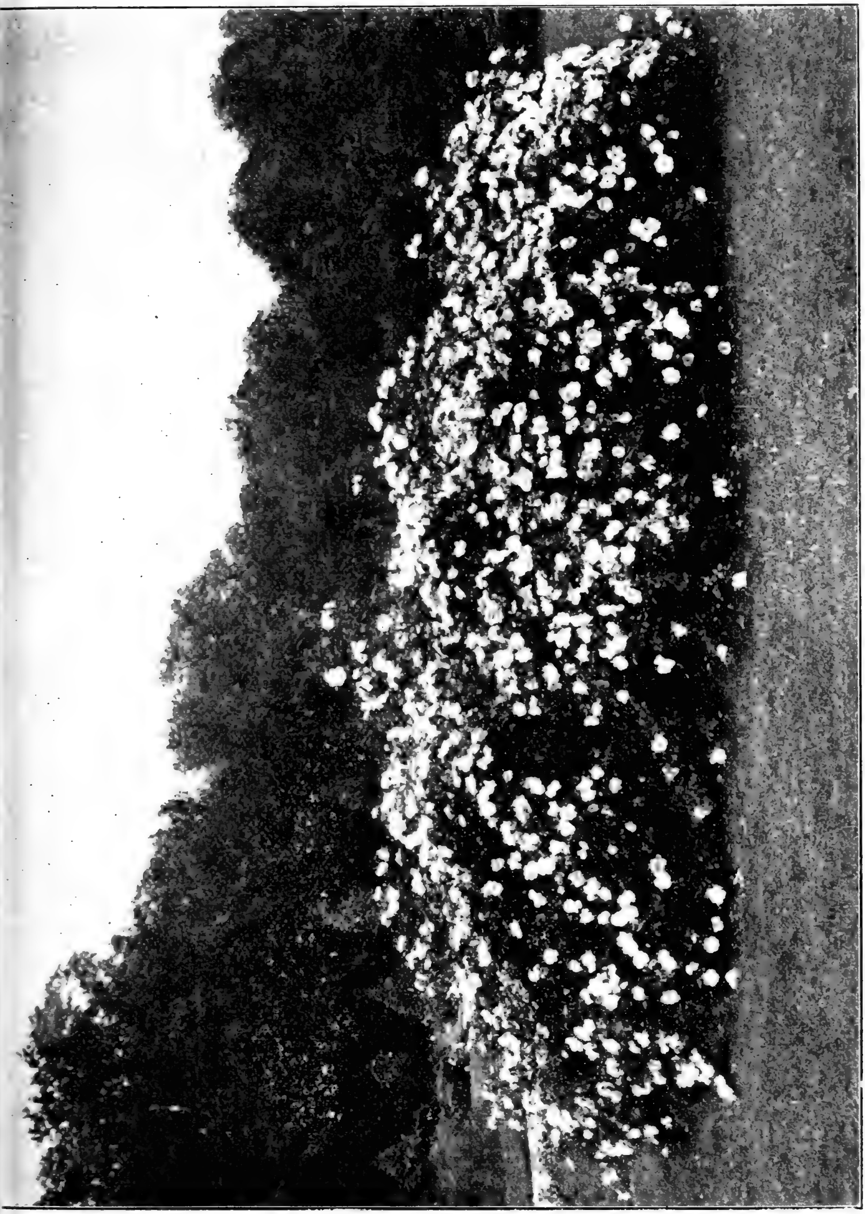


FIG. 148.—LAWN GROUP OF ROSE 'UNA.'

when so arranged, and the chains covered with Roses, the effect is very pleasing.

There are other methods of supporting Roses of scandent habit when grown away from a wall. There are pillars of iron or wood, and pergolas, the former being used for two or three plants of the same variety, arranged in isolated positions in the grounds, and the latter for the display of a selection of the best. The latter have much to recommend them, not so much for the shade they give as for the aid they render in displaying to the best advantage an important section of Roses. In sunny climes shade is of primary importance, and it is necessary so to arrange the supports, and the plants, as to protect those passing beneath from the rays of the sun. But in this country this is quite a secondary matter, and we should, therefore, give the first consideration to the Roses or other climbers with which the pergola is draped. Wooden supports appear preferable to the Roses, but examples are constantly coming under notice that serve to show Roses have not so great an antipathy to iron supports as is generally believed to be the case. When wood is used, there should not be a superabundance of material, nor should either supports or cross-pieces be too stout. In some pergolas that have come under my notice the woodwork has been arranged at intervals too short for the proper display of Roses, and in others it has been much too stout. Peeled stems and branches of oak, or some other durable wood, are preferable to square-cut deals; but the latter may be used, as, when well clothed, but little is seen of the framework.

When, from choice or necessity, iron is used in the construction of pergolas, the form that has been adopted with so much success at Kew will commend itself to a large section of rosarians. It is light and elegant, two important considerations in making provision for the support of climbing Roses; and it is inexpensive, which to many will, of necessity, be a strong recommendation. The pergola in the Royal Gardens at Kew is of a much greater length than would be required in any but the largest of private gardens, but the design has the advantage of being as well suited for a walk a hundred yards long as for one of a thousand yards. Briefly stated, the framework consists of ordinary gas-piping and chains. The uprights and cross-pieces are formed with gas-pipes, the latter being quite straight, and the several arches are connected together with tightly stretched chains on either side of the walk. Nothing could be more simple or less expensive, and that the Roses are in agreement with their supports is made evident by the highly satisfactory growth they annually make.

In clothing pergolas with Roses, it is desirable to plant varieties from several sections, because of the difference in their time of blooming, and the consequent prolongation of the season of attractiveness. The strong growing Teas and the climbing forms of several of the Hybrid Teas, with a few robust Hybrid Perpetuals, should be employed because of their continuity of flowering. Several will not be sufficiently rampant to run over the top of the pergolas, but they will reach the top of the uprights and give an abundance of flowers throughout the summer months. The following is a good selection :—RAMBLERS: Aglaia, Claire Jacquier, Crimson Rambler, The Dawson, Dorothy Perkins, Dundee Rambler, Electra, Euphrosyne, Félicité Perpétue, Hélène, Leuchstern, Psyché, Queen Alexandra, Thalia, and Thoresbyana. TEAS: Belle Lyonnaise, Bouquet d'Or, Climbing Perle des Jardins, E. V. Hermanos, Gloire de Dijon, Le Soleil, Madame Moreau. HYBRID TEAS: Bardou Job, Climbing Caroline Testout, Climbing Mrs. W. J. Grant, Gruss an Teplitz, Longworth Rambler, Pink Roamer, Reine Olga de Wurtemberg, and The

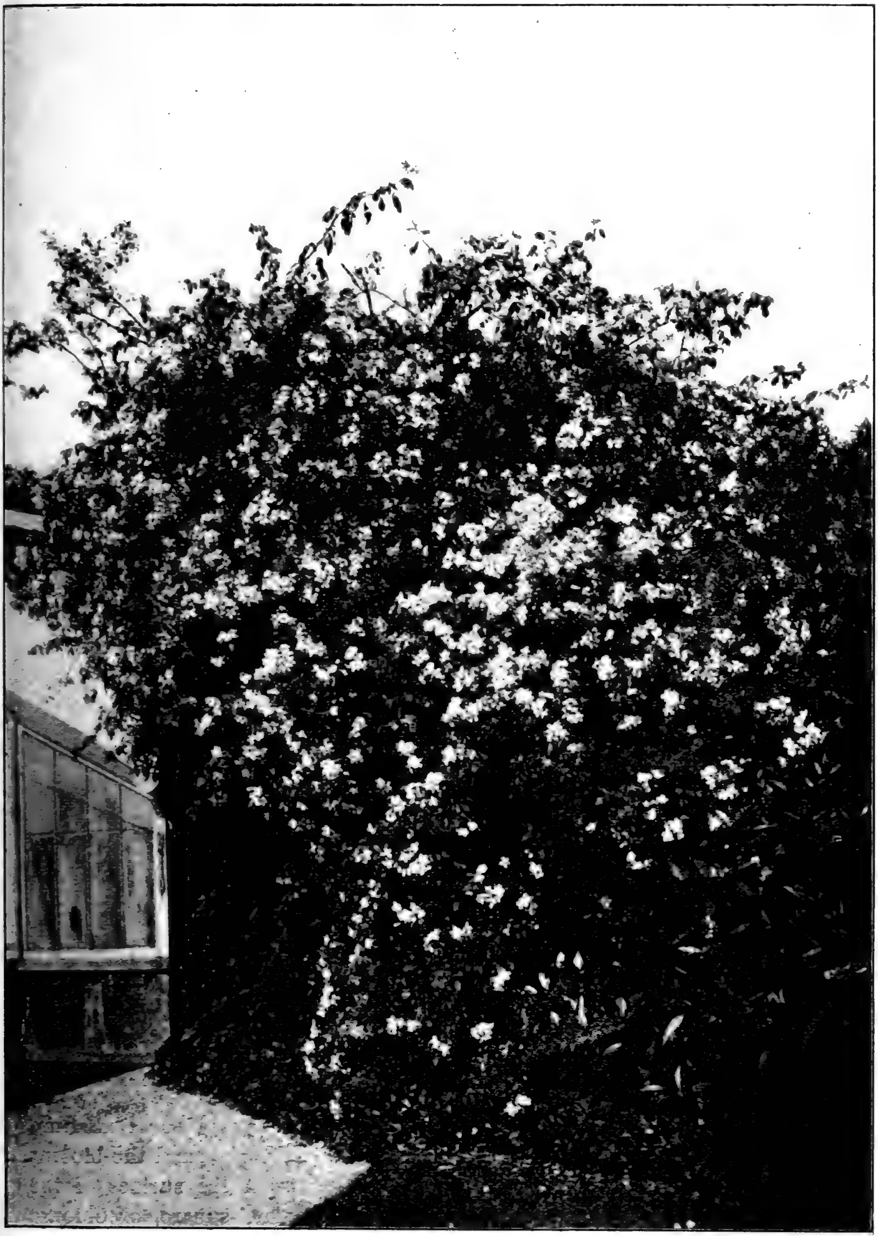


FIG. 149.—THE HIMALAYAN BRIER GROWING OVER AN OLD CUPRESSUS.

Wallflower. NOISETTES: Aimée Vibert, Alister Stella Gray, Céline Forestier, Madame Alfred Carrière, and William Allen Richardson.

Wall surfaces of dwelling-houses and other buildings in the garden, or on its boundary, will afford an excellent opportunity for the successful cultivation of some of the finest of the Tea-scented and Noisette varieties. In many instances walls with a south and west aspect are devoted to the hardy and free-growing ramblers, and, although these produce a delightful effect in their season of flowering, they can be grown satisfactorily in the open, whereas the varieties belonging to the Tea and Noisette sections will be benefited by the shelter and warmth they derive from the wall. They, moreover, are more continuous in flowering, and are therefore attractive for a longer period. For high walls, Aimée Vibert, Bouquet d'Or, Climbing Devoniensis, Fortune's Yellow, Gloire de Dijon, Lamarque, Madame Alfred Carrière, Madame Bérard, and William Allen Richardson. For low walls, and for clothing the lower part of high ones, Belle Lyonnaise, Billiard et Barré, Céline Forestier, Climbing Perle des Jardins, Dr. Rouges, E. V. Hermanos, Le Soleil, Madame Pierre Cochet, and Rêve d'Or can be recommended.

Beds and Borders of Roses.

The cultivation of Roses in beds and borders is the most important of all the methods by which gardens may be made beautiful, from the rosarian's point of view. One or more of the features to which I have already referred should be included in gardens where the space is sufficient; but beds or borders of Roses, or both, must have a place in all gardens. The number and area of these will, of course, be determined by the size of the garden, and the space available, but, as far as practicable, a sufficient area should be assigned them to allow for an adequate representation of the Teas, the Hybrid Teas, the Hybrid Perpetuals, the Bourbons, and the Dwarf Polyanthas. It will be better to have one good bed or border filled with the choicest varieties than to have the garden roseless, under the impression that it is too small for the successful cultivation of Roses.

The design of the garden and the arrangement of the borders may, with a general statement of the case, be left pretty much to the individual taste and judgment of the owners of the gardens, or those in charge of them. So far as the growth of the Roses is concerned, it matters not whether the beds are on gravel or grass; and in the case of borders, whether they are intersected by a breadth of turf or a broad gravel walk. To those who have a strong objection to walking on short grass when damp, gravel will appeal, but in all other cases grass is decidedly preferable, as turf is in summer the most pleasant to walk upon, and Roses appear to great advantage on a green carpet. The beds should be of medium size, so that the plants can receive the necessary attention, and the blooms be closely inspected without overmuch treading upon the surface of the beds. They should be regular in outline, circular, square, or oblong, because when of fanciful shape, not only is there more trouble in arranging the Roses satisfactorily, but there will be difficulty in keeping the grass in proper order without an undue amount of handwork. The spaces between the beds ought, as a matter of course, to be of sufficient width to enable a wheelbarrow readily to pass along them.

So much for the beds. How are they to be furnished? Opinions may differ upon this point; I am persuaded that the strong-growing summer-flowering Roses should have no place in these beds and borders. There should be a wealth of flowers from the early days of summer until

Fig. 150.—Group of Rose 'Conrad F. Meyer.'

the end of the autumn, and to ensure this we must plant only the truly perpetual-flowering varieties. Whether the beds are arranged to form a geometric scheme, or occupy isolated positions, the strong-growing

Polyanthas, the Penzance Briers, and some others of extreme vigour must be excluded because of the injury they will do to their less robust neighbours. Although I would exclude such stalwarts as these from the Rose

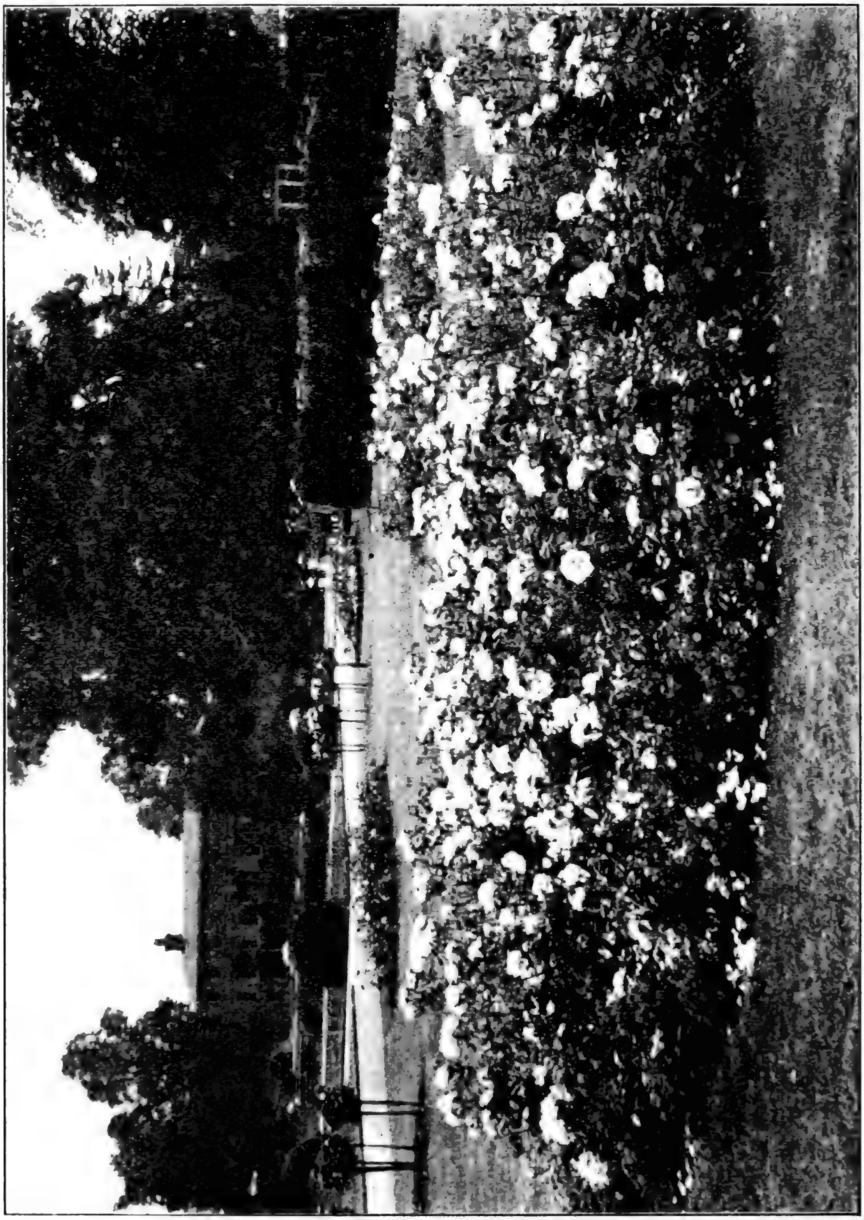


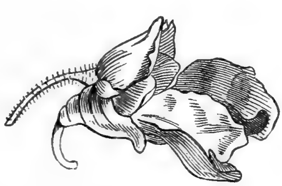
Fig. 151.—Bed of Rose 'Caroline Testout.'

garden of Perpetuals, I would suggest that in making selections from the Teas, Hybrid Teas, Hybrid Perpetuals, Chinas, and Dwarf Polyanthas, constitution and vigour should have due weight given them. Varieties that will grow freely and bloom profusely over a long period should alone be planted, and happily there are more than sufficient for planting any one garden which fulfil these conditions.

In furnishing the beds, dwarfs alone may be employed, or (except in the case of the Dwarf Polyanthas) they may have standards and half-standards associated with them. To distribute a few standards and half-standards through the beds and borders is a decided advantage, as they break up the flatness, and thereby add materially to the general effect. These, as already mentioned, should be vigorous, and in the case of Hybrid Perpetuals the selection should be limited to varieties that are perpetual in fact as well as in name. The varieties of all the sections should be somewhat limited, and in preparing a list the intending planter should constantly keep in mind the fact that it will be better to have half-a-dozen plants of one variety that is really first-class in all particulars than to have that number of plants in as many varieties of which perhaps one-half are decidedly second-rate.

In the cultivation of Roses in beds the selection of the varieties is an important point, and as but comparatively few will be required even in the largest gardens, they should be of the best. The practice of growing mixtures is capable of much improvement. Mixed beds are seldom satisfactory, for they differ materially in vigour as well as in the freedom of flowering and the colour of the blooms, and beds containing several varieties usually present a gappy and unsatisfactory appearance. Mixtures of Teas are the least objectionable when selected with due regard to their habit, but the practice that can be most strongly recommended is to plant one variety in each bed. The excellent results that are obtained from it are admirably shown in the Royal Gardens, Kew.

The following varieties form an excellent selection: HYBRID PERPETUALS.—Captain Hayward, Dupuy Jamain, Frau Karl Druschki, Général Jacqueminot, Mrs. John Laing, Mrs. R. G. Sharman Crawford, Paul Neyron, Ulrich Brunner. HYBRID TEAS.—Augustine Guinoisseau, Camoens, Caroline Testout, La France, Madame Ravary, Marquis of Salisbury, Mrs. W. J. Grant, and Princess Bonnie. TEA-SCENTED.—Corallina, Dr. Grill, Enchantress, Général Schablikine, Gloire de Dijon, Janet Lord, Madame Hoste, Marie van Houtte, Mrs. B. R. Cant, and Raoul Chauvry. CHINAS.—Common China, Ducher, Duke of York, Fabvier, Laurette Messimy, Madame Eugène Resal, and Queen Mab. Général Jacqueminot and Gloire de Dijon should, at the winter pruning, have their long shoots slightly shortened, and then pegged down to within a few inches of the surface.



REPORT OF THE COMMITTEE ON THE FRUIT INDUSTRY.*

To the President of the Board of Agriculture and Fisheries.

Sir,—The Departmental Committee appointed by Lord Onslow to inquire into the condition of the Fruit Industry beg to present the following Report :—

Preface.

1. The Reference to the Committee was as follows :

"To inquire into and report upon the present position of fruit culture in Great Britain, and to consider whether any further measures might with advantage be taken for its promotion and encouragement."

2. The inquiry thus undertaken has proved to be long and complicated, many different issues having been raised in the course of the evidence. The Committee have met altogether 49 times, having examined 61 witnesses, and 11,968 questions have been asked and answered. The witnesses consisted of officials from the Board of Agriculture and Fisheries, who were able to state the present condition of the industry, and to inform the Committee what measures had hitherto been taken by Government to promote it ; of some of the County Council Horticultural Instructors, who explained what had been done so far by way of instruction by several of the County Councils ; of fruit-growers from all the principal fruit-growing districts in England, Scotland, and Wales ; of salesmen from several of the largest distributing centres ; of railway officials, who stated to what extent the railway companies had been able to meet the requirements of the industry ; of land agents and surveyors, who dealt with the present state of the law with regard to land tenure, so far as it affects market gardens and fruit plantations ; of officials of the Board of Trade, Somerset House, the Royal Agricultural Society, the British Bee-Keepers' Association, and other bodies, who gave evidence on special points brought before them. In addition to this the Committee heard several witnesses on the condition of the cider and jam industries, on the prosperity of which the fruit-grower is largely dependent. In the selection of witnesses, the Committee endeavoured to procure thoroughly representative men, by inviting various corporate bodies and local associations to delegate one of their members to give evidence. Besides hearing evidence, the Committee visited some of the chief fruit-growing districts in England, including Swanley in Kent, the large plantations at Toddington in Gloucestershire, and the Evesham district. They also took the opportunity of seeing the National Fruit and Cider Institute, at Long Ashton, near Bristol, the Swanley

* This Report is so intimately connected with one large branch of the work of our Society, that the chance of any (but a very small proportion) of our Fellows seeing it otherwise has induced me to print it in full. Anyone sufficiently interested in the subject to wish to read the Evidence of the Witnesses called before the Committee can obtain the verbatim report of questions put to and answers made by all the witnesses by applying to Messrs. Wyman and Sons, Fetter Lane, London E.C.—Editor.

Horticultural College, the East Sussex County Council Fruit Station at Uckfield, and, by the kindness of the Duke of Bedford, the Experimental Fruit Farm near Woburn, where a most interesting day was spent. The Chairman also paid a visit to the large Strawberry plantation of Messrs. Bellis Bros., at Holt, Denbighshire. As was only to be expected in the course of so exhaustive an inquiry, many questions were raised which affected other industries besides that of fruit-growing; but, while confining the evidence, so far as possible, to those points on which the fruit industry was affected, the Committee did not see their way to exclude some evidence which raised much wider issues.

Extent of the Industry.

3. It may be useful to begin by giving some figures showing the extent of the industry as it exists to-day. According to the official statistics, the total acreage under orchards in 1904 was 243,008 acres, of which 236,705 were in England, 2,490 in Scotland, and 3,813 in Wales. These figures refer to orchards only, not to small fruit, though in many cases there would be small fruit under the orchard trees, but that is dealt with separately. Mr. Rew, the Head of the Statistical Branch of the Board of Agriculture and Fisheries, was of opinion that these figures were fairly accurate, but, as they are compiled from Returns voluntarily made by owners and occupiers of land, there would doubtless be some omissions and inaccuracies; in addition to which, no account is taken of orchards in any holdings of less than an acre in extent, nor of the isolated trees and clumps constituting the remains of former orchards, so prevalent in Herefordshire and Devonshire, nor of fruit trees growing in hedgerows, as in the case of the Damson trees lining the hedges in the Holt district. Next, taking the figures by counties, we find that six counties comprise three-fifths of the orchard acreage of Great Britain, viz. Kent, with 29,055 acres; Herefordshire, with 28,042 acres; Devonshire, with 27,346 acres; Somersetshire, with 25,265 acres; Worcestershire, with 22,387 acres; Gloucestershire, with 20,385 acres. Herefordshire has the largest orchard area in proportion to its size of any county, no less than 6 per cent. of the cultivated land being orchard; Worcestershire follows next with 5·4 per cent., and Kent stands third, with 3·7 per cent.

4. Turning next to Small Fruit, the total acreage in 1904 was 77,947 acres, 70,612 acres being in England, 6,072 in Scotland, and 1,263 in Wales. In this case one county, viz. Kent, is far ahead of any other, having no less than 22,549 acres; next comes Middlesex, with 4,700 acres; then Worcestershire, with 4,546 acres; then Cambridgeshire, with 4,403 acres; then Norfolk, with 4,030 acres; then Hampshire, with 2,472 acres; then Essex with 2,061. No other county reaches 2,000 acres of small fruit. In this connection it should be stated that these figures and those for orchards present to some extent a double return. Small fruit is very often grown in orchards, especially when the orchard trees are young; consequently, the same land would in many cases be entered under the heading both of orchards and of small fruit—and it is not possible to obtain absolutely accurate figures of the total acreage under fruit generally which, however, at the outside would probably not exceed 300,000 acres.

Progress of the Industry.

5. Though, however, this is but a small proportion of the total amount of cultivated land in Great Britain, the fruit industry appears to be a most progressive industry; in fact, it is the only form of agriculture which has exhibited any sign of progress in recent years. The Committee have, indeed, been much struck with the great increase in fruit-growing in the country. Taking orchards, there has been an increase from 148,221 acres in 1873 to 243,008 acres in 1904, or 63·9 per cent. in thirty-one years. Taking small fruit, there has been an increase from 69,792 acres in 1897, to 77,947 acres in 1904, or 11·7 per cent. in seven years. It is, unfortunately, not possible to give any accurate figures for small fruit for any year earlier than 1897, for although returns were first collected in 1887, Mr. Rew stated that there were reasons for supposing that they were not reliable before 1897. With this remarkable growth it is instructive to compare the decline of every other crop in Great Britain. From another table furnished by Mr. Rew it appears that there has been a decrease in the acreage of Wheat from 2,564,237 acres in 1888 to 1,375,284 acres in 1904, or 46·3 per cent. in sixteen years; a decrease in the acreage of all corn crops from 8,187,758 acres in 1888 to 6,953,034 acres in 1904, or 15·0 per cent. in sixteen years; a decrease in green crops from 3,471,861 acres in 1888 to 3,036,026 acres in 1904, or 12·5 per cent. in sixteen years; a decrease in Hops, from 58,494 acres in 1888 to 47,799 acres in 1904, or 18·2 per cent. in sixteen years.

6. In fact, the development of the fruit industry has come to the assistance of the farmer most opportunely in certain parts of England, notably in Kent, Middlesex, Worcestershire, and Cambridgeshire, and, as more than one witness pointed out, much land which previously grew Wheat is now planted with fruit.

7. Several important questions naturally arise in connection with this remarkable increase. The first is, What has been the cause of it? On this point some interesting evidence was given by Sir William Thiselton-Dyer, Director of the Royal Botanic Gardens at Kew. He spoke of the extraordinary growth of the taste for fruit on the part of the public, a taste which, in his opinion, was not sufficiently provided for at present by fruit-growers at home. There can be no doubt that fruit is becoming more and more a regular article of food for all classes, and it is probable that, except in special years of glut, the home supply has not kept pace with the demand, and that, as it increases, the demand will increase also. But it is not merely the consumption of fresh fruit which has largely increased. There is, on the part of the public, a great and growing demand for jam, preserved fruits, and cider. Mr. T. F. Blackwell, of the firm of Crosse & Blackwell, stated that "the demand for fruit in various forms grows quite as rapidly as the growth of fruit," and he also informed the Committee that "the taste for preserved fruit was growing enormously." Mr. Chivers, a jam manufacturer at Histon, near Cambridge, testified to the extraordinary increase in the jam industry. As regards cider, there undoubtedly had been a falling off for many years, both in the public taste for it and in its manufacture. This was probably due chiefly to the fact that the great vintage orchards in the West of England were rapidly

becoming worn out, many of them having been planted in the seventeenth century, and very little replanting having taken place since. In the last ten years, however, renewed attention has been paid to the industry; a considerable amount of planting has taken place of cider varieties of Apples, especially in Herefordshire, and organised efforts have been made with considerable success to revive the trade. Mr. Bulmer, a cider-maker from Hereford, told the Committee that the taste for cider would soon be formed if only there were sufficient Apples grown of the right sort.

8. From the above it will be gathered, not only that the taste for fruit in various forms has grown very rapidly, but that there would appear to be room for a further extension of the industry. A question which was frequently put to witnesses by members of the Committee was: "Is there a likelihood of the fruit industry being overdone?" The answer in the majority of cases was in the negative. Sir William Thiselton-Dyer stated that he thought the supply of home-grown fruit was perfectly inadequate, and that, if home-grown fruit could be distributed to the people more efficiently and more cheaply, it would be absorbed, and would be profitable to the cultivator. Mr. Best, a large Worcestershire grower, said that he thought much more fruit-growing might be undertaken in this country if the foreigner did not increase his as well. Mr. Kruse, a grower from Cornwall, took a similar view, and expressed the opinion that all the hardy fruit required by the people could be grown in the country. Mr. Collins Clayton, from Wisbech, described the industry as "still progressing and likely to progress." Mr. Wise, the agent to Mr. Andrews, the proprietor of the Toddington estate, said that there was no fear of the industry being overdone "with better means of distribution." The same opinion was expressed by Mr. King, a Huntingdonshire grower, who said that he could double his business easily, and should do so if he could get the labour; by Mr. Pringle, a fruit salesman from Newcastle-upon-Tyne, who said that, if fruit culture were extended in this country, there would be a sale for the extra fruit thus grown at home, and probably a depreciated sale of the foreign, "because English fruit is preferable anywhere"; by Mr. Craze, who combines the business of a fruit-grower in Cornwall with that of a fruit salesman in Liverpool, and who expressed the view that fruit-growing was not being overdone in the country, and that there was plenty of room for more cultivation. Other witnesses gave evidence to the same effect.

9. On the other hand, Mr. Berry, a Kentish grower, while recognising that the industry admitted of considerable extension, was of opinion that it might easily be overdone, unless the extension were made in the right direction; and Mr. Wood, of Swanley, pointed out that there was a very large acreage of fruit already planted which had not yet come into full bearing. Mr. Hughes, of Evesham, agreed with Mr. Berry that caution was necessary in extending the industry, though considerable extension was possible with Strawberries; whereas Mr. Trevethan, from Devonshire, was against extension of Strawberry-growing. Mr. Poupart, from Middlesex, was doubtful as to possible extension. As to cultivation under glass, the two witnesses examined—Mr. Rochford and Mr. Sams—both spoke of that branch of the industry as having been overdone already. It is, however, only necessary to consider the phenomenal

increase in the consumption of fruit in recent years, and the fact that it seems to be steadily on the increase, to realise that furthur production in Great Britain would be possible. In the last thirty years, not only has this production been doubled, but our importation of fruit (after deducting the re-exports) has risen from an insignificant quantity to the colossal amount of approximately 13,000,000 cwt. per annum; and so expansive has been the public taste for fruit, that this enormous increase in the supply has in many cases not affected the average prices realised to any appreciable extent. Having regard to all the evidence, the Committee feel that it is probable that a large extension of the industry at home might profitably be undertaken if carried out with judgment, and that, if certain difficulties and drawbacks are removed, fruit-growing may progress as rapidly in the future as it has in the past.

The Extension of the Industry a Benefit to the Country.

10. The next question which arises is, Would such an extension be beneficial to the country? Upon this the Committee think that there can hardly be two opinions. As has been already observed, fruit has taken the place of Wheat in some districts where it has been found impossible to make Wheat pay, and it is evident that the profits from fruit-growing, taking one year with another, are far greater than those from ordinary farming. It is undoubtedly the case that the planting of fruit greatly increases the value of land, as is shown by the high rents which land under the cultivation of fruit commands. When visiting the Evesham district, the Committee saw land which was let a few years ago for ordinary agricultural purposes at not more than £1 an acre, and is now fetching £6 an acre as a fruit plantation. Evidence of similar enhancement of value in Middlesex was given by Mr. Lobjoit, a grower from Hounslow, who said that he knew a piece of open land for which the rent was £3 an acre, while on the other side of the hedge there was similar land for which the tenant was paying £10 an acre, simply because it was under fruit; and Mr. Hodge stated that in the Blairgowrie district fruit-growing had increased the letting value of the land from 25*s.* an acre up to £4 to £12, and the selling value from £15 to £20 up to £50 to £100. Mr. Chivers also, representing the Wisbech district of Cambridgeshire, spoke of the increase in the value of land in consequence of the extension of fruit cultivation there. The same result is well known in all parts of the country where fruit is grown to any extent. Another beneficial effect of the planting of fruit is the great additional employment of labour in country districts which of necessity follows. A fruit plantation, especially if conducted on modern principles, employs far more labour than any other crop, with the possible exception of hops. Mr. Wood, of Swanley, a grower, not only of fruit on a very large scale, but also of hops, stated that fifty acres of fruit land properly cultivated would cost more money in labour than 1,000 acres of ordinary corn land, and he put the average labour bill down at about £25 an acre per annum, both in the case of fruit and hops. This view was confirmed by Mr. Pink, of Kingsdown, Kent, Mr. Clayton, of Wisbech, Mr. Wise, Mr. Craze, and many others. Mr. Pink's statement was remarkable: he said that the

population of his parish, where fruit was not grown until he went there, had increased 25 per cent., and that, had fruit not been planted, he felt sure that it would have declined by the same amount, through the falling off in the growth of corn, and he added that there was work for the people all through the winter. The Committee believe that no better means can be devised for bringing people back to the land than an extension of the fruit industry, where it can be done profitably. Nor is this all. It should be remembered that, besides the regular labour employed all through the year, a great amount of extra labour is required during the picking season, which, in the case of fruit, lasts for three months—from about the middle of June to the middle of September—and this labour is obtained chiefly from London and other large towns and industrial centres, thus providing a splendid opportunity for many of the workers in these places of enjoying a most healthful and profitable change into the country. A great deal of labour is also employed in cider-making, jam-making and basket-making, which are the direct results of fruit-growing. Mr. Watkins, a Herefordshire grower, said that, although the cultivation of cider fruit does not employ very much labour in itself, the making of cider undoubtedly does. With regard to jam-making, the Committee had the advantage of visiting Messrs. Beach's factory on the Toddington estate, and are in a position to testify to the amount of labour which this industry employs. Referring to basket-making, the Committee were informed by Mr. Monro that the firm with which he dealt kept 40 to 50 men all the year round employed principally on his orders.

11. It may also be said that fruit-growing is in itself a most interesting pursuit, calculated to enlarge the mind both of employers and employed. This point was emphasised by Mr. Sheppard, who spoke of the intellectual growth of the labourer in the Holt district within the last thirty years, which he attributed, not merely to the general spread of education, but largely to the fact that the cultivation of fruit tended to bring out all the latent intelligence of those engaged in it. The Committee were greatly struck on the occasion of their visit to Evesham with the intelligence and business capacity displayed by the members of the local Market Gardeners' Association, most of them growers on quite a small scale, and many of them men who had raised themselves from the position of labourers.

The Principal Fruit Districts.

12. It may at this stage be interesting to give a short account of the principal districts, and the various classes of growers. From the figures quoted above it will be noticed that, with the exception of Kent and Worcestershire, the counties in which orchards most abound are situated in the West of England—Herefordshire, Gloucestershire, Somersetshire, and Devonshire. This district has long been celebrated for its Apple and Pear orchards, and is still the home of the cider and perry industry. Everybody acquainted with this part of the country has seen the old grass orchards, so beautiful in the spring, when the bloom is still on the trees, and in the autumn, when the fruit is matured. Many of these

orchards are very old, the trees in Herefordshire, and doubtless in the other counties, having been planted as long ago as the end of the 17th century. Herefordshire, indeed, is described by Marshall in a work published in 1789, and entitled "The Rural Economy of Gloucestershire, including the Management of Orchards and Fruit Liquor in Herefordshire," as "a forest of fruit trees." The great bulk of the fruit grown is vintage fruit (*i.e.* grown for cider and perry making): in Herefordshire 75 per cent. was stated to be of this character, and a similar proportion would probably hold good for Somersetshire and Devonshire. Scarcely a farm in these districts is without its orchard. The cider used to be entirely home-made, the cider press, like the orchard, being a necessary part of every farm. In recent years, however, the factory system has been introduced, with, apparently, good results. But a great deal of cider is still made at home. The cultivation of these old orchards is a very different matter from that of the modern fruit plantation. Very little labour is necessary; even picking is dispensed with, the fruit being generally shaken down; indeed, it must be admitted that, in many parts, the orchards have been terribly neglected--notably in Devonshire. Replanting is urgently needed, though a certain amount has been undertaken in Herefordshire recently. But these orchards are still profitable—the cider fruit fetches a good price as a rule, and the trees standing in grass afford shade for sheep which graze in the orchards. The growers in these counties are generally not "fruit-growers" in a specific sense—they are ordinary farmers, whose farms consist to a greater or less extent of orchard; but, having regard to the larger profits made elsewhere by fruit-growers, it may well be surmised that, if they devoted more time and labour to their fruit, and took more interest in it, they would largely improve the value of their holdings and their yearly profits. It is specially worthy of notice that, where replanting occurs, the demand is largely for good varieties of market fruit, and that, in some cases, the farmers exhibit a tendency to develop into professional fruit-growers, and to adopt the higher methods of cultivation. There are many growers in Herefordshire whose main object is the production of the cider fruit, and in all these counties there are districts where mixed plantations exist, and where all hardy fruits are grown upon the most scientific principles. The most conspicuous example of this is the great fruit farm at Toddington, in Gloucestershire, started by Lord Sudeley in 1883, and now the property of Mr. Andrews, where there are between 600 and 700 acres actually under fruit—producing in some years a total of over 2,000 tons of fruit—Apples, Plums, Damsons, Pears, Cherries, Strawberries, Raspberries, Black and Red Currants, Gooseberries and Nuts. Other examples which may be given are the Tamar Valley, in Devonshire; and, going further west, many parts of Cornwall, where, thanks to the climate, Strawberries and other fruit ripen a week or a fortnight earlier than in most English districts.

13. Turning to a totally different part of England, we find the county of Kent standing at the head of the list as regards the acreage, both of orchards and of small fruit—its pre-eminence in the latter being, indeed, most marked—with 22,549 acres to its credit, Middlesex coming next with 4,700. Kent has, of course, special advantage in respect of its

proximity to London, which enables growers, particularly in West Kent, to send their fruit easily and cheaply to the London markets, and also to get down large amounts of stable manure. Indeed, so far as the Swanley district is concerned, railway carriage is dispensed with almost entirely for these purposes, the roads being used, and motor haulage being employed more and more each year. In Kent every class of grower and of plantation is found, from the ordinary farmer with the old grass orchard, to the highly specialised fruit-grower, having possibly 500 to 1,000 acres of fruit, in mixed plantations. A good deal of the highest class of fruit is also grown under glass at Swanley. Speaking generally, however, it may be said that large holdings prevail in Kent, and that very little vintage fruit is grown, it being found more profitable to grow Apples for the table than for cider-making. Another county conspicuous for its fruit-growing is Worcestershire. Worcestershire, indeed, seems to combine many of the characteristics of the West of England with the large mixed plantations of Kent and other districts. Very interesting evidence of a large fruit farm, comparable only with some of the Kent plantations or with Toddington, was given by Mr. Best of Suckley, near Worcester. But the most remarkable feature in Worcestershire is to be found at Evesham. Here is an area of many thousand acres, stretching in every direction from the town of Evesham, devoted to the cultivation of fruit, flowers and vegetables, and mostly divided into small holdings, varying from two to twenty acres. The cultivation is of a high order, and the whole is a remarkable example of what can be effected on small holdings by industry and skill. All the hardy fruits are grown, the plum predominating. Other notable fruit-growing districts in England are Middlesex, where a great deal of small fruit has been planted in recent years, and where there is also a considerable acreage of orchards ; Norfolk, where the cider industry of the West is reproduced, to some extent, in the East ; and Cambridgeshire, where, though the acreage is not very large at present (orchards, 3,732 acres ; small fruit, 4,403 acres), there has been a greater increase than in any other county, amounting to no less than 88 per cent. in the case of orchards during the past twenty years, and 56 per cent. in the case of small fruit during the past six years. This increase has been chiefly in the Wisbech district, where, as at Evesham, small holdings generally prevail, though here the fruit-grower has been able in many cases to buy his own holding, whereas at Evesham he is generally a tenant. There are, of course, many other counties which grow fruit in a greater or lesser degree, but not to such an extent as to cause it to occupy a leading position among the industries of the county ; but an exception must be made of the very large business, employing capital and labour altogether out of proportion to its acreage, of growing fruit under glass, which has sprung up, especially in the Lea Valley in Hertfordshire, and in the neighbourhood of Worthing in Sussex. The same industry is also extensively carried on in the Island of Guernsey, from which the Committee received some interesting evidence, although, strictly speaking, the condition of affairs in the Channel Islands is a little beyond the limits of their Reference.

14. Turning now to Scotland and Wales, the amount of fruit grown in these countries is small compared with that grown in England. In

certain parts of Scotland, however, fruit-growing has gone ahead, and is an important local industry—notably in the Clyde Valley and in the Blairgowrie district of Perthshire. The climate of the Clyde Valley seems well adapted to the growth of fruit, especially Strawberries, while Tomatos are grown under glass. In the Blairgowrie district the industry is rapidly progressing, Raspberries being a specialty. A very interesting account of the Blairgowrie and Rattray Fruit-Growers' Association was given by Mr. Hodge, a member of the Committee, small holdings, as at Evesham and Wisbech, prevailing here also. In Wales there are a considerable number of old grass orchards, especially in the counties of Brecon, Montgomery, and Radnor. The small fruit grown is insignificant in amount, and is almost entirely confined to the Holt district, in the Dee Valley in Denbighshire, which county claims 741 acres out of a total of 1,263. The Strawberry is almost the only fruit grown. Here the industry is in a progressive state.

15. There can be but little doubt that there is abundance of land in other districts where fruit-growing might be profitably undertaken, especially as its establishment in many cases has been the result of adventitious circumstances, such as cheap carriage—due to the competition of railways—the proximity of a good market, facilities in obtaining land from the land-owners, or the presence of some one enterprising individual.

Difficulties and Drawbacks of the Industry.

16. It will be seen from what has been already said that the cultivation of fruit, though but a small part of agriculture generally, especially if judged by acreage alone, is a growing industry in Great Britain, and that its increase in recent years has been remarkable. The opinion, also, that still more fruit might be advantageously grown, provided that certain difficulties and disabilities were removed, and if extension were directed into the proper channels, would seem to be well founded. Nearly all the witnesses argued that the British grower was unfairly handicapped in some respects at the present moment, though their grievances differed very largely, some laying stress on one thing, and some on another; and their suggested remedies differed even more widely. The Committee have thought it well to analyse these grievances, and propose to deal with each in turn, and to consider how far any of these remedies would be likely to prove effectual, and might with advantage be recommended.

17. The disadvantages under which the industry is alleged to labour now may be classified as follows :—

I. Insufficiency of knowledge, especially in regard to :

- (*a*) The right kinds and varieties of fruit to plant.
- (*b*) The character of the soil, and the effect of manuring.
- (*c*) The pruning and the general treatment of fruit trees.
- (*d*) Diseases and insect pests, and the methods of combating them.
- (*e*) Packing and grading.

II. Land tenure, especially the difficulty of obtaining land for the cultivation of fruit and of adjusting equitably the respective interests of landlord and tenant.

III. Taxation grievances—alleged excessive and unfair valuation of fruit holdings for the purposes of local rates and Imperial taxation.

IV. Railway grievances—complaints of excessive rates, preferential rates, unpunctual deliveries, bad handling, pilfering, inadequate service and refusal to pay claims.

V. Foreign competition, and tariffs hostile to British fruit.

VI. The insufficient inspection of fruit—especially of foreign fruit.

VII. The difficulty of obtaining labour in country districts.

VIII. The insufficiency of markets, and other market grievances.

IX. The ravages of birds.

X. The effect of the rise in the price of sugar on the jam industry.

Other matters affecting the fruit industry will be mentioned under a general heading.

Insufficiency of Knowledge.

18. The fruit industry as at present conducted is a comparatively modern one, and it may be said to be largely in the experimental stage in this country. It is not surprising, therefore, if the average grower is ignorant of many things essential to his success ; but the ignorance alleged appears to go very far beyond this, and, on certain material questions, nobody in this country appears to be able to speak with certainty. To give two remarkable instances :—first, with regard to manures, doubts appear to exist as to the effect of manures on fruit trees, especially on Apple trees. The beneficial effect of all kinds of manure on Apple trees has generally been assumed, but from the account given by Mr. Pickering of the remarkable series of experiments carried on during nine years at the Woburn Experimental Fruit Farm it appears that there the effect of manure upon Apple trees has been practically nil. Mr. Pickering stated that there were at Woburn twenty main plots, each containing eighteen bush Apple trees. In some of these plots they applied no dung at all, in others they applied dung to the extent of twelve tons to the acre, in others to the extent of thirty tons to the acre, and in others they applied artificial manures ; the result had been that after nine years there was not one per cent. of difference between the trees which had been treated and those which had not been treated. Similar results had been obtained with standard Apple trees. The conclusion drawn from these experiments is, not that manure has no effect on Apple trees, but that it has none in particular soils, and that the whole question requires far more full and exhaustive investigation than has hitherto been given to it.

19. The other example of the inadequacy of our present knowledge is concerned with an insect pest known as the black currant mite. The ravages of this mite in recent years have been most serious ; indeed, unless some remedy is found, there is a danger that black currant growing may be extinguished in this country altogether. Yet, up to the present, no effectual remedy has been discovered, and it is clear that, although a good deal of work has already been done on the subject, opinions differ considerably as to some of the fundamental facts concerning the mite, *e.g.* whether it hibernates in the buds of the black currant only, or elsewhere ; whether it is identical with the mite which attacks nut bushes, or not ; whether the removal of infested buds is an effective

remedy. The insecticides proposed up to the present for eradicating the evil have proved to be altogether ineffectual.

20. But this is by no means all. What knowledge is possessed by those who may be termed "fruit experts" is most insufficiently diffused among growers. It is a common practice to allow grass to grow in orchards, even with young trees, and to plant trees in grass, without removing the grass from around them; yet there can be no doubt, as proved at the Woburn Experimental Fruit Farm, that no form of ordinary ill-treatment produces such bad effects on a young tree as does the growth of grass over its roots. If fruit trees are planted in grass, the latter should always be removed to a distance of two or three feet from the stems, though later on, when the trees are well established, grassing-over may, perhaps, take place with impunity. Then, far too many varieties, especially of Apples, are planted for market purposes. Mr. Monro's evidence on this point was most emphatic. "If a customer came to us now," he said, "or to any firm in the market that import American or Canadian Apples, they could buy for the next season 100,000 barrels of one variety if they liked, and of one grade. We cannot sell ten bushels hardly of one variety of English fruit. You do not know what you are going to have with English fruit. It is almost impossible to get fresh customers on to English Apples. . . . We cannot get our grocers to keep English Apples, because we cannot depend on keeping up a supply. Occasionally they want Cox's Orange Pippins. We supply them for a week or two, and then cannot go on, and they say 'Send us American or Canadian,' and they get a sort that suits them, and can get that sort for nine months out of the year with cold storage, and they keep on with them. That is what they want." The fact is that many English growers do not know what market varieties they can grow on their soil to a profit, and they experiment with innumerable varieties. Again, great ignorance appears to exist as to the proper treatment of trees. Far too few precautions are taken in many districts against the ravages of diseases and insect pests, and pruning is frequently either very badly done or not done at all. It is the same with grading. Nothing pays better. One witness estimated that the difference made would amount to 2*s.* a bushel on the price realised for the whole crop, perhaps representing £30 an acre. Yet by a large number of growers grading is entirely neglected, through ignorance, apparently, of its importance or of how to grade. And if grading is frequently neglected, the packing of British fruit is by universal testimony exceedingly bad as a rule. It compares most unfavourably with that of foreign or colonial fruit.

21. In view of this generally admitted want of knowledge, so detrimental to the British grower, it may be well to state what steps have hitherto been taken to provide horticultural instruction in this country. The Committee were fortunate in receiving a full account of this from Mr. Brooke-Hunt, one of the Superintending Inspectors of the Board of Agriculture; from Mr. Luckhurst, Mr. Goaring, and Mr. Ettle, the Horticultural Instructors of Derbyshire, East Sussex, and Somersetshire respectively; from Mr. Keeble, the Director of the Department of Horticulture at University College, Reading; from Mr. Buckmaster and Mr. Leaf, of the Board of Education; and from Mr. Struthers, of the Scotch

Education Department. From the evidence of the two last named it appears that something is done, though not very much, in the elementary schools, both in England and Wales, and in Scotland. According to Mr. Leaf, horticulture may be taught in elementary schools in England and Wales, and grants are given for it to those schools which include it in their curriculum. But, as a matter of fact, in 1904 such grants were given to only 349 elementary schools in England and Wales out of a total of 20,264, of which about 11,000 were in agricultural districts. Taking the principal fruit-growing centres, we find that eighteen of these schools are in Kent, ten in Worcestershire, seven in Gloucestershire, six in Herefordshire, and two in Cambridgeshire. The subject is, of course, entirely an optional one, and it is not the policy of the Board to take active steps to encourage it. The initiative, indeed, in such a matter would rest entirely either with the local managers, or with the local education authority to whom the grants would be paid. Two practical difficulties stand in the way of further immediate extension—the difficulty of obtaining school gardens and the difficulty of getting competent teachers. Practical horticulture is not taught at any of the training colleges, and the nature-study which is taught and often encouraged in them is quite theoretical. In Scotland even less appears to have been done up to the present; but the Scotch Education Department, in their Revised Code for 1903, issued certain suggestions for special courses for children between twelve and fourteen years of age. One of these suggested courses is called the Course of Rural Schools, in which horticulture is specially included. It is also suggested that there should be school gardens, but, as Mr. Struthers added, these gardens "have to be established yet for the most part." The Committee feel strongly the importance of the teaching of practical horticulture in elementary schools in rural districts, not because they desire to see the introduction of a particular branch of technical instruction, but because few subjects will be found which help so forcibly to stimulate inquiry and quicken observation in children, whilst at the same time affording scope for immediate practical application out of school. It is frequently asserted, and probably with truth, that the present system is largely responsible for what has been termed the "rural exodus"—the tendency of the children of country parents to migrate to the towns—and the Committee feel that one of the best ways to arrest this tendency would be to interest them in the natural objects around them, and in the occupations and industries of country life. Now that the management of elementary schools in England is vested in local bodies, instead of in a centralised office in London, there is a greater possibility of modifying the curriculum to suit local circumstances, and the Committee hope that the local educational authorities will take steps to encourage the teaching of practical horticulture, and the provision of school gardens. The Committee would further draw attention to the provisions of what is usually known as the Robson Act, whereby in England and Wales boys of a certain age may, subject to certain by-laws, become "half-timers," spending six months on the land and six months in school. Unfortunately, there appears to be the greatest ignorance of these provisions, and the Board of Education has taken no steps to make them known. Mr. Leaf, indeed, was perfectly candid on the point, and said that he was unaware that the Robson Act had ever been put into force in the rural districts of England, and that the Board had taken no steps to draw the attention of local authorities to its provisions. Mr. Struthers also, of the Scotch Education Department, remarked that it was not their business as an Education Department to facilitate withdrawals from school. The Committee regret this, feeling that these provisions afford a method of developing a taste for, and knowledge of, horticulture and country life generally, and they hope that the new authorities will put them into force without delay. In this case, also, the local control of education should facilitate the desired change. Mr. Hodge, the Scotch representative on the Committee, confined his observations on this subject to Scotland, and pointed out that the Education (Scotland) Act, 1901, is somewhat different from the English Act. In Scotland every case where exemption is asked for must be considered on its own merits by the School Board, and exemption refused or granted accordingly. Where parents are too poor to keep their children at school till fourteen years of age, or where by so acting they would be doing an injustice to other members of the family, or where other circumstances make withdrawal a necessity, the School Board has power to grant exemption certificates. They are not, however, encouraged to grant them in Scotland, and, in the interests of the child and of the country, he did not think they should be, and he was not inclined to suggest anything to the Scotch School Boards beyond this fact; that, when they had decided to grant exemption certificates, they might as far as possible see that the children exempted were to be employed in the open air, so that their health might not be impaired.

22. Turning next to higher education, the Committee find that in England two Government Departments, the Boards of Education and of Agriculture, are concerned in the work, with the result that there may be some overlapping. In the first place, certain grants are made by the Board of Education towards schools or classes in horticulture, among other subjects, and the amount of the grants going to horticulture is on the increase. The Board of Education visits and inspects these schools or classes, but it is very difficult to estimate the character or the effect of the work which is being done, as the Board itself confesses that its Reports are in no way a guarantee of the soundness of the instruction given. The Board does not inspect, it says, "as experts in horticulture, but merely to see that its general arrangements are carried out." The Committee would not be surprised to learn that some of the money thus spent is wasted. In England, however, the principal horticultural education is in the hands of certain colleges or schools which teach agriculture or horticulture, or both, most of which are in connection with one or more County Councils. To many of these the Board of Agriculture makes grants, and in return inspects them, thus by a system of decentralisation taking a share in agricultural and horticultural instruction. Horticulture is taught at the following colleges among those to which the Board gives grants: the Yorkshire College, Leeds: the Armstrong College, Newcastle-upon-Tyne; the University College of Wales, Aberystwyth; the University College, Reading; the South-Eastern Agricultural College, Wye, Kent; the Midland Agricultural and Dairy Institute, Kingston,

Derby; the Harper Adams Agricultural College, Newport, Salop; the Agricultural and Horticultural College, Holmes Chapel, Cheshire; the Agricultural and Horticultural College, Uckfield, Sussex; the Cumberland and Westmorland Farm School, Penrith. In addition to these, a new institution, to be devoted specially to the study of fruit-growing and cider-making, has recently been started at Long Ashton, near Bristol, supported by the counties of Somerset, Devon, Gloucester, Hereford, Worcester and Monmouth, and to this the Board is making a grant of £300 a year. This institution was not in working order when the Committee visited it in August 1904, in consequence of a delay in the delivery of the machinery which had been ordered from America. Several of the County Councils also have what are known as "fruit stations," where demonstrations, or even experiments, are carried on by horticultural instructors, who, as a rule, are connected with some of the colleges and schools already mentioned.

23. Turning to Scotland, there is not so much danger of overlapping in secondary and technical instruction as exists in England, since the Scotch Education Department has taken over from the Board of Agriculture the administration of the annual grant made by the Treasury for the promotion of agricultural instruction. The Board of Agriculture, however, still gives grants to a limited extent for the promotion of research. The work is done chiefly through the three agricultural colleges in Scotland, situated at Edinburgh, Glasgow, and Aberdeen. Of these the only one which has undertaken the teaching of horticulture to any extent is Edinburgh, which has three lecturers on the subject in the college and two "Extension" lecturers, who visit the counties contributing to the support of the College. The Glasgow College has also done a little in the way of giving horticultural instruction, but makes dairying its speciality, while Aberdeen has not touched the subject so far. Mr. Struthers also stated that, under the continuation classes code, provision is made for giving grants for instruction in horticulture on the same terms as for any other technical subject, but he could not say to what extent this provision had been utilised.

24. The Committee are most anxious not to disparage any of the good work which has been accomplished so far. But in view of the recent growth of the fruit industry and its importance, and the ignorance which prevails with regard to many of its fundamental conditions, they cannot help feeling that it is inadequate. It will be observed that in the distribution of its grants the Board of Agriculture has selected few schools or colleges in the chief fruit-growing districts. There is no school in Worcestershire, Herefordshire, Gloucestershire, or Devonshire receiving a grant. We are not imputing any blame—the only course open to the Board has been to select colleges where the teaching of agriculture and horticulture appeared to be practicable, and such colleges are conspicuous by their absence in the chief fruit-growing districts. The action of the County Councils has been similar in kind. One of the greatest fruit-growing counties is Worcestershire: yet the Committee were informed that the fruit station in it (at Droitwich) was too small to be of much practical value. Another great fruit-growing county is Herefordshire: here the fruit station has been temporarily suspended. The most progressive

county in fruit-growing is, as we have seen, Cambridgeshire; but the Cambridgeshire County Council has never had a fruit station at all. Several witnesses expressed satisfaction with the work which was being done by the County Councils, whereas others spoke unfavourably on the subject. Such a difference of opinon is but natural, as the quality and extent of the work done must differ widely in different cases. The Committee do not doubt that there may often be much room for improvement, but they believe that, on the whole, good work is being done by these lecturers, and that an extension of such teaching, especially in connection with well-organised demonstration grounds, is highly desirable. But the lecturer should be a man of sufficient practical and scientific knowledge to be of assistance to professional growers, and not merely to act as instructor to cottagers and tenant farmers. His work, however, should be strictly educational. The fact that the County Council demonstration grounds are sometimes spoken of as experimental gardens is calculated to produce an impression that experimental work is actually conducted in them. This apparently is not the case. Several witnesses have insisted on the practical impossibility of the conduct of investigations in such demonstration grounds: the extent of land, as well as the funds available, are inadequate; and the ordinary lecturer possesses neither the time nor the qualifications for such work. "Experimentation," as one witness expressed it, "is just as much a matter of special training as any other business in life," and County Council lecturers who make trials of manures, or of varieties, under imperfect conditions, and draw conclusions from their results, may be doing much more harm than good. The teaching of known facts, and not the attempting to discover unknown ones, is the proper function of the County Council lecturer.

25. It is to the Government—to the Board of Agriculture—the Committee turn. The Board, indeed, undertakes certain work now, in direct communication with growers, by the issue of leaflets, especially with regard to the best means of combating insect pests and diseases. But the Committee have had evidence that these leaflets are insufficiently distributed, and are unknown to many growers; and, in some cases, the leaflets cannot speak with certainty owing to the deficient state of existing knowledge. All this points to the necessity for closer study and deeper research and experiment. The Committee, therefore, agreeing with the great majority of the witnesses, recommend that a sub-Department of the Board of Agriculture be established, to deal with horticulture and pomology. Similar Departments of Government exist at the present moment in Canada and in several other British Colonies and foreign countries. Such a sub-Department should contain experts, with a practical acquaintance of fruit-growing, and with a scientific knowledge of the origin and course of diseases and insect injuries. The functions of the Department would be two-fold. It would, first of all, be a bureau of information and an intelligence department, collecting and tabulating facts and statistics relating to fruit cultivation in various parts of this country and abroad, keeping closely in touch with the County Council and other fruit stations, sending experts to visit plantations in the country, and ready at all times to render assistance and to tender advice to growers. Secondly, an experimental fruit station should be established, somewhat

similar to the Duke of Bedford's experimental farm at Woburn, where experiments in planting, manuring, pruning, spraying, and other methods of combating insect injuries and diseases should be systematically carried out by experts, and the results recorded. For the purposes of such a station thirty acres might suffice. It has also been suggested by several witnesses that, in addition and contiguous to the experimental station, there should be a large fruit-farm, for demonstrational purposes, under the management of the Government sub-Department, but worked on strictly practical lines. Such a farm, it was contended, would be of great use to growers, by showing them the latest and most scientific methods of growing fruit for market; and in connection with it a school of instruction might be established, where future fruit-growers and horticultural instructors could receive a practical training. It is pointed out that nothing of the kind exists in the case of fruit-growing, whereas gardeners are trained at Kew in flower-gardening; and that it would be a great advantage if the County Council horticultural lecturers of the future had had an opportunity of studying at the Government fruit-farm. Lecturers who had received their training there would become the means of disseminating, not only sound practical knowledge, but also an appreciation of the scientific methods imbibed from the neighbouring experimental station. With such men dispersed throughout the country, the central station would have but little difficulty in the collection of local information, or in arranging for the carrying out elsewhere of such experiments as might require repetition under different conditions of soil or climate. The Committee feel that this suggestion has much to recommend it, and they would like to see it carried into effect; but they regard the establishment of the Government sub-Department and the Experimental Station as of greater importance at the present moment, and they therefore confine their definite recommendations to these two points. The Committee are, of course, aware that in the past England has looked to private benevolence for most of its experimental work, instead of to the State, as other countries have done; and in horticulture there already exists the experimental station founded by the Duke of Bedford in 1894. But they are strongly of the opinion that the time is now past when a private station can adequately supply the requirements of the nation: no such station can have the same authority, the same scope, nor the same influence as a station conducted by, and forming an integral part of, one of the Departments of the State itself.

26. It may be objected that in making this recommendation the Committee are asking, for the cultivation of fruit, advantages and privileges not enjoyed by any other branch of agriculture. This objection was more than once raised in cross-examination. In reply the Committee desire to point out: (1) That fruit-growing has special difficulties, and that our knowledge is most incomplete. (2) That the amount of capital invested in it per acre far exceeds that invested in an ordinary agricultural farm. (3) That it employs far more labour. (4) That agricultural experimental work has been in progress in England for over sixty years—indeed, it might be said ever since the end of the eighteenth century—and that this country has from the beginning taken a leading position in such work throughout the world; whereas systematic

horticultural investigation was to a great extent neglected until the foundation of the Woburn Experimental Fruit Farm only ten years ago.

27. The Committee are aware that in making these recommendations they are largely following the proposals made in a Bill brought before the House of Commons by Sir James Rankin in 1903, at the instance of the Herefordshire County Council. It was further proposed in this Bill to make the spraying of nursery stock in some cases compulsory, and various drastic powers for the purpose of eradicating disease were to be employed. The Committee feel that such powers may become necessary, but that, in the present insufficient state of knowledge, the country is not ripe for them. After the new sub-Department and the experimental fruit station have been established some years, and our knowledge has thereby been increased, they are of opinion that the subject might be dealt with.

Land Tenure.

28. The questions of land tenure and the effect of the present state of the law upon the fruit industry have been prominently brought before us throughout the inquiry. It is alleged by many witnesses, of whom some were themselves tenants, that the provisions of the Market Gardeners' Compensation Acts (since incorporated in the Agricultural Holdings Act of 1900)—whereby a tenant of a holding which it is agreed in writing shall be let or treated as a market garden may plant fruit and erect the necessary buildings, without having first to obtain the consent of his landlord, and at the end of his tenancy is then entitled to compensation, which often amounts to a very large sum an acre—act as a deterrent, landlords refusing to let land for the purpose of the cultivation of fruit. This point was especially insisted upon by Mr. Wheler, President of the Land Agents' Society, and late Commissioner to the Duke of Northumberland. Another objection to the Acts frequently urged was the alleged obscurity of many of their provisions, especially that relating to holdings created before the commencement of the Acts. On the other hand, it was pointed out that, in the case of a fruit plantation, the tenant increases immensely the value of the land by his skill, his enterprise, and the expenditure of large sums of money, all of which would become the property of the landlord unless there were a proper scheme of compensation; while, if his consent to each separate improvement had to be obtained, the tenant would be seriously hampered in the extension of his business. The supporters of the Acts, indeed, complain that they do not go far enough, as, although it would seem to have been the intention of Parliament that the Acts should be retrospective, *i.e.* that the landlord should be liable to pay compensation for all tenants' improvements effected in market gardens before the passing of the Acts, the House of Lords has held (in the case of *Callander* v. *Smith*) that this, in a market garden which existed before the Acts were passed, only refers to improvements made since the passing of the Acts, and this, especially in the Evesham district, is felt to be a great grievance. The Evesham witnesses strongly insisted that the Acts should be made retrospective.

29. With regard to the position of the landlords various suggestions have been made with the object of limiting their liability. Mr. Poupart,

Mr. Bunyard, and Mr. Wheler propcsed that the amount to be paid in compensation should be restricted to a certain sum an acre; Mr. Langridge, that there should be a limit to the amount of fruit which any tenant might plant. Mr. Wise suggested that the whole difficulty could be met by the landlord raising the rent, in the case of fruit land, by a sum sufficient, if invested, to meet the claim for compensation at the end of a lease. But, according to Mr. Wheler, these claims often amount to more than the whole rent during a term of years; and it must be remembered that fruit is often planted where there is no lease, but only a yearly tenancy.

30. The Committee have very carefully considered all the evidence laid before them, and fully admit the difficulty of the question. In the first place they cannot help feeling that, although the Acts have had, in certain districts, a deterrent effect on the letting of land for fruit-growing, and may possibly have a still greater effect in the future, the difficulty has hitherto been avoided in some of the important fruit-growing districts, either by the granting of leases sufficiently long to permit of the tenant recouping himself for the cost of his plantation (*e.g.* in Kent), by the landlord selling his land in small holdings (*e.g.* in the Wisbech district), or by the outgoing tenant making arrangements with the incoming tenant (*e.g.* in the Evesham district). This view is strengthened by the consideration that, as a matter of fact, the planting of fruit has continued to increase since the passing of the Acts; and the Acts, therefore, do not seem to have materially checked planting.

31. In the next place the Committee feel that the principle of the Acts is fair. The value of land is often increased five or six times over by the planting of fruit, and the landlord enjoys an enhanced rent. It would be unjust that the tenant should lose the value of his improvements on the termination of his tenancy; and the Committee think that he should not do so, even though they were made before the passing of the Acts.

32. On the other hand, they recognise that the landlord has two serious grievances. In the first place, he may suddenly be called upon to provide a large sum of ready money, which he may find it very difficult to lay his hand upon. It has been suggested by several witnesses that this might be met by the State lending money to landowners at a low rate of interest, somewhat on the analogy of the old drainage loans. In the next place, he may suffer, and undoubtedly in many cases does suffer, from improper and unfair valuation. The Agricultural Holdings Act of 1883, with which the Act of 1900 is to be read, makes it perfectly clear that the value taken is the value to an incoming tenant. The Committee think that very often valuers act on a different system, basing their calculations on what the tenant has spent on his plantation, without reference to the letting value to an incoming tenant. It was stated by Mr. Wheler that enormous claims are sometimes made when it is impossible to find an incoming tenant at all. It was suggested by some witnesses that the best way to meet this difficulty of valuation would be to adopt the "Evesham custom," with some modifications, as the law of the land. In the Evesham district it is the almost invariable custom for the outgoing tenant to find an incoming tenant who buys him out, the landowner

neither paying nor receiving any money, and rarely objecting to the outgoing tenant's nominee, the fact that he is able to pay out his predecessor being a sufficient guarantee of his financial position. The landlord, however, has the option of refusing a nominee of the outgoing tenant, if, instead, he prefers to pay compensation himself. Another suggestion which was made was that, when two valuers differed, the holding should be put up to auction. But this suggestion would have the effect of depriving the landowner of all control over his estate, and making him a mere rent-charger, like the Irish landlords under the Act of 1881. The Committee cannot recommend this, but they hold that the valuation difficulty must be dealt with.

33. It cannot be too strongly insisted, that the only fair value to be taken is the value to an incoming tenant, under the conditions laid down in the Act of 1883. Fruit may be planted in most unsuitable soils, or on land with most unsuitable surroundings, where, possibly, no incoming tenant could be found at all; and if so the value would be *nil*, and the outgoing tenant who planted the fruit ought to suffer for his lack of judgment. On the other hand, the value may be very great, and an incoming tenant may be willing to pay treble or even quadruple the old rent, and here, clearly, the outgoing tenant ought to be entitled to substantial compensation. The question next arises, What is to be the amount of the compensation, or on what basis is the value (if any) to an incoming tenant to be calculated? This is a matter rather for expert valuers than for the Committee to decide, but the Committee venture to indicate certain principles. In the first place, it should be observed that fruit-growing is a speculative form of cultivation: its success or failure depends at all times on a great variety of chances and circumstances which it is impossible to foresee, and largely also on the capacity, or want of capacity, of the individual grower. In the second place, allowance must be made for the life of a fruit plantation and the probable duration of its productiveness; for two orchards of the same present letting value may have very different lengths of life ahead. Thirdly, the Act directs that regard must be had to the "inherent capabilities of the soil," it being apparently assumed that the landlord, as owner of the soil, contributes something in cases where there is an enhanced value; and this must be taken into account. The matter is often complicated by the fact that, in many cases, landlords charge a higher rent from the beginning where the land is let for fruit. In such cases it may be held that the landlord has already received what is due to him on account of the inherent capabilities of the soil. These would appear to be governing factors in calculating compensation on quitting a holding. The Board of Agriculture has the power to appoint official valuers, and the Committee feel it would be advantageous for the Board to nominate experts in fruit valuation and call them together to decide how best to apply these principles to the calculation of compensation under varying conditions.

34. It has, however, been suggested to the Committee that the best way to meet the difficulties of valuation, which are inevitable in practice, would be to make such an amendment of the law as would, in many cases, avoid the necessity for valuation as between landlord and tenant in the future. The proposal is to make something akin to the Evesham

custom the general law as regards fruit plantations. As the law stands now, a tenant holding under a yearly agreement is entitled to compensation, whether the landlord gives him notice to quit, or he gives the landlord notice. In the case of the landlord giving notice, no change is suggested. If he chooses to get rid of his tenant, he must, in justice, compensate him for any unexhausted improvements the latter may have made. The case, however, is far different where the tenant gives notice. He may have planted fruit rashly, or have made a large loss, and then may throw up his holding, in the hope that the landlord may have to pay him a large sum by way of compensation, even though, in fact, no incoming tenant can be found. It is proposed, therefore, that, in order to establish a right to compensation in cases where the tenant gives notice, the outgoer must present to the landlord an incomer who is willing to become the tenant of the holding at the same rent, and to buy the outgoer's interest in the unexhausted improvements. The landlord, then, would neither pay nor receive any money, and there would be no valuation as between him and his late tenant—the outgoer and the incomer settling this between them. But the landlord would have the option of refusing the nominee of the outgoing tenant, only, if he did so, he would have to compensate the outgoer, exactly as he has to do under the present law. In the event of the tenant failing to find an incomer who would take the holding over, he would not be entitled to receive any compensation ; but this would rarely occur, as the tenant would in all probability not give notice until he had made arrangements with a successor. The Committee have been dealing thus far with yearly tenancies, but there would be no insuperable difficulty in making the same principle apply in the case of leases.

35. This plan has great advantages to recommend it. In many cases it would get rid of the valuation difficulty altogether. The matter is put upon its proper basis :—If the fruit upon the holding is of any value, the outgoing tenant will have no difficulty in finding a successor :—If he cannot find one, the presumption is that there is no value, and the landlord is not likely to be more successful in finding one than the tenant was ; and, as there is no value, there should be no compensation. At the same time, the landlord's control over his estate would not be destroyed :—He could refuse the nominee of the outgoing tenant, and, if so, he would pay compensation under the present law, and be no worse off than he is now. The greatest advantage, however, would be the removal of what has been the chief drawback to the successful working, for the benefit of the tenant, of the Market Gardeners' Compensation Acts—namely, the fear on the part of landlords that they may have to pay large sums by way of compensation, and receive in return what is practically of little value. This would to a great extent disappear, and in consequence they would probably be more willing to let land for fruit-growing than they are at present. On the other hand, it may be objected that it is, to some extent, a curtailment of the privileges enjoyed by existing tenants under the Market Gardeners' Compensation Acts. This difficulty could be met by enacting that it should not apply in the case of existing tenancies ; and, with regard to tenants in the future, the advantage of being able to obtain land for the cultivation of fruit, easily, and without the restrictions now made by landlords and their agents, would far outweigh the right to

compensation for nominal improvements in cases where no incoming tenant could be found. It has also been urged that, in districts where fruit is not yet commercially grown, this provision might deter a tenant from starting the industry, on account of the possibility of his not being able to arrange for a successor. It may, however, be pointed out that this local difficulty of finding a successor would equally deter the landlord from letting for fruit-growing in such districts, as has been shown to have actually happened under the existing state of the law by the evidence of Mr. Wheler and others. The Committee, after much consideration, are of opinion that this proposal contains the elements of the best solution of a most difficult problem.

36. With regard to the other suggestions made to them, the Committee hold that the Market Gardeners' Compensation Acts should be made retrospective, so that a tenant should be entitled to compensation for any improvements made by him before the Acts came into operation, on any holding which, at that date, was in use or cultivation as a market garden within the knowlege of the landlord. If any alterations or modifications of the Acts should be made on the lines suggested in the previous paragraph, such modifications should apply in this case also. They also adopt the suggestion that the State should be empowered to lend money to landlords to help them to pay compensation under the Acts, provided that the Board of Agriculture is satisfied that the valuation has been properly made and that there is good security. The Board already has power to create legal rent-charges for such purposes under the Agricultural Holdings Act, 1883, as amended by the Act of 1900, and has exercised this power in the case of several fruit plantations. The Committee propose that in such cases the Treasury should be authorised to advance the money. No doubt this provision would not often be used, if the Compensation Acts be amended as suggested above; but if no such amendment be made, it would be a great assistance to landlords, and would tend to encourage them to let land for fruit.

37. The Committee wish further to point out that, although it is not permissible to contract out of the Market Gardeners' Compensation Acts, their deterrent effects would be to some extent removed by the employment of a provision of the original Act of 1883 (section 5), which permits a landlord and tenant to make what is called a "particular agreement," by means of which a scale of compensation can be agreed upon in advance, provided only that it is "fair and reasonable." There can be no doubt that a great deal of fruit land is held under such particular agreements, which in many cases have proved to be thoroughly satisfactory. The Committee feel that a more general use of this provision would be most beneficial.

38. So far the Committee have been considering only the case where the fruit grower is a tenant, and have been endeavouring to solve some of the many difficulties which arise from this condition of affairs. The great majority of fruit growers, probably, are tenants, but, in the opinion of the Committee, it would be far more satisfactory if they were the

owners of their plantations and market gardens. The fruit grower expends large sums of money on his holding in improvements which are permanent, or at least likely to last for a considerable time, and, if he is successful, he adds immensely to its value. In this respect his position is very different from that of the ordinary agricultural tenant, in whose case permanent improvements are usually made by the landlord. The ideal solution of the difficulty would be that every fruit grower should be the owner of the soil. Many of the witnesses before the Committee spoke of the advantages of "small holdings," and the great development of the Wisbech district was largely attributed to the fact that the growers had been able in most cases to buy their holdings. Men started by acquiring four or five acres under mortgage, which was generally paid off after a time, and, in many cases, the owner ended by erecting a small house on his land. In the Blairgowrie district a syndicate bought an estate as recently as 1902, and cut up 205 acres of it into small holdings of five to twenty-five acres each: these have, for the most part, been acquired by working men at a price of £50 an acre, payable by instalments, and already 150 acres of the land have been planted. There can be no doubt, also, but that the acquisition of land for small holdings would be much facilitated by the establishment of a cheaper method of conveyance than at present exists. Several witnesses advocated a measure of State-aided purchase of small holdings, on the lines of the Bill brought in by Mr. Jesse Collings last session. Without venturing to pronounce any opinion on the details of Mr. Collings's proposal, the Committee hold that the passing of some such measure would be an immense advantage to the fruit industry.

39. There is another aspect of the question, however, in cases where the planting is done by the landlord. This occasionally occurs on a holding under the Market Gardeners' Compensation Acts, but not very frequently. In this case the Committee have heard two opposite views expressed: first, that the landlord should be entitled to nothing but the recoupment of the original value of the trees; and, secondly, that he should take over the trees without compensating the tenant for the cultivation of them. Both these views appear to be extreme, and the Committee consider that the fair course, in such a case, is for the landlord to raise the rent (though, perhaps, not immediately) by such an amount as would yield him a reasonable percentage on his outlay, and that, on the termination of the tenancy, the valuation for compensation should be made in the same way as in other cases, but that from the amount thus determined there should be subtracted the landlord's expenditure in planting. The planting of trees by the landlord for his tenant is, however, of more frequent occurrence in cases where the land is not rented as a market garden, and this applies to the greater portion of the orchards throughout the West of England, and generally, indeed, to farm orchards throughout the country. In the Western counties, 95 per cent., or more, of the fruit is to be found in grass orchards. In view of the amount of fruit thus grown, and the deplorable state of most of the orchards, the Committee consider that this subject demands the earnest attention of landowners.

Taxation Grievances.

40. These grievances were very general on the part of the witnesses. They may be divided as follows:—

(*a*) Complaints that tenants of fruit farms paid income tax under Schedule A, as well as under Schedule B.

(*b*) Complaints that under Schedule B they paid, not on one-third of the annual value, as other agricultural tenants, but on the profits.

(*c*) Complaints that assessments for local rates, and, in consequence, for income tax (the income tax assessment generally following the poor rate in England), were put up too soon after fruit had been planted.

(*d*) Certain special grievances in connection with the rating and assessment of glass houses.

41. (*a*) With regard to (*a*) and (*b*), which may be described as income-tax grievances, the Committee had the advantage of a carefully explained account of the present system from Mr. Bell, one of the Superintending Inspectors at Somerset House. As regards Schedule A, Mr. Bell explained that in the case of all tenancies, if they are for seven years or more, the assessment can be raised over and above the rent if, in the opinion of the Commissioners, the annual value has been increased by improvements. The result is that the tax on the excess amount falls on the tenant, as the landlord naturally only bears the tax on the rent actually received by him. This is the grievance brought forward by Messrs. Smith and Wood quoted above, and marked (*a*), and these and other witnesses represented it as a hardship and a discouragement to fruit growing. The Committee cannot entirely endorse this view. It is not a special grievance of the fruit grower, but applies in all cases where a tenant improves a property held under a lease of seven years or more, and, if it did not apply, a certain amount of property would go untaxed, as the landlord cannot be expected to pay on more than the amount he receives. The tenant, in the meantime, is the beneficial owner of the improvement. But, as a matter of fact, it is very often the landlord, and not the tenant, who suffers by it; for the deductions to which he is entitled before the assessment is made, viz., the tithe, the one-eighth allowed by the Finance Act of 1894 for repairs, and the land tax, are calculated on, and deducted from, the whole amount of the increased value, and not from the actual amount of the rent, so that in such cases he does not obtain the benefit of the whole, or, perhaps, of any of the deductions.

42. (*b*) With regard to Schedule B, Mr. Bell explained that there is a special rule (called Rule No. 8) for assessing market gardens and nurseries, whereby, instead of paying on one-third of the annual value, the tenant pays on the estimated profits, being assessed practically according to the rules of Schedule D, though nominally under Schedule B. This is the grievance mentioned by Messrs. Lobjoit, Clayton, and others, and marked (*b*) above. This rule used to apply to hop gardens also, but was abolished by the Income Tax Act of 1853 in their case. It should be observed, however, that the rule does not apply to fruit plantations

generally, but only to what are considered to be market gardens or nurseries, and Mr. Bell stated that it only applied, in fact, to 4,749 acres of fruit land, pure and simple, in England and Wales, and to 27,413 acres of market gardens, in which flowers, vegetables, &c., as well as fruit, were grown for sale. It appears that no certain definition either of "market garden" or "nursery" exists for this purpose, and Mr. Bell was of opinion that much land which ought to come under the special rule escaped. Having regard to the uncertainty of the operation of the rule, and of the incidence of the tax, the Committee hold that its continued existence in the case of market gardens is detrimental to the fruit industry. They further see no reason why one particular branch of agriculture should be taxed in a different way from all other branches. The abolition of the rule would result in a very small loss to the Treasury, while it would be a great advantage to the industry, and would remove a source of considerable irritation. The Committee recommend that it be abolished in the case of market gardens, as it was in the case of hop gardens in 1853. As regards nurseries, however, they feel that a similar recommendation would not be reasonable. So much capital is invested in the business, and the goodwill is such a large item in the assets, that nurseries must be regarded as more analogous to ordinary commercial undertakings than to farming concerns, and a tax on one-third of the rent of the land would be disproportionate to the profits of the business.

43. (*c*) With regard to local rating, besides the ordinary complaints that the rates are too high, and always rising (a subject beyond the power of the Committee to deal with), the chief grievance is that assessments are raised much too soon after fruit has been planted. This is the grievance brought forward by Mr. Riley and others, and marked (*c*) above. There can be no doubt that the complaint rests on a real basis of fact. Many overseers and assessment committees doubtless believe that the profits of fruit growers are immense, and directly fruit has been planted they rush up the assessment. This is most unfair, as the profits from fruit do not arise for a considerable period after the planting, especially in the case of orchards. Small fruit yields a return much sooner, and it is a common practice now to plant small fruit between the orchard trees, thus getting a much quicker return; but in the case of all fruit plantations there is probably no return for a year or two, in fact there is generally a loss. The increase of the assessment, moreover, affects not only the rates, but also the income tax in most cases. The Committee think it should be definitely laid down that the assessment of a farm should not be raised in consequence of the planting of fruit for a period—of five years after the planting in the case of small fruit, of seven years in the case of a mixed plantation, and of twelve years in the case of orchards.

44. (*d*) The last of the taxation grievances are those affecting glass houses, which were prominently brought before the Committee's notice by Mr. Rochford, of Cheshunt; Mr. Sams, of Worthing; and Mr. Templeton, of Clydeside. These grievances are of two kinds, concerning income tax and local rates respectively. With regard to income tax, it was pointed out that, whereas in the case of all dwelling houses one-sixth was allowed for repairs, this and nothing more was allowed in the case of glass

houses, though they depreciate much more rapidly than dwelling houses, and the cost of upkeep—chiefly for glass and paint—is immense. It was contended that the one-sixth was quite inadequate. The Committee hold that a strong case has been made out. They recommend that the one-sixth for repairs be increased to one-third in the case of glass houses; that is to say, one-sixth for repairs, and another sixth for depreciation or renewal, the life of glass houses being so short. The rating grievance is that glass houses, and the land upon which they stand, are excluded from the benefits of the Agricultural Rates Act of 1896, it being held that they are buildings within the meaning of the Act. This appears to be unjust; it is evident that glass houses do not stand to fruit plantations in the same relation as farm buildings to ordinary agricultural land; they are merely shelters over part of the land on which the fruit is actually grown. The Committee recommend that the Agricultural Rates Act be amended in such a way that, in the future, glass houses used for commercial purposes should be held to be land, and not buildings, for the purposes of the Act.

Railway Grievances.

45. An immense amount of evidence has been given, which may be summarised under the above heading, nearly every grower and merchant having had something to say about the treatment received from the railway companies; in addition to which the Committee heard two witnesses called to represent the railways: Mr. Hennel, Assistant Goods Manager of the Great Western Railway, and Mr. Vincent Hill, General Manager of the South Eastern and Chatham Railway; while Sir Herbert Jekyll, Assistant Secretary of the Railway Department of the Board of Trade, stated what were the powers of the Board with regard to railway rates and facilities. The evidence given has been of very conflicting character, ranging from decided discontent to expressions of approval. The complaints made may roughly be divided as follows:—

(*a*) That the rates for the carriage of fruit are too high for the services rendered;

(*b*) That preferential rates are given in the case of foreign fruit coming to this country;

(*c*) That preferential rates are given to one place over another in Great Britain; that the incidence of the charges is variable; and that the existing classification presses hardly on growers;

(*d*) That deliveries are frequently unpunctual, so that fruit misses the market;

(*e*) That there is a great deal of bad handling of fruit;

(*f*) That pilfering frequently occurs;

(*g*) That the service given in many places is inadequate; and that the vehicles provided, especially on goods trains, are often most unsuitable;

(*h*) That considerable delays and losses occur in connection with the conveyance of empties;

(*i*) That great difficulty is experienced by growers in getting the companies to pay claims for damage or loss, especially in the case of fruit sent at owner's risk, in the last two years, in consequence of a certain combination among the companies ;

(*j*) That other evil results follow from railway combination.

46. (*a*) Taking these complaints in order, and dealing first with the charge that the rates are too high, we may quote the following from among the statements made by witnesses :—

Mr. Berry (Kent) complained that the rates were too high, and instituted a comparison with the rate charged for flour.

Mr. Riley (Herefordshire) made the same complaint.

Mr. King (Huntingdonshire), the same, especially as regards Gooseberries.

Mr. Templeton (Clydeside) complained that British fruit rates were much higher than corresponding rates abroad.

Mr. Sinclair (East Lothian) complained of the high local rates on the North British Railway.

Mr. Macdonald (Blairgowrie) said the fruit rates were too high.

Mr. Gibbons (Guernsey) said the rates to London were unduly high.

Mr. Pringle (Newcastle-upon-Tyne) said the rates were excessive.

Mr. Craze (Liverpool) made the same complaint, but added that quick delivery was more important than lower rates.

Mr. Bulmer (Hereford) said the rates on cider Apples were too high.

Mr. Monro (Covent Garden) said the rates were much too high, and that the rates abroad were much lower.

Mr. Dennis (Covent Garden) followed on the same lines, and gave a number of comparisons between English and foreign rates, according to which the English rates were much higher ; but Mr. Dennis's statements were subsequently called in question by Mr. Vincent Hill.

47. On the other hand—

Mr. Best (Worcestershire) said that he had not much complaint as to the rates.

Mr. Clayton (Cambridgeshire) said that the Great Northern, Great Eastern, and Midland Railways had treated them well so far.

Mr. Pickering (Bedfordshire) had not much to complain of as regards parcel rates.

Mr. Kerswell (Exeter) had not very much to say against the treatment of the railways.

Mr. Trevethan (Devonshire) said the railway people had been trying to meet the fruit growers as much as possible, and added, "If they could reduce the rates a little more I suppose it would be better for all"—a doctrine to which, probably, every trader in the country would subscribe.

Mr. Wise (Gloucestershire) said the rates were reasonable.

Mr. Idiens (Evesham) stated that in 1896 the Great Western Railway, after a conference with leading growers, issued a new scale of rates, which he described as "the most practical and satisfactory ever issued by a British railway for the carrying on of a trade." He added that the Midland and London and South Western Railways had followed the Great Western's lead.

Mr. Rochford (Cheshunt) had very few grievances against the railway companies, and, among those which he did mention, he did not include any complaint as to the rates.

Mr. Russell (Glasgow) said he had not much complaint about the rates, and thought that the railways "could not do the thing much cheaper than they are doing it now."

Messrs. Wood and E. Pink, two Kentish growers, made no complaints as to railway rates at all; but it should be noted that all their produce which goes to London is sent by road.

The members of the Evesham Market Gardeners' Association, whom the Committee had the pleasure of meeting on the occasion of their visit, expressed themselves quite satisfied with the rates charged, and with the facilities generally, on the Midland and Great Western Railways.

48. A great deal of evidence as to rates was given by Mr. Hennell of the Great Western Railway, and Mr. Vincent Hill of the South Eastern and Chatham Railway. Mr. Hennell confirmed Mr. Idiens's evidence as to the new scale introduced by the Great Western Railway after a conference in 1896, and stated that, in the case of a small consignment of twenty-four pounds by passenger train (the most expensive form of carriage), the charge for 100 to 200 miles works out at $\frac{1}{2}d.$ a pound; if five hundredweight were sent by passenger train the same distance the rate would come down to $\frac{1}{3}d.$ a pound; if ten hundredweight were sent it would be $\frac{3}{10}d.$ a pound. Turning to goods rates, ten hundredweight of Plums could be sent on the Great Western Railway 200 miles for $\frac{1}{6}d.$ a pound, and ten hundredweight of Apples and Pears the same distance for $\frac{1}{8}d.$ a pound. From this he contended that the freight charge was a very small item to the trader; and he quoted the opinion of the late Sir Joseph Wilkinson (the general manager), that the Great Western Railway was making no profit out of its fruit traffic. Mr. Vincent Hill, on behalf of the South Eastern and Chatham Railway, stated that, although their fruit rates had been fixed by the Railway Rates and Charges Acts of 1891–2, his company had, after receiving a deputation of growers, reduced them by 15 per cent. in 1896. The whole of their fruit traffic sent to London by passenger train was conveyed at an average rate of $\frac{1}{10}d.$ a pound, while in the case of fruit sent to London by goods train the average rate is $\frac{1}{12}d.$ a pound. These charges appear at first to be lower than those of the Great Western, but it should be pointed out that the average distance which fruit is carried on the South Eastern and Chatham is very much less than in the case of the Great Western. The Committee have thought it well to quote the evidence as to rates rather fully, in order to show the conflict of opinion which exists, and they now proceed to the other points connected with railways.

49. (*b*) The next complaint was that preferential rates were given to foreign fruit. Many witnesses made this complaint, some quite generally, others quoting what appeared to be definite examples. As, however, an Inter-Departmental Committee has been appointed to deal with this question, the Committee refrain from going further into it.

50. (*c*) The complaint that preferential rates were given to one place over another in the United Kingdom, and that the incidence of the rates was very variable, was made by several witnesses, notably Mr. Gibbons, who gave several examples of inequalities of rates from Guernsey to different places in the United Kingdom; Mr. Sinclair, who complained

that fruit was conveyed from the East of Scotland to Glasgow at a much lower rate than it was to Edinburgh; Mr. Pringle, who gave a series of examples (for Potatos, not fruit) on the North Eastern Railway; and Mr. Monro, who mentioned similar cases on the Great Eastern. No witness denied the existence of these inequalities; in fact, Mr. Hennell admitted that they might exist, the cause generally being competition. At points where two railways compete the rate would generally be charged by the shorter route; this might cause an intermediate place on the longer route to be charged at a considerably higher rate than was the competitive station further on. He further pointed out that, where general reductions had been made by one company, the reduced scale could only apply in its entirety to non-competitive stations, the rates for competitive stations having to be fixed by agreement between the competing companies.

51. (*d*) The next series of complaints was that deliveries were frequently unpunctual, and that the fruit, in consequence, missed the market. This complaint is a serious one, and was very general. If perishable fruit does not reach the market to which it is consigned by the early morning, when the retail dealers come to make their purchases for the day, a great loss ensues to the grower, his fruit having to be sold at a disadvantage. Among the growers who made this complaint were Messrs. Best, Templeton, and Gibbons, and among the salesmen, Messrs. Pringle, Craze, and Monro. In reply, Mr. Hennell admitted the great importance of the question, and stated that his company were doing all they could to avoid delay; at the same time, he pointed out the difficulties of running goods trains to time, and suggested that, if growers would only send their produce a little earlier to the stations, delay might often be avoided. Mr. Vincent Hill gave similar evidence with regard to the South Eastern and Chatham Railways.

52. (*e*) Bad handling of fruit, with consequent loss to the grower, was also the subject of a good deal of complaint. It was mentioned by the following, among others: Messrs. Lobjoit, King, Pickering, Gibbons, and Chambers. That such bad handling takes place to some extent is undoubtedly the case, and it was not denied by the representatives of the railway companies, though they stated that they took all possible steps to prevent it. Mr. Vincent Hill produced before the Committee a very stringent notice, issued in 1904, to the staff of the South Eastern and Chatham Railway on the subject, threatening the penalty of instant dismissal in the case of any of the company's employees being detected handling fruit in such a manner as to cause a risk of damage. Mr. Hennell suggested that bad handling was often the result of fruit being sent too late to the stations, and of bad packing.

53. (*f*) Similar complaints have been made as to the pilfering of fruit while on the rail, with consequent loss to the grower. The existence of the evil in some cases cannot be denied.

54. (*g*) Serious charges have also been made against the companies for inadequate facilities, and with regard to the class of vans or waggons provided for the carriage of fruit. But here, again, there has been some conflict of testimony.

Mr. Kruse complained of the sheeted vans used on goods trains, the black tarpaulins (which absorb much heat) pressing down on the fruit and preventing ventilation ; on the other hand, he stated that the vehicles used on passenger trains were suitable and good.

Mr. Sinclair also complained of the sheeted waggons, and said that the service of trains from Prestonkirk to Edinburgh was very bad.

Mr. Hodge stated that until lately there was no such thing as a ventilated waggon at Blairgowrie station, but that now they had some ; and he added that they wanted refrigerator cars also.

On the other hand, Mr. Berry said that the fast train traffic from Kent to the North of England was well manipulated, and that he was well satisfied with the waggons.

Mr. Lobjoit said the supply of vans was sufficient, so far as his experience went.

Mr. Idiens spoke highly of the new covered and ventilated goods vans put on by the Midland Railway.

Mr. Russell said that a good service was wanted, but he added that he could not complain much about it.

The chief of these grievances appears to be the character of the goods waggons, and there can be no doubt that the ordinary low waggons with the black sheets pressing on the fruit, and with no ventilation, are most unsuitable. To get over this difficulty certain railways now have what are called "sheet supporters," which keep the sheets away from the fruit and allow a current of air to pass over it. The new ventilated goods vans introduced by the Midland Railway, some of which the Committee had the opportunity of inspecting at Evesham, are a still greater improvement, and appear to give complete satisfaction. The Committee were informed that the Great Western Railway proposes to build similar vans for its fruit traffic, and they would be glad if other companies could see their way to do the same. The practice of running special services of trains appears to be established in some of the principal fruit-growing districts during the season.

55. (*h*) As to the next of the grievances mentioned above—the delay in the carriage of empties—instances have been mentioned to the Committee in which empties, despatched for the marketing of a crop, were not delivered until one month afterwards, and not until the crop had been gathered and sold. Empties, no doubt, are generally conveyed at a very low rate, but delays such as this may be a serious matter to the grower, and should certainly not occur ; they imply culpable negligence on the part of the carrier. The handling of empties on the lines also appears to be extremely rough and to admit of much improvement.

56. (*i*) Perhaps the most difficult of the railway grievances is that connected with the payment of claims made by growers in consequence of loss or damage while their produce is in transit. In the case of fruit this is a matter of great importance, as so much fruit sent by rail is perishable in character. The question is greatly complicated by the fact that fruit (like other articles) can generally be sent either at company's risk or at owner's risk. When goods are sent at company's risk the company is under the ordinary liability of a carrier ; and in case of any loss or damage the companies are liable if it can be shown that they have not done what might reasonably be expected of them. But the

companies have been willing to contract out of their liability by giving lower rates (as much as 50 per cent. lower in the case of parcels), the goods being then sent at what is called owner's risk; and in this case, by the terms of their contract note, they are relieved of all liability, except such as can be proved to have arisen from the wilful misconduct of their own servants. Notwithstanding this, the companies continued to pay a good many claims on goods sent at owner's risk until about two years ago, when, according to the evidence of very many witnesses, they made a combination, and since then it has been most difficult to obtain the payment of claims, these now being adjudicated upon, not by the officials of the particular line, but by a joint committee. The railway witnesses did not deny this. They stated that they had been much too easy in the past in the payment of claims in the case of goods forwarded at owner's risk, and that in consequence, after giving the growers the benefit of the low rates, they were still undertaking the liability which they had intended to avoid. They further said that this had arisen largely through competition—one line paying a claim, when it was not legally liable to do so, at a competitive station in order to secure traffic in the future—and that they had, therefore, agreed that all claims in respect of goods conveyed at owner's risk should be dealt with in future by a joint body known as the Joint Claims Committee. This action may not be illegal, but it has caused great irritation among growers all over the kingdom.

57. (*j*) With regard to the other evil effects which are said to have followed from the tendency to closer combination exhibited in recent years by the railway companies three instances given in evidence may be quoted:—

> Messrs. Clayton and Welchman stated that, as a result of the combination among the three railways which serve the Wisbech district, some of the facilities previously given had been curtailed, especially with regard to the collection of fruit.
>
> Mr. Monro and others stated that the Metropolitan Conference of Railway Companies had curtailed the facilities for the collection of fruit and empties in London.
>
> Mr. Gibbons, on behalf of the Guernsey growers, gave a large amount of evidence to show that the service from the Channel Islands, and the facilities given there, had been changed for the worse since the traffic agreement concluded by the Great Western and London and South Western Railways came into force. Mr. Gibbons's statements were confirmed by Mr. Monro, as regards late delivery of Channel Islands produce in London.

58. With regard to the powers of the Board of Trade, Sir Herbert Jekyll stated that the Board relied chiefly on what is commonly called the Conciliation Clause of the Railway and Canal Traffic Act, 1888. By this clause the Board acts as umpire between traders and the railway companies; first, by means of correspondence and investigation of complaints, and then, if thought desirable, by inviting both the aggrieved parties and the representatives of the companies to meet in conference, an official of the Board taking the chair. It should be observed that the Board has no coercive or compulsory powers under this section, to which

fact Sir Herbert Jekyll, in agreement with the late Sir Courtenay Boyle, attributed the great success which he thought it had achieved, 1,188 complaints having in all been made to the Board, of which 769 were settled more or less to the satisfaction of the complainants, and the remainder dismissed as unreasonable; and in all cases he thought that much friction was removed by mutual explanations. It is somewhat remarkable that, of all these complaints, only twenty related to fruit traffic, and some of these were concerned with the carriage of foreign fruit. It should also be noted that the cases dealt with under this clause are not cases of illegality, but of unreasonableness. With regard to the cases of illegality, they can be dealt with by recourse to the courts. A report is presented to Parliament every year of the proceedings of the Board under this clause, but it appears to be of a rather meagre description. Sir Herbert Jekyll also mentioned certain other powers possessed by the Board with regard to rates and facilities—viz., power to determine what are reasonable facilities for the conveyance of perishable merchandise under Part V. of the Schedule to the Railway Rates and Charges Acts, 1891–2; power to add to the statutory classification of goods, articles not previously classified; power to assist traders to obtain reductions in the railway general classification of goods by agreement with the railway companies; power to make application to the Railway and Canal Commission with regard to any contravention of the Railway and Canal Traffic Acts; and some others. But these powers have been very seldom exercised, and the last mentioned not at all. The Board is convinced of the great utility of its action under the Conciliation Clause, and it does not desire any extension of its present powers.

59. The Committee have endeavoured to set out as fairly as possible the various points raised in the evidence given on railway grievances, and now proceed to deal with them in order. Looking at the evidence as a whole, they are inclined to believe that, whatever may have occurred in the past, before the fruit industry had grown to its present importance, the railway companies are now in many cases realising the fact that it is in their own interest to give fuller consideration to the requirements of the industry. This is more particularly the case with some of those lines which run in the chief fruit-growing districts and are the largest carriers of fruit. In this connection Mr. Wise, manager of the Toddington fruit farm, said, "I think the railway companies are, thanks to the efforts of the National Fruit Growers' Federation mainly, more inclined to meet growers. I particularly refer to the Great Western and Midland." In the case of railways running in districts where the fruit industry is less developed, and having a comparatively small amount of fruit traffic, the condition of affairs is not so satisfactory.

60. In view of the figures put in by Mr. Hennell and Mr. Vincent Hill, and the statements of many witnesses, we cannot hold that the rates in themselves are, in most cases, unduly high. But we think that they are often very variable in their incidence, due, to some extent, to special reductions having been made to meet the requirements of particular districts and to the presence or absence of competition. We think that the introduction of a more uniform system throughout the whole country would be a great advantage.

61. Some witnesses have suggested that the existing classification is unfair, and also unduly complicated, and have advocated a statutory revision. But this would mean an amendment of the Rates and Charges Acts of 1891–2, and the reopening of all the questions then raised. We do not think that there is evidence enough to justify our recommending this course at present. We would further point out that it is within the power of the companies to adopt in practice a simple and uniform scale, thus getting rid of the complication of the legal classification, as was first done by the Great Western Railway in 1896, and subsequently by other lines. It would, however, be more satisfactory if such a new scale were made general, and, as pointed out by Sir Herbert Jekyll, this can be done by the railway companies agreeing to alter their general classification for fruit, with the assistance of the Board of Trade, under Section 31 of the Act of 1888.

62. Turning to the question of facilities, there can be no doubt that quick transit and punctual delivery are by far the most important matters in connection with the fruit traffic, and it is here, the Committee think, that the companies most fail. No doubt they have difficulties. If goods trains are to be run to fixed hours, they might have to be allowed more time than they are at present, and this would not be an advantage to the fruit grower. But, having regard to the perishable character of much of the fruit sent by rail, in consequence of which it is rightly carried at higher rates than non-perishable goods, and to the great importance of its catching the early market, the Committee think that the companies ought to make greater efforts to get fruit traffic through up to time, and to deal in the most liberal manner with claims for losses arising from late delivery. With regard to the waggons and vans supplied, ventilation is all-important, and the sheeted trucks, without sheet supporters, are most unsuitable. Such trucks should be condemned altogether for fruit traffic, and, if growers are unable to obtain a proper supply of covered ventilated goods waggons, or sheeted trucks with supporters, the Committee advise that they should at once combine, and complain to the Board of Trade, taking advantage of the Conciliation Clause mentioned by Sir Herbert Jekyll. With regard to the demand for refrigerator cars, the Committee are not certain that they would be an advantage, except for fruit coming long distances, such as from Scotland to London. Mr. Berry, also, pointed out that if special waggons were built at considerable cost for the fruit traffic, the companies would certainly make this a reason for raising their rates, which they would have a right to do within their maxima. The vans used on passenger trains appear to be satisfactory.

63. With regard to the refusal of the companies to pay claims for loss or damage, especially in the case of fruit consigned at owner's risk, the Committee are strongly of opinion that it would be a great advantage to all parties if carriage at owner's risk were done away with altogether. Mr. Hennell, as representing the companies, was clearly of this opinion, and stated that when the Great Western Company framed their new scale for goods traffic, they made the rates at company's risk only, and that they did not, as a rule, give owner's risk rates between places where they controlled the traffic, on account of the friction which invariably arose. We believe that if the owner's risk rates at present in existence were

slightly raised, say 5 per cent. (which Mr. Vincent Hill suggested was the proper difference between them and company's risk rates, though the actual difference is generally much more, and varies enormously), and if all fruit, both by goods and passenger trains, were carried at company's risk in future, growers would gladly pay the small extra amount, and get rid of the present annoyances and loss occasioned by the non-payment of claims, or the payment of them only after much correspondence and delay.

64. In the event, however, of the owner's risk rates being maintained, the Committee are of opinion that the exemption of a company from liability unless "wilful misconduct" is proved is too stringent a condition; for in hardly any case would it be possible for a consignee to obtain the necessary evidence, as that would have to be derived from the servants of the company itself. They consider that the term "culpable negligence" should be substituted for "wilful misconduct." They are glad, however, to note that, according to Mr. Hennell, the railway companies seem inclined to take a more reasonable view of their liability, and to admit claims in the case of total loss, and sometimes in the case of damage, the assumption of this attitude being, no doubt, largely due to the representations made by the Board of Agriculture to the railway companies in Great Britain, the correspondence being subsequently presented to Parliament. [Cd. 2045.]

65. With regard to the other evil effects said to follow from the policy of combination or co-operation adopted in recent years by the railway companies, it should be pointed out that working agreements may be of distinct advantage to the public; they ought to, and in some cases do, ensure greater certainty of connection and punctuality of delivery than used to exist in the days of keen rivalry and competition. At the same time, it is clear that the companies, in consequence largely of trade depression and decreasing dividends, have been induced by the advantages they derive from combination to curtail facilities granted by them before, much to the annoyance and loss of growers and traders generally. Some of these facilities were such as growers had no right to demand, but the withdrawal of such privileges, once granted, is none the less felt to be a grievance. The most serious aspect of the case, however, is that by means of combination the railways are rapidly becoming a powerful monopoly, against which it is practically impossible for any individual or for any ordinary association to contend; and the Committee are of opinion that it will soon be necessary, if indeed the time has not already arrived, for the Government to appoint an official, or a Department, to watch over the companies' actions in the interest and for the information of the general public, and to report to Parliament.

66. The Committee are disposed to think that the action of the Board of Trade under the Conciliation Clause has been most advantageous to traders, so far as it has been employed, and they agree with Sir Herbert Jekyll in holding that the Board's powers under the clause should not be made compulsory. As the late Sir Courtenay Boyle remarked, the strength of the clause is in its weakness. If the official appointed to conduct negotiations under the clause had power to fix a rate, the railway companies would not be inclined to come before him, but would prefer to

go before a regularly constituted court of law. But the Committee feel that the provisions of the clause and the possibility of obtaining the good offices of the Board in the case of disputes with railway companies are evidently very little known among traders generally; and it is clear that the average fruit grower is quite unaware of the existence of anything of the kind, otherwise is it credible that there would have been only twenty complaints of "unreasonableness" against the companies in sixteen years? The Committee desire to draw the attention of fruit growers and salesmen to this most valuable provision, and strongly advise them to avail themselves of it in all cases where they consider they are not receiving fair treatment at the hands of the railways. The Committee are also of opinion that it would be an advantage if the Board of Trade laid before Parliament, every year, a far more detailed report of their proceedings under this Conciliation Clause than they appear to do at present.

Foreign Competition and Hostile Tariffs.

67. Much evidence was given on this subject. Many witnesses complained of the unfairness of the present fiscal system of the country, which, they said, resulted in the ruinous competition of foreign fruit, and also in the exclusion of British fruit from foreign markets. The remedies suggested were, first, the imposition of duties on imported competitive fruit—though some witnesses expressly excluded fruit coming from the Colonies from such a proposal—or, secondly, some power of retaliation, or some alteration of our present system, so as to enable the Government of this country to compel the foreigner to treat us as we treat him. Among those who advocated the imposition of duties the following may be mentioned:—the Canterbury Farmers' Club, through Mr. Berry (though he stated that personally he did not agree with the recommendation); Mr. Smith, representing the Maidstone Farmers' Club; Mr. Wood, Mr. Riley, Mr. Best, Mr. Kruse, Mr. Kerswell, Mr. Trevethan, Mr. Macdonald, Mr. Bunyard, Mr. Meats, Mr. Sheppard, Mr. Buck, and Mr. Chambers. Besides these, the following witnesses advocated some alteration in our present fiscal system, so as to free this country from what they held to be a state of dependence on foreign nations and Governments, and to enable us to fight hostile tariffs by retaliatory tariffs at home:—Messrs. Wise, Idiens, Rochford, Sams, Monro, Dennis, and Langridge. Other witnesses, again, complained of the competition of foreign pulp and cider, and advocated some fiscal change as a remedy for these grievances.

68. A somewhat remarkable example was given by four witnesses of the killing or stifling of an English export trade by the imposition of duties abroad. It appears that some years ago a considerable business was started in this country in the way of exporting hothouse Grapes to France for table purposes. It may seem strange that this country, with its notoriously fickle climate, should export Grapes to sunny, Grape-growing France; but the fact appears to be that the French, though they produce an immense crop of Grapes grown out of doors for the purpose of making wine, had attempted little commercially in the nature of growing first-class Grapes for table. Several English firms, therefore, who grow

the highest class of fruit under glass began to export Grapes for this purpose to France, and a very considerable and most lucrative trade was springing up. But, on representations made to the French Government, a prohibitive duty was placed upon foreign Grapes, and since then not only has the export from England entirely ceased, but Grapes from Belgium, which formerly went to France, have been diverted to the English markets.

69. Mr. Blackwell also mentioned that the McKinley Tariff had destroyed the export trade of jam to the United States of America. He was not, however, in favour of the imposition of duties, and stated that he had been fortunate in finding markets elsewhere, chiefly in the Colonies, and must run the risk of prohibitive duties being imposed there.

70. On the other hand, a large number of witnesses stated that the importation of foreign fruit was a great advantage to the British fruit grower, as it created a taste for fruit, and kept the fruit merchants busy and the fruit shops open all the year round, thus greatly assisting the distribution of British fruit when in season. Among those who supported this view were Messrs. Berry, Poupart, Best, Pringle, Lobjoit, Templeton, and Craze. Other witnesses, again, such as Mr. Hodge, Mr. Sinclair, and Mr. Chivers, objected to the suggested imposition of duties, on the principle that the present fiscal system of free imports was best for the country generally; but Mr. Sinclair added that protection against foreign fruit would be a great benefit to him as a grower.

71. With regard to the important question here raised, the Committee desire to state that at the outset they decided not to ask for evidence on this question, nor to make any recommendation, as it was really part of the larger question, into which they could not enter, viz. that of the fiscal policy of the country generally. As a result many of the witnesses examined made no reference to the question at all. The Committee did not, however, see their way to refuse such evidence as might be voluntarily tendered. They now content themselves with recording the various opinions expressed and the suggestions made.

72. Leaving the fiscal question, we may mention the suggestion made by several witnesses that all foreign fruit sold in this country should be marked and labelled, and that a similar note of identification should be applied in the case of all jam made from foreign fruit. It seems to be generally held that English fruit is preferred to foreign for the table—no doubt on account of its freshness—and that preservers, for a similar reason, would always prefer to make jam from English fruit, if only the supply were assured. It was argued that by such marking the British grower could be helped in his fight with the foreign grower, without any prejudice to the system of free imports, just as has been done in the case of manufactured articles since the passing of the Merchandise Marks Act. Among the witnesses the following may be mentioned as advocates of the marking of foreign fruit—Messrs. King, Trevethan, Kerswell, and Bunyard; and those in favour of marking jam, Messrs. Templeton, Chivers, Wood, and Sheppard. No doubt it would be considerably more difficult effectively to mark fruit—and also to obtain proof of improper marking—than in the case of a manufactured article, and the Committee are doubtful whether it would be feasible. No such insuperable difficulty,

however, would appear to exist in the case of jam; and the Committee, therefore, recommend that every pot of jam made wholly or in part from foreign fruit should have this fact clearly stated on the label.

The Insufficient Inspection of Foreign Fruit.

73. Many witnesses complained that much of the fruit and fruit pulp imported from abroad arrived in bad condition, and urged that a great deal more in the way of inspection was required. Of these, several seemed to think that there was no system of public inspection at all, or, at least, they were unaware of its existence. Mr. Templeton, for example, stated that he had never heard of fruit being condemned at Glasgow, though much of the imported fruit was bad; while Mr. Blackwell, speaking of foreign pulp, said that it was inspected by the wharfinger before it was sent to the factory, but that he did not know that there was any Government inspection. On the other hand, it is a matter of common knowledge that fruit, like other articles of food, is sometimes seized and condemned by public officials as unfit for human consumption, and, among the witnesses, Mr. E. Pink said that he had had visits from the inspectors at his factory, and Mr. Idiens spoke of seizures which had taken place in 1903 of Dutch and German Plums, in consequence of which, he said, pulp was now sent instead of fruit, and that much of it was bad and not inspected. Having regard to the importance of the matter from the point of view both of the British fruit grower and the public health, and to the uncertainty which appeared to prevail, the Committee invited the Local Government Board (as being the Department concerned with Public Health in England) to give them any information which they might possess on the subject, and the correspondence and memorandum forwarded by the Board are printed in the Appendix.

74. From this memorandum it appears that the inspection of fruit (and of other articles of food) is not undertaken by the Board itself, but is dealt with by local authorities exclusively, acting through their medical officers of health and inspectors of nuisances. The powers of these officials, which are very considerable, are to be found in sections 116 to 119 of the Public Health Act, 1875, and section 47 of the Public Health (London) Act, 1891. The Board has, by general orders issued in 1891, drawn attention to the duties and powers of these officers, but has not collected any statistics showing to what extent action has been taken. The Committee, while anxious not to appear to criticise a Public Department, feel that this is an unfortunate omission. The administration being purely local, it may well be understood that it varies greatly in different districts, some local authorities acting vigorously and effectively, others being lax in the discharge of their duty. But the Local Government Board has no knowledge of what is taking place, and has no means of discriminating between the action of different authorities. The Committee are also of opinion that something more than mere local action is needed. Having regard to the great danger to public health arising from unsound food, and to the fact that this danger is far more likely to arise in the case of imported than in that of home-grown food, owing to the length of time occupied in transit, the Committee hold that, in addition

to local inspection, there ought to be Government inspection of all perishable food at the ports of entry. They are of opinion that if this had been done in the past much foreign fruit which has found its way to some of the jam factories would have been destroyed as being unsound, with great advantage to the British fruit grower and to the public generally.

The Labour Difficulty.

75. Several witnesses complained that the industry was seriously handicapped in their districts by the difficulty of obtaining labour, or, at least, the right kind of labour. For example, Mr. King, a fruit grower in Huntingdonshire, stated that there was a great scarcity in his district, and attributed it to the absence of cottage accommodation. Mr. Sinclair made the same complaint as regards East Lothian. Mr. Wise, the agent for the Toddington estate, said that it was very difficult to get the right sort of men. All these witnesses complained, it will be observed, of the difficulty of getting regular labour throughout the year, which, as we have seen, is a very large item on a fruit farm. Others complained of the difficulty of obtaining pickers—notably Mr. Trevethan, Mr. King, and Mr. Sinclair. These two grievances are quite distinct, and may be dealt with separately.

76. With regard to the question of regular labour, the absence of cottages in country districts and the disinclination of landowners to build them undoubtedly lie at the root of the difficulty. It costs so much to build cottages at the present day, largely in consequence of the elaborate and extravagant by-laws in force in many country districts, and the rent which can be obtained for them is so small, that very few people are willing to build them, for the simple reason that they do not pay. The result is that labour is either unobtainable in some districts, or else the workmen have to walk a long distance, as mentioned by Mr. King. In either case the development of an industry which employs a great deal of labour, like the fruit industry, is seriously retarded. It should be observed, however, that these complaints came principally from those districts where fruit is not grown on a very large scale, and where, probably, it is to some extent a new industry, suddenly causing a great additional demand for labour. No such complaints were made from Kent, Worcestershire, or any of the larger districts. Mr. Wise explained that at Toddington they had solved the cottage difficulty by building themselves, thirty cottages having been erected at an average cost of £450 a pair, and let for £5 per annum each, which meant that the landlord received practically no interest upon the capital expended; but, he said, it was worth while "to put up a good cottage to house a good man, if they could get one," and added that they regarded it as part of the business of the fruit farm. No doubt the same plan has been adopted in other large fruit-growing districts. But the difficulty remains wherever the industry has been recently introduced, and the Committee feel that some steps should be taken to endeavour to mitigate it. They suggest that in England the present building by-laws should be amended in country districts, so as to reduce the unnecessarily high cost of building cottages at the present time. They also desire to draw attention to the fact that District Councils

have the power to build cottages, with the assent of the County Council, under the provisions of the Housing of the Working Classes Act, 1890; but they believe that the time allowed for the repayment of loans was, until recently, so short as to render the rent which had to be paid prohibitive to working men. By the provisions of the Housing of the Working Classes Act, 1903, this term has been extended from 60 to 80 years, and the Committee believe that the Acts may now be put in force by District Councils with advantage to country districts.

77. With regard to the alleged difficulty of obtaining pickers, we notice, again, that there are practically no complaints from the larger districts. Indeed, where fruit growing is general very elaborate arrangements are made for the importation and housing of pickers from the great towns and populous districts in the neighbourhood. In Kent, the pickers come largely from the East End of London; in Worcestershire, from the Black Country; in the Holt district of Denbighshire, from the Lancashire towns. Mr. Sheppard, in his evidence, described the buildings specially erected by Messrs. Bellis Bros., the largest growers in the Holt district, for the housing of the pickers there, and the very careful sanitary and other regulations enforced during their stay. Similar arrangements are made by growers elsewhere; and Mr. Hodge mentioned an experiment, which he had recently made in the Blairgowrie district, of obtaining the services of large numbers of respectable girls from shops and factories in Glasgow, through the medium of the Scottish Women's Trades Council, and stated that it had proved a great success. Such arrangements are in every way beneficial, securing to the grower an adequate supply of cheap labour, and providing a most healthy and invigorating change into the country for a considerable portion of the dwellers in our great cities. But in districts where fruit growing is less organised, or which are far from industrial centres, the difficulty of obtaining pickers is a real one. Mr. King stated that he could double his business if only he could obtain pickers, and that he had planted a large amount of Strawberries, but had to plough the land up again because of the impossibility of picking them. Similar complaints were made by Mr. Trevethan, a Devonshire grower, and by Mr. Sinclair, who represented the East Lothian district. The remedy which naturally suggests itself in such cases is, that growers should co-operate to obtain labour from outside. Several of the witnesses, however, were of opinion that a great deal more might be done by children in elementary schools, if only the school authorities would give more help; and Mr. Hodge suggested that boys should be allowed to be sent from industrial schools, and to remain for the fruit harvest. Apparently, at the present time they cannot remain away from school more than two nights without the consent of the Home Office. This would appear to be a very reasonable proposal, subject to proper conditions. With regard to the elementary schools, it was complained that the school authorities were unwilling in some places to arrange the holidays so as to free the children during the picking season; but it should be remembered that the fruit-picking season is a long one, lasting from the middle of June to the middle of September, and it would be impossible to arrange for the holidays to last all this period. It should further be noted that, according to the provisions of the Robson Act (or, in Scotland, the Pirie Act), to

which reference has already been made, boys of a certain age may spend part of their time on the land and part of their time at school. Their services would be most useful in the picking season.

Market Grievances and Distribution Difficulties.

78. We pass now to the problem of the distribution of fruit—a most important matter to British growers. It will probably be most convenient to give a short account of the market system at present in existence in Great Britain, and, in passing, to notice the complaints and suggestions which have been made.

79. The markets for fruit may be divided into two main classes, namely, the wholesale markets, where large consignments are sold, and whence a great deal of the produce dealt with finds its way into other smaller markets; and, secondly, the smaller markets, where the growers themselves sell their produce to local fruiterers, or direct to the consumers. There are, naturally, many gradations between these two classes, and in many markets wholesale dealing is combined with the retail selling by stallholders.

80. As a wholesale market and chief distributing centre, Covent Garden occupies by far the most prominent position. There are, however, in or near London, other markets, such as Spitalfields, the Borough, Stratford-le-Bow, and Kew Bridge, which are on a fairly large scale; and some of the provincial markets, such as those at Manchester, Newcastle-upon-Tyne, Birmingham, Liverpool, Edinburgh, Glasgow, &c., are big enough to act as distributing centres of the same character (though on a smaller scale) as Covent Garden. The opinion expressed by various witnesses on the subject of these larger markets may be classified as to their bearing on the questions: (1) As to whether more markets are required for London; (2) as to whether the existence of one pre-eminently large distributing centre is advantageous, or not; (3) as to whether the number of large local markets is sufficient.

81. There would appear to be undoubted advantages under the present circumstances in the existence of one pre-eminent distributing centre. For high-class fruit, especially that grown under glass, Covent Garden has come to be recognised as the best centre, and although attempts have been made to deal with the same class of fruit in other London markets, these attempts have not been successful. It is evident that it must be a convenience to buyers to be certain that they will find what they want in one particular market (if procurable at all), instead of searching through several different markets. For dealing with large quantities of choice fruit, also, centralisation presents great advantages, and, indeed, according to one witness, is quite necessary, instances being quoted where large growers, after attempting to sell their goods in a number of different markets, had to revert to sending them all to Covent Garden, whence they became distributed to those places where they were required. Several witnesses expressed the opinion that there was no need for other markets in or near London. This may be true as regards markets of a size sufficient to act as large distributing centres, and, possibly, as regards markets for the highest class of goods; but the origin of the Kew Bridge

Market, an account of which was given to the Committee by Sir William Thiselton Dyer, shows that the formation of a fresh market at a new centre may supply a decided local want and create a fresh demand. The Kew or Brentford Market originated six or seven years ago. The carters on their journey from the country to Covent Garden used to stop at Kew Bridge to bait their horses. The practice arose of selling some of the goods while waiting. An informal market grew out of this, which the proprietors of the district converted into a formal one, and which now has become a market of considerable importance. It can scarcely be doubted that if a similar opportunity for starting a market occurred in other suburbs of London a similar demand for fruit would be found to exist there, or would be created by the opportunity afforded.

82. Whether or not such subsidiary markets in London would ever tap Covent Garden of any of the highest class produce is a question, but they would probably not do so without a persistent effort on the part of the producers, maintained for a considerable time at a loss to themselves. Even those witnesses who considered that one great central market, dealing with the bulk of such produce, is wrong in principle were agreed that, as a matter of fact, Covent Garden is at present the only market to which a grower can send such produce in bulk so as to secure proper prices. Any want of efficiency of Covent Garden as a central market appears to lie in its being too small to fulfil its functions adequately. Every effort, the Committee believe, is made to extend it whenever opportunity arises, but extension—and also the improvement of the approaches to it—is rendered very difficult by the property around it belonging to different owners.

83. Just as other markets in London would not interfere with Covent Garden, so would it be with subsidiary markets in provincial towns; indeed, the extension and multiplication of these would probably increase the work of the larger distributing centres. That there is room for extension of provincial markets appears to be certain. The market at Bristol, for instance, is said to be quite inadequate for a town of that size, and there are towns of 100,000 inhabitants which have no markets deserving the name.

84. The multiplication of large provincial markets would, no doubt, be of much importance in relieving gluts, to the great advantage of growers. Two instances which may be quoted in illustration of the development of provincial markets are those of Birmingham and Hereford. Thirty years ago the former was quite small, but it has been repeatedly enlarged, and has now become an important distributing centre. That at Hereford has proved of immense importance to the growers, who there find customers for their produce in bulk, and who, according to Mr. Meats, the salesman for the Corporation, make double the prices which they used to do before the market was started. This market was but little appreciated at first, but is now recognised to be of much importance to the county. It is managed for the Corporation by a committee, and the committee supply the growers with boxes for their produce at a low charge.

85. In regard to the small retail markets in country towns, there appears to be room for much improvement. These markets are in many

cases held in the open streets, where the sellers are fully exposed to the weather, and where, as might be naturally expected, no good produce or well-to-do growers are likely to be found. If these markets were suitably covered, a considerable increase in trade would doubtless result, for the small grower cannot send to large markets with much chance of good profit, owing to the heavier rates on small quantities, and to the fact that small consignments do not admit of his name getting known on the market. His proper market is the local market. A favourable instance of a retail local market which has been mentioned to the Committee is that of Barnstaple, to which the farmers in the neighbourhood send their produce every week, and to which the whole countryside resorts to obtain their week's provisions.

86. The market facilities and distribution of fruit in Scotland were stated by Mr. Russell to be satisfactory.

87. There have been few complaints as to market tolls being unduly onerous, though one witness said that at Covent Garden they were excessive. This, however, appears to have been an individual opinion, and was not supported by other witnesses. It is possible that in some cases a revision of tolls would be an advantage, the existing scale having been fixed at a time when the fruit trade was very different from what it is at present.

88. Co-operation for distribution has been adopted in some cases, notably at Blairgowrie by the Fruit Growers' Association there, as described by Mr. Hodge. Each member of this Association sends his produce to the secretary of the Association, who then consigns it to the various markets in bulk, according to the information which he has received as to the requirements of the markets. Such information is, naturally, more complete than that which could be obtained by each individual grower; overstocking an already glutted market may thus be avoided and better prices realised. An average price is struck, and the growers are paid on that basis, less a percentage deducted to pay the expenses of the working of the Association. The advantages of this plan are obvious, and the Committee are of opinion that it would be to the benefit of growers if similar co-operative societies were started in other districts. But it is not easy to persuade British farmers to co-operate, and there appear to be special difficulties in the case of fruit. A grower whose fruit is above the average, and who takes trouble about packing and grading, might be unwilling to pool it with that of less careful growers. But, at any rate, co-operation may be usefully employed, as at Blairgowrie, where fruit is grown mainly for jam-making, and where special packing and grading are not necessary; in such cases it is strongly to be recommended.

89. Whatever improvements may be effected in markets, it is probable that they will still leave much to be done in the way of fruit distribution. Even in fruit-growing counties it is often difficult to obtain a proper supply of fruit, just as fish is often unobtainable at seaside places. Certain firms, especially in the Evesham district, are doing a considerable business in supplying the consumers direct with fruit in boxes. The direct distribution of fruit is, however, not such a simple matter as that of fish; for the supply is not so constant, either in character or in amount, and,

therefore, it is a form of business more suited to a fruit dealer than to a fruit grower. Any such retail distribution would be much assisted by the provision of greater facilities in the parcel traffic on railways, and it has been suggested that if the parcel rates were simplified for weights up to 30 lb., so as to be dependent on weight only, and not on both weight and distance, a great advantage would be secured, and the traffic in such parcels would probably develop to the same extent as has the traffic in smaller parcels by post, to the benefit of producers and consumers, and of the railway companies as well.

90. The Committee have heard a considerable amount of evidence in favour of the use of non-returnable boxes for packing the better classes of fruit. The return of empties is a cause of annoyance and expense, and it is said that the deposit left on the hire of baskets in Covent Garden amounts to thousands of pounds a day, which money might otherwise be laid out in the purchase of fruit. Boxes, if stamped with the grower's name, enable the grower to become known on the market and to obtain higher prices; it is also a great convenience to growers to have their own boxes, and not to be dependent on the arrival of empties for the packing of their fruit. On the other hand, some growers appear to be satisfied with the baskets at present in vogue. Whilst refraining from expressing any opinion of their own as to the best method of packing, the Committee consider that the shortcomings of some British growers in not giving sufficient attention to the subject of grading and packing, and not studying the requirements of consumers, is one of the chief reasons of their failure to compete successfully with the foreigner.

The Ravages of Birds.

91. A good many witnesses complained of the great amount of damage done to their crops by birds, especially bullfinches, starlings, blackbirds, thrushes, and sparrows. Of these the greatest offender is probably the bullfinch, which attacks the buds, and in many cases destroys whole crops. There can be no doubt that this grievance is well-founded. The destruction of all vermin in country districts, the curtailment of the area of cultivation, and the protection afforded to wild birds by recent legislation have upset the balance of Nature, so to speak, with the result that they have multiplied to such an extent as to become a positive pest in some places. Apparently, however, considerable ignorance exists as to the provision of the Wild Birds' Protection Acts, growers not realising their powers, and fearing that if they destroyed the birds they would be infringing the law. This, however, does not appear to be the fact. According to Mr. Clark, K.C., there is a certain scheduled list of birds (mostly rare birds) which nobody may destroy during a certain close time. With regard to all other birds (*i.e.* birds not in the schedule) a similar close time exists for the general public but the owners or occupiers of lands; and any person or persons authorised by them may destroy them during the close time. On looking at the schedule, it appears that bullfinches, starlings, sparrows, thrushes, and blackbirds are not included in it, so that, according to the general law, fruit growers have an absolute right to destroy such birds all the year round on land owned or occupied by

them. The operation of the Acts, however, may be modified by the Home Secretary on the initiative of the County Council. He may extend or vary the close time, or exempt a county or part of a county from it altogether, as to all or any wild birds; and he can add to the schedule, thus depriving owners and occupiers of the right to destroy destructive birds in the close time. From this it follows that the fruit grower has no legitimate grievance against the general law; but if a destructive bird has been added to the schedule in his county (so that he cannot kill it in the close time), he should make his complaint to the County Council, and from it seek redress. But it is clear from the evidence that growers are in most cases quite unaware of their rights, and, especially, that they may destroy non-scheduled birds in the close time. The Committee hold that in the publication of their Orders under the Acts, the County Councils should state explicitly the rights of owners and occupiers. There seems, also, to be an idea prevalent that an owner or occupier may only authorise one person besides himself to destroy birds on his land. This may be due to the existence of a somewhat analogous provision in the case of the Ground Game Act. But, according to Mr. Clark, he may authorise any number of persons to destroy birds on land in his occupation, though, if they shoot them, they must procure gun licences.

The Effect of the Rise in the Price of Sugar on the Jam Industry.

92. The importance of the jam industry to the fruit growers cannot be over-estimated. The jam maker, as one witness put it, is the fruit grower's best customer. Immense quantities of fruit are grown for the express purpose of being made into jam; and all growers, including those who produce the highest and choicest class of fruit, send a large part of their crops to the jam factories every year. As Mr. Berry stated, they depend on their best fruit to pay their expenses; the "second size" and "common varieties" are sold to the jam manufacturer, and give to the growers their profit. The jam industry has enormously increased in recent years, the public taste for jam having steadily grown, and a considerable export trade having sprung up. One cause of this development has certainly been the cheapness of sugar.

93. During the earlier sittings of the Committee several witnesses expressed a fear that the price of sugar might rise in consequence of the imposition of the sugar duty and the abolition of the bounties. But although some of these witnesses alleged that there had been a slight increase, none of them could say that the jam industry had been seriously affected at that time; in fact, both Mr. Blackwell and Mr. Chivers, the two jam makers then examined, emphatically stated that little, if any, damage had been done to the fruit-growing industry.

94. Since then, however, there occurred the remarkable rise in the price of sugar in the last months of 1904, and the Committee, therefore, summoned another witness, Sir Thomas Pink, in order to ascertain what had been the effect of this rise on the jam trade. His view was that the effect so far had not been great, since the rise had taken place after the fruit crop of 1904. At the same time he attributed this rise

principally to the partial failure of the beet crop on the Continent, and was confident that, if there were a good crop next season, the price would fall again. He pointed out that sugar was then being sold by speculators for delivery next December at 4*s.* a cwt. less than its present price. While not denying that the abolition of the bounties had contributed to some extent to the rise in price, he stated that a large increase in the production of cane sugar was likely to take place in consequence of their abolition, and said that already large quantities of the latest and best machinery were being sent to the principal cane-growing countries; thus ultimately there would probably be an increase in the total amount of sugar produced in the world. With regard to the duty, he objected to it, both on the ground that it was a tax on one of the raw materials of the manufacture of jam, and also because it was too high, amounting to about ½*d.* a lb. on sugar and ¼*d.* a lb. on jam—jam consisting roughly of 50 per cent. of sugar and 50 per cent. of fruit.

95. Whatever may be the effect of the rise in the price of sugar on the jam industry (and indirectly on the fruit industry) in the future, the evidence before the Committee, taken as a whole, indicates that at present it has not affected it to a serious extent; although they are of opinion that the continuance of the present price would have a most detrimental effect, by raising the price of jam to the consumers (the great majority of whom consist of the working classes), and so largely diminishing the sale.

General.

96. We have considered all the main grievances brought before us by the various witnesses, and have endeavoured to deal with them in order. We may now allude briefly to one or two other points.

97. Certain defects in the present form of returns for land under fruit have already been alluded to in that portion of the Report which dealt with the growth of the fruit industry. The Committee suggest that the form should be modified so as to be simpler, and, at the same time, more suited to the existing conditions of horticulture. Orchards in grass, as well as small fruits under trees, have now to be entered twice over, creating considerable uncertainty; whilst for plantations of dwarf trees there is actually no place at all for entry except under the heading of "bare fallow." The Committee suggest that the grower should return his total fruit-holding under the two main headings of:—(*a*) in grass land; (*b*) in cultivated ground, and should state roughly under subsidiary headings the proportion of each of these areas which is occupied by the individual kinds of fruits growing in them. The Committee are aware that any change in the form of returns tends to destroy the continuity of the record; but the growth of the fruit industry would render some such change inevitable before long, and, therefore, the sooner the change is made, the better.

98. It has been pointed out that it would be of considerable advantage to growers to obtain information as to the probable crops of fruit in foreign countries, and as to the magnitude and date of arrival of large consignments of fruit from abroad, and the Committee consider that there

should not be much difficulty in obtaining and publishing such information. Estimates might also be made of the probable crops of fruit in various districts in Great Britain, in the same way as estimates of agricultural crops are now made, and these would, no doubt, be of interest and of service to the grower and salesman.

99. The attention of the Committee was drawn, in a memorandum furnished by the Board of Agriculture, to the measures taken by foreign countries and British Colonies to prevent the introduction, through the importation of infected fruit or fruit packages, of pests and diseases detrimental to fruit culture, and also of diseased nursery stock. They are of opinion that this is a matter to which the early attention of the proposed sub-department should be directed.

100. The Committee have been struck by the difficulty experienced by most of the witnesses of understanding the provisions of the Agricultural Holdings Acts so far as they affect fruit growers—a difficulty which appears to be caused by the complexity of the Statutes, arising from the confused manner in which Parliament has from time to time dealt with the subject—and they therefore suggest that these Statutes should be consolidated into a single Act.

101. Several witnesses mentioned the immense advantage of the telephone to growers, in enabling them to communicate quickly with the markets, and thus to learn where there was a chance of a good price and where there was a glut. The telephone also makes it possible for growers to place themselves in direct communication with dealers in small towns, thus greatly facilitating inexpensive and easy distribution. Mr. Idiens, for instance, stated that his business had increased by twenty-five per cent. through the introduction of the telephone, and that the prices realised were twenty to twenty-five per cent. higher. The extension of the telephone in country districts was advocated. Unfortunately, under the practical monopoly of the National Telephone Company, the use of this most valuable instrument has been confined mainly to the towns; but the Committee hope that under the new arrangement recently concluded a general extension of the telephone into the country districts may be carried out, which, in their opinion, would be of the greatest advantage to the fruit industry.

102. The difficulties arising from gluts of fruit which occur in years when there is an exceptionally large crop—such as 1904—have also been mentioned by many witnesses. Co-operation has been suggested by some of them as affording a means of dealing with gluts, or with the disposal of second-class fruit, by the establishment of a co-operative pulping or jam factory, owned by the growers. Under some circumstances, no doubt, such a business might be worked successfully. It is, however, noticeable that in many instances where individual growers have attempted to make their fruit into jam they have not been successful, and, in a few notable cases where they have succeeded, it has evidently been due to the special aptitude of the grower for such business. In some instances, where fruit growers have pulped their own fruit, the results have not been satisfactory, the demand for pulp, except for cheap jams, not being great. There would not seem to be—according to the answers received from one witness—much prospect of using surplus or

small Apples for the manufacture of cider. They could, apparently, only be used successfully when mixed with cider fruit, whilst in years when the Apple crop generally is abundant the cider fruit would be abundant also, and there would be ample of it for cider purposes without using other fruit. Cold storage also has been mentioned as a means of mitigating the effects of a glut or of an inrush of foreign fruit. Its adoption must obviously be left to private enterprise, although investigations at an experimental station would probably add much to our knowledge of the most suitable temperatures for the preservation of various fruits.

103. A temporary lowering of the railway rates in order to deal with gluts has also been suggested, and, apparently, has received a certain amount of encouragement from some of the railway companies. A somewhat similar plan has been for years past adopted by the railways with regard to excursion traffic by passenger trains on special occasions. The objection to such a temporary lowering of the rates is stated to be the difficulty of raising them again afterwards. Sir Herbert Jekyll pointed out that if rates were temporarily lowered, and the companies subsequently endeavoured to raise them to the old standard, they would, in the case of complaint, have to justify the reasonableness of the increase before the Railway and Canal Commission under section 1 of the Act of 1894. The Committee think that this difficulty might be overcome by arrangement; but if this be not possible, they recommend that the Act be amended so as to enable it to be done with proper safeguards. The results would be advantageous to the companies as well as to the growers, for they would have fruit to carry which would otherwise rot on the ground.

104. Evidence was given before the Committee by Mr. Cowan, the representative of the British Bee Keepers' Association, as to the great advantage to fruit growers of keeping bees in or near their plantations. It is claimed that bees perform a very useful and necessary function in fertilising the blossoms, thus assisting the fruit to set, and preventing unfruitfulness. Bees carry the pollen from the blossom of one variety to that of another, producing what is called "cross-fertilisation," which is necessary in the case of some varieties. The Committee do not doubt that this is perfectly true, and although other insects perform the same functions, the keeping of bees is probably exceedingly advantageous, because of the numbers available to perform these services. Mr. Cowan estimated that where bees were kept there were twenty bees flying in spring to one of any other insect. Another witness, a practical fruit grower, stated that he had experienced the advantage of keeping bees, which, moreover, were very profitable in themselves.

105. One witness called the attention of the Committee to the dangers attending the growth of fruit on sewage farms. In France the sale of sewage-grown vegetables which are to be eaten uncooked is prohibited, and it is stated that Strawberries are grown on sewage farms in this country, and that their sale should be stopped here. The matter is one affecting the public health, and the Committee suggest that the whole question of sewage-grown fruit and vegetables should be inquired into by the department concerned.

106. The Committee conclude their labours by adding a list of the recommendations and suggestions which they make. They desire also to express their thanks to their secretary, Mr. Ernest Garnsey, for the zeal and ability which he has displayed throughout the inquiry, and to record their entire satisfaction with his work.

Summary of Recommendations and Suggestions Made by the Committee.

(1) That a special sub-Department of the Board of Agriculture and Fisheries be established to deal with matters connected with the fruit industry. That there be two branches of such sub-Department: (*a*) a bureau of information; (*b*) an experimental fruit farm.

(2) That after the establishment of the Government sub-Department its attention be directed to the necessity of preventing the importation of diseases and insect pests through the importation of diseased fruit and nursery stock.

(3) That the question as to the desirability of setting up compulsory powers for the eradication of diseases and insect pests in this country be postponed until we are in possession of fuller knowledge through the work of the Government sub-Department.

(4) That horticulture be taught in elementary schools in country districts, and that such schools should have school gardens attached wherever possible. That the attention of local education authorities should be called to this, and also to the desirability of encouraging the study of practical horticulture in training colleges.

(5) That the present defective form of returns made by growers for land under fruit should be improved and amplified.

(6) That estimates of home and foreign crops should be published, together with forecasts of the probable date of arrival of imports.

(7) That the various Agricultural Holdings Acts should be consolidated into one Act.

(8) That the Market Gardeners' Compensation Acts be amended by making section 4 retrospective.

(9) It is further suggested that, in cases where a tenant gives notice to quit, he shall not be entitled to receive compensation unless he presents to the landlord a successor who is willing to take over the holding at the same rent; that in the event of his so doing, and the landlord accepting his nominee, the compensation be paid directly by the new tenant to the old tenant, but that the landlord have the right to refuse to accept the outgoer's nominee, in which case he must pay compensation to the outgoer under the provisions of the existing law.

(10) That the Board of Agriculture should appoint experts in fruit valuation, and should call them together for the purpose of formulating general rules for estimating the amount of compensation to be paid to an outgoing tenant of a holding under the Agricultural Holdings Acts on the basis of the value to an incoming tenant.

(11) That the State be empowered to lend money to landowners who have fruit on their estate, subject to suitable conditions, for the purpose of supplying the ready money required for the payment of compensation at the determination of a tenancy.

(12) That it would be to the advantage of landowners and tenants in fruit districts if, under the provisions of section 5 of the Agricultural Holdings Act, 1883, they settled the basis of compensation by the "particular agreement" therein referred to.

(13) That a Bill should be passed for facilitating the purchase of small holdings by tenants with assistance from public funds, somewhat on the lines of the measure brought in by the Right Honourable Jesse Collings, M.P., in the session of 1904.

(14) That Rule No. 8 for the assessment for income tax, whereby market gardens and nurseries are assessed for Schedule B according to the rules of Schedule D, be repealed so far as it applies to market gardens.

(15) That in the assessing of agricultural holdings for local rates the assessments should not be raised by reason of the planting of fruit for a period of five years after the planting in the case of small fruit, of seven years in the case of mixed plantations, and twelve years in the case of orchards.

(16) That in the case of glass houses, the allowance of one-sixth given to dwelling-houses for repairs in the assessment for income tax be increased to one-third, by making a special allowance of one-sixth for renewal, in addition to the one-sixth for repairs.

(17) That the benefits of the Agricultural Rates Act of 1896 be extended to glass houses used for commercial purposes.

(18) That it is highly desirable that a more simple and uniform system of rates for fruit be introduced by the railway companies. This can be done, without a statutory re classification, with the assistance of the Board of Trade.

(19) That railway companies should make greater efforts for ensuring the prompt delivery of perishable fruit.

(20) That railway companies be urged to provide suitably ventilated goods vans for fruit traffic, similar to those recently introduced by the Midland Railway Company. That sheeted trucks without sheet supporters should never be used.

(21) That it is most desirable that all fruit be consigned at company's risk, and that the so-called owner's risk rates be abolished, the rates at company's risk being reduced to a figure approximating to those now in force at owner's risk, but providing the companies with just a sufficient margin for the extra liability incurred. That 5 per cent. would be a fair margin.

(22) That, in the event of owner's risk rates being retained, the liability of the railway companies should not be confined to cases where only wilful misconduct, but to those where culpable negligence, can be proved.

(23) The Committee also suggest that, in view of the recent tendency to combine among the railways, it would be an advantage if the Government were to appoint an official or a department to watch over the companies' actions, and to report to Parliament.

(24) That in the cases of all serious grievances against the railway companies, growers and merchants should at once send their complaints to the Railway Department of the Board of Trade, and ask them to exercise their powers under the Conciliation Clause of the Act of 1888.

(25) That in years of glut railway companies should be urged temporarily to lower their rates for fruit, just as excursion passenger fares are lowered on special occasions, and that, if this cannot be done by agreement, it is desirable that the Railway and Canal Traffic Act of 1894 should be amended for that purpose.

(26) That jam made wholly or in part from foreign fruit be so labelled.

(27) That the Government should undertake the inspection of imported fruit and fruit pulp at the ports of entry.

(28) That it would be an advantage to fruit growers and to the public generally if the Local Government Board collected statistics of the fruit seized and condemned as unfit for food.

(29) That the present by-laws for building in country districts be modified so as to allow of the cheaper construction of cottages.

(30) That boys in industrial schools be allowed to stay away from such schools for the purpose of fruit picking, subject to suitable regulations.

(31) That the provisions of the Robson Act as to "half-timers" be made generally known, and applied by local education authorities in country districts.

(32) That, with regard to markets, it is desirable that more local markets, similar to that of Kew Bridge, be established in the suburbs of London. That, as regards the large distributing markets in provincial centres, it is desirable that certain of these be extended and improved. That the provision of retail markets in many country towns is urgently needed, and that very good results would be likely to follow if the Councils of other towns followed the example set by Hereford in establishing a fruit market under their own authority.

(33) That the telephone should be further extended in country districts.

(34) That County Councils, in the publication of any Orders made by the Home Secretary on their application under the Wild Birds' Protection Acts, should clearly state the powers belonging to owners and occupiers of land under these Acts.

(35) That it is desirable that an inquiry be instituted into the alleged practice of growing fruit on sewage farms, and the effect of such a practice on the public health.

(36) That fruit growers should pay more attention to the careful packing and proper grading of better-class fruit, and to the selection of the right kinds of fruit to plant according to the soil, and to the importance of cultivating fewer varieties, especially of Apples.

(37) That the establishment of co-operative societies, similar to that existing at Blairgowrie, for the disposal of fruit, and for other purposes, such as the obtaining of adequate supplies of pickers, would be beneficial, particularly in districts where there are many small holdings.

(38) That it would be an advantage to fruit growers if they kept bees in connection with their fruit plantations.

(39) That the attention of landlords, especially in the West of England, should be called to the pressing need of renovating and replanting the decayed orchards on their property.

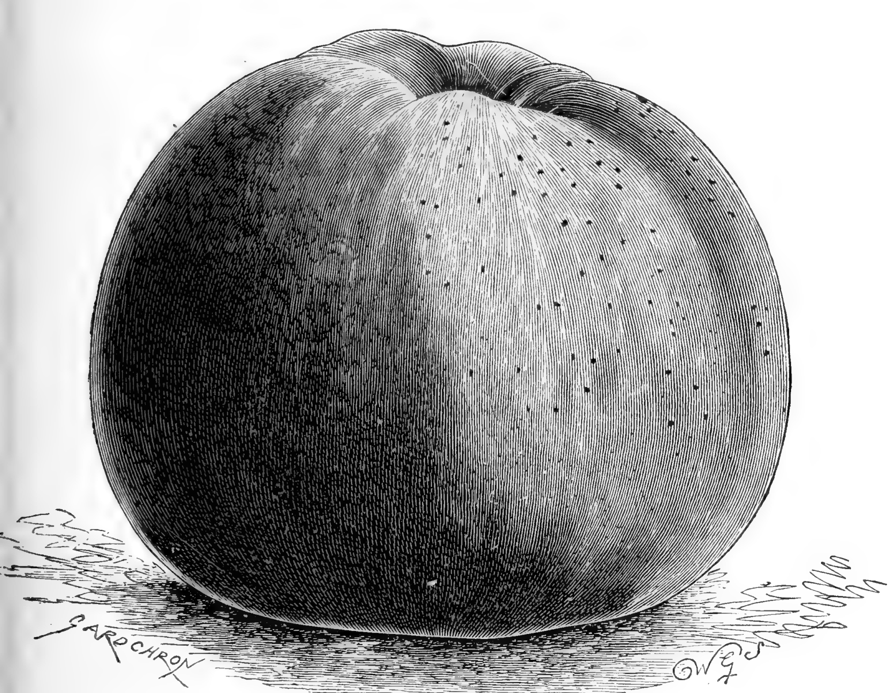
(40) The Committee are also of opinion that, in connection with the proposed Government sub-Department, it might be advantageous that a large fruit farm should be established in proximity to the experimental farm, where fruit growers and lecturers could receive a practical training.

We have the honour to be, Sir,

Your most obedient servants,

(*Signed*) ARTHUR G. BOSCAWEN, M.P.
C. W. RADCLIFFE-COOKE.
J. M. HODGE.
CHARLES W. LONG, M.P.
GEO. MONRO.
P. SPENCER U. PICKERING, F.R.S.
WM. SOMERVILLE.
EDWIN VINSON.
W. WILKS.

ERNEST GARNSEY, *Secretary*.
June 9, 1905.



METHODS OF FRUIT PRESERVING.

By Thos. E. Sedgwick, Assistant Secretary.

CONTENTS.

Introduction.

It is a curious fact that although the English varieties of fruit and vegetables are equal, if not superior, to those of our neighbours on the Continent and in the Colonies, we fail signally to produce sufficient for our home consumption, even in years of heavy crops like the season of 1904. This is doubtless largely due to the general systems of tenure, which by no means encourage either landlord or tenant to plant trees, the full benefits of which are not realisable for years. It is also due in some measure to the absence of co-operation among producers, such as exists abroad, and is now being rapidly advanced in Ireland under Sir Horace Plunkett, and to this latter cause the smallness of consignments and the consequent relatively high railway rates are largely attributable. We in England appear to be waiting to see who shall move first; no company wishes to erect a factory until certain of having sufficient fruit and vegetables to treat, and the farmers and growers are not ready to alter their cropping and start fresh planting until they feel sure of being able to dispose of the produce. But this does not explain the large quantity of foreign-preserved fruit consumed in this country, even in years in which our own fruit crop has resulted in a glut and been in some places almost unsaleable. The Council of the Society, having this in mind, instructed the writer to proceed to Germany to study the methods of fruit preserving there, and to see where in England we failed and how far the German methods might be applicable to English conditions.

By the preservation of fruit and vegetables are understood various means for carrying over in a durable form the surplus of one season or one year for use in another, when the fruits and vegetables in question cannot be obtained—at all events in sufficient quantity—in a fresh state. These methods are very numerous, and their application has reached enormous dimensions of late years, and what was formerly regarded as the hobby of the house-proud matron or the business of the farmer's wife has become an industry employing thousands of hands, and in which several millions of capital are embarked.

Our German, American, and other competitors having shown us what can be produced, it is no longer possible to find a market for second or third grade preserved fruits. To make good preserves, good fruits must be used. It is of no use commercially to dry or bottle fruit which is otherwise unsaleable. Much attention is paid abroad to the appearance of the article when exposed for sale; the labels, lids, and general appearance are made as attractive as possible; and when with this a uniform high quality of the fruit is always found in certain brands, the only difficulty that is experienced is the producing of a sufficient quantity to meet the demand. When all our home fruit preservers have realised that everything depends on *appearance*, *flavour*, and *uniformity*, we may hope that our foreign bills for preserves will dwindle out of sight. There are already several excellent large firms of fruit preservers in this country, who, having already realised these three essentials, are now reaping the reward of their foresight. Many small growers may say that this is impossible with them, and as the day of English co-operative factories is still some way off, they may not be able to secure the custom of large towns. But these people could easily preserve sufficient fruit and vegetables for home consumption at an extremely low cost, and could generally have a surplus which they could sell through the local grocer or in a neighbouring market town. In short, the tastes of the nation are being moulded by foreign imports, and it remains for the English grower to take advantage of this and secure the market for home-preserved fruit.

Bibliography.

It is remarkable that, despite its importance, there is no single book in the English language which treats of the whole subject of the preservation of fruit, although there are several papers dealing with various processes which have appeared in this Journal and other journals, and in bulletins and reports issued by the Royal Agricultural Society and the Boards of Agriculture of our several Colonies and of the United States.

Our German rivals have a series of books on the subject of the utilisation and preservation of fruit, most of which have been prepared at the Government Fruit Schools. The principal of these works are:—

Goethe, Rudolf: "Obstverwertung unserer Tage," ii. Auflage, 230 Seiten, 8vo. Wiesbaden, 1897.

Hausner, A.: "Die Fabrication der Konserven und Kandiden."

Hermann, R.: "Praktisches Handbuch der Industriellen Obst- und Gemüse-Verwertung," 164 Seiten, 8vo. Berlin, 1891.

"Koche auf Vorrat," 2te Auflage, 132 Seiten, 8vo. Berlin, 1905.

Mertens, R., und Junge, E.: "Obsteinkochbüchlein," vi. Auflage, 140 Seiten, 8vo. Wiesbaden, 1904.

"Obstdörbüchlein." Wiesbaden.

Part of the following material has been collected from the above works, and part is the result of personal observation in Germany and elsewhere.

In the United States of America, although a great deal of attention has been paid to the utilisation of the fruit crop, but few books have appeared on the subject, and a very large part of the most recent information on the subject is found only in current periodicals such as the "California Fruit Grower," "Pacific Rural Press," "Western Fruit Grower," "American Agriculturist," and the "Rural New Yorker."

Technical discussions of commercial canning, preserving, &c., are mostly confined to a few volumes such as the following: "Secrets of Canning," by Ernest Schwab, published at Baltimore. Much information regarding the handling of fruits on the Pacific coast will be found in Prof. Wickson's volume "California Fruits and How to Grow Them," published by the Pacific Rural Press, San Francisco, California. Many of the bulletins and reports on various kinds of fruits published by the Department of Agriculture, Washington, also include notes on the preparation thereof for market and for household use; and their Farmers' Bulletin, No. 203, deals with "Canned Fruit, Preserves, and Jellies," by Maria Parloa, 1904.

Attention to Details.

Two points that are most noticeable in Germany are the attention to details and the great secrecy observed by the manufacturers as to their trade processes. I visited no fewer than five factories with an application to be allowed over the works; at four I was greeted with either a firm refusal or a statement that the proprietor was not at home. At the fifth I was shown over—the warehouse department.

Their attention to details manifests itself throughout every part of their fruit industry. All sorts of fruit are always *carefully* gathered and graded. Old newspaper is frequently used for lining the baskets and for placing between the layers of fruit in the packing for transport. The machines now on the market for the preparation of fruit and vegetables for drying or other forms of preservation are innumerable and in great variety. Some are labour-saving and accurate mechanical methods for operations hitherto conducted by hand, and some are necessary for certain applications of the produce.

Another of the details in which the Germans excel is the method of putting the goods on the market. Clear bottles, bright contents, attractive labels, all encourage their being purchased. They admittedly use and teach the use of such colouring matters as sulphur and copper, and of salicylic acid and other preservatives; and the sale of fruit and vegetables so treated in England has already led to several prosecutions in the London police courts, so that the fruit for export here is now specially prepared. Their factory system of buying up all the fresh produce of a district and their efforts to reduce the number of varieties grown, so as to secure a greater uniformity, have resulted in certain brands becoming recognised, and one can then know exactly what one is buying on seeing the label, bottle, or tin.

But another point on which too much stress cannot possibly be laid is the careful way in which the fruit is always graded and placed fruit by fruit or piece by piece in the bottles or tins.

Government Fruit Schools.

The German growers are admittedly more favoured in some ways than ourselves, but the difficulties and impediments to our ultimate success are not such as should discourage a Britisher. The German Government aids fruit-growing by State loans free of interest, by large expenditure on Government Fruit Schools and peripatetic teachers, by Acts of Parliament and by other means, and the small proprietorships in Germany are very favourable to planting.

One of the methods most favoured by the Germans for fruit culture, as for everything else, is technical instruction. There are the special Horticultural Schools for women at Godesberg near Bonn, at Marienfelder near Berlin, and at the Schwetzingen, Hofgarten, near Heidelberg. The last-named is intended for the daughters of farmers. They also have special Fruit Institutes and Schools at Frankfurt, Mayence, Worms, Geisenheim, and elsewhere.

The school at Geisenheim is among the best of its class in Europe. The State subsidises this institution largely, and the students pay about £20 a year, including board and lodging. The three main divisions of work and instruction are: Flower (and ornamental) gardens; fruit-culture and disposal of produce; vines and wines.

Considerable time is devoted to scientific subjects, such as physiology, botany, entomology, chemistry, and similar sciences.

The buildings include: Central Office with Laboratory; Students' Quarters, with class and recreation rooms; Fruit-preserving and model and class rooms; Fruit-storage room (a detached building) and fruit-storage cellars.

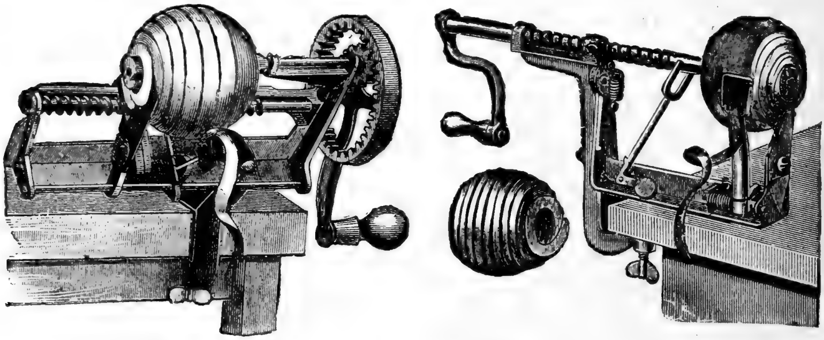
The three sections have separate heads, who are individually responsible to the Director for the practice and theory of their several departments. The School, moreover, issues a bulletin of information, mostly derived from observations made in the gardens thereof.

The building equipped as a Fruit-preserving room above mentioned has a vertical boiler, a lecture room, and another room for cutting, peeling, stoning, and otherwise preparing fruit, with all the best German and American machines therefor, "Invicta" and "Gnom" fruit-dryers (for commercial and household use), a set of steam-jacketed copper pans for boiling, fruit-presses, tin-closers, and pulping machines.

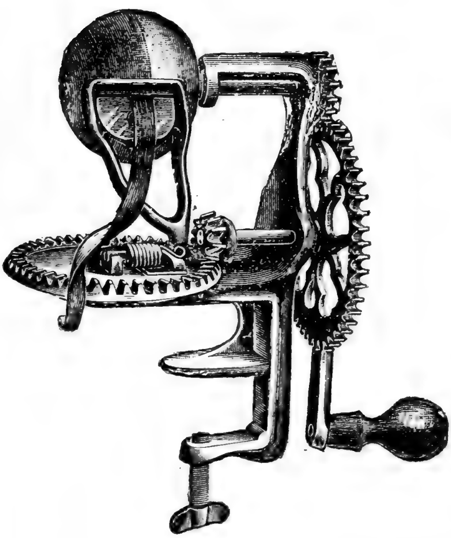
At this valuable station two courses of one week each are held early every autumn on the subject of the Utilisation of Fruit. The first is for school teachers and other men interested in the methods of treating the fruit; and the second is for women, and deals with the utilisation of fruit (and vegetables) from a household standpoint. In order to become more practically acquainted with the German methods, I attended the autumn course last year in company with about thirty Germans. The fees to non-Prussians are only 9*s*. (Prussians 4*s*.) for a full week's instruction in gathering, grading, storing, packing, preparing, drying, bottling fruit, and the making of marmalades, fruit-pulps, pastes, juices, and wine.

Preparing the Fruit.

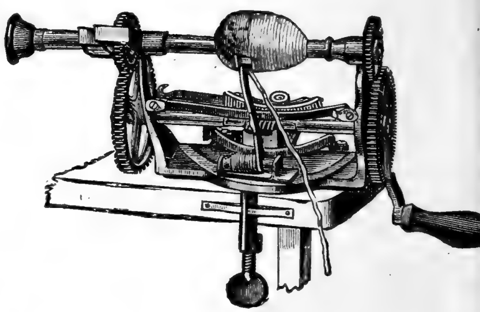
There are a number of machines which by the simple turn of a handle core and pare Apples and cut them into a spiral, which, being divided through one half, forms rings. The figures of the typical machines show the usual form of the machines which stand on the table. In two cases the Apple is fixed on a rod, and as this revolves the skinning and ringing are performed by two knives kept in position by springs, and the core is gouged out automatically. In the case of the other two machines the skin only is removed. By such means as these the skin is removed without any unnecessary flesh as well, rings are of uniform thickness, and whilst the work is done in less time with less labour, the



TWO MACHINES FOR PARING, CORING, AND RINGING APPLES AT ONE OPERATION.



TURN-TABLE APPLE-PARER.



FRUIT-PEELING MACHINE.

Fig. 154.—Typical Machines for Preparing Fruit.*

weight of pared fruit is greater, and the appearance is smoother and more uniform. Any bruises or other blemishes are cut out by hand, as the slightest imperfection spoils the appearance of the whole sample.

Drying or Evaporating.

The preservation of fruit by the removal of its watery contents is a matter which has been practised as long indeed as fruit trees have been planted. Up to a few years ago fruit drying was regarded as a secondary business, especially with respect to Apples and Pears, and only small

* I am indebted for the loan of Figs. 154 to 158 to Messrs. Lumley, who also lent the actual machines for the demonstration. Figs. 159 to 164 are from Herr Weck of Oeflingen, who also rendered similar service.

quantities were put on the market. The drying of Plums was carried out more commercially in those districts where the Plums were most grown, and consequently larger quantities of the dried product were available and considerable business done in it. Formerly stone fruit was skinned, cut in slices, and placed on trays, or more frequently on sheets of paper, laid in the sun. Later on it was laid on the stove or hearth, or dried in an oven, where it finally became a brown leathery, unappetising article. This system was, however, most disastrous to the quality of the fruit; the flesh became broken up through the slow-drying process, and the concentration of the sugar of the fruit became acetic acid.

Some twenty-five years ago fruit drying was introduced to the Germans from America by dried Apples, which showed them the shortcomings of their former methods, and compelled them to seek some new way of drying their home supplies, and they began to conduct this business on the same lines and with the same machine as the Americans did. Formerly they had dried the fruit for a long time at high temperatures, whereby the sugar frequently became somewhat burnt, and thus gave the fruit that dried flavour which set many people against eating such goods. The fruit also obtained a bad appearance, and often became so hard that much time was occupied in boiling in order to render it soft to eat. On the other hand, the fruit dried on the American plan was conspicuous for being bright-coloured, tender, and when cooked of good flavour, which reminded one rather of the fresh than the dried fruit.

By this newer method only so much water was removed by drying as is absolutely necessary to its keeping, and thus the good flavour is produced, and, moreover, one gained a larger proportion of the dried to the fresh product than was formerly possible.

Besides the American methods (see p. 584) the Germans have invented another drying apparatus at the Fruit School at Geisenheim, and others have been evolved elsewhere. As, however, it is the opinion of the authorities of the school in question that for large factories the American Ryder machine is best, and that invented in the school is most suitable for smaller businesses and for household use, it will be sufficient to confine the descriptions here to the two machines in question.

Drying Machines.

The larger of the two machines above referred to was invented by Dr. Ryder, an American, but is now manufactured and largely used in Germany. As will be seen from the illustration, the machine consists of a self-contained stove which heats the air before it passes through the long barrel-like container in which are placed a series of trays, the sides of which are of wood and the bottoms of galvanised wire. As the trays are filled with the prepared fruit, they are inserted in the racks inside the barrel, and the fruit is gradually evaporated as the current of hot air carries off the essential moisture. An improved form of this kind of apparatus is that known as the Rössler, in which a circulating fan is placed in the end of the barrel furthest from the stove, and when the case is closed the action of the fan keeps the air in perpetual motion.

The second form of drying machine was invented and perfected at the

German School of Horticulture at Geisenheim before referred to. For larger consumers the apparatus is self-contained, and is capable of being shifted from one portion of a holding to another, or from one farm to another. The apparatus consists of a stove, in which the heat can be regulated in the ordinary way. Above this is placed a metal rack containing thirteen trays similar to those mentioned above, and, if desired, inner trays can be inserted in these, so as to enable the machine to take nearly double the quantity of the prepared fruit. By a simple ratchet arrangement, operated by the lever handle shown at the side of the machine, the trays can be raised from the bottom, or, if it be desired to inspect the contents and progress of any tray, those above it can be raised in the same manner. A spare tray having been filled with the fruit, it is

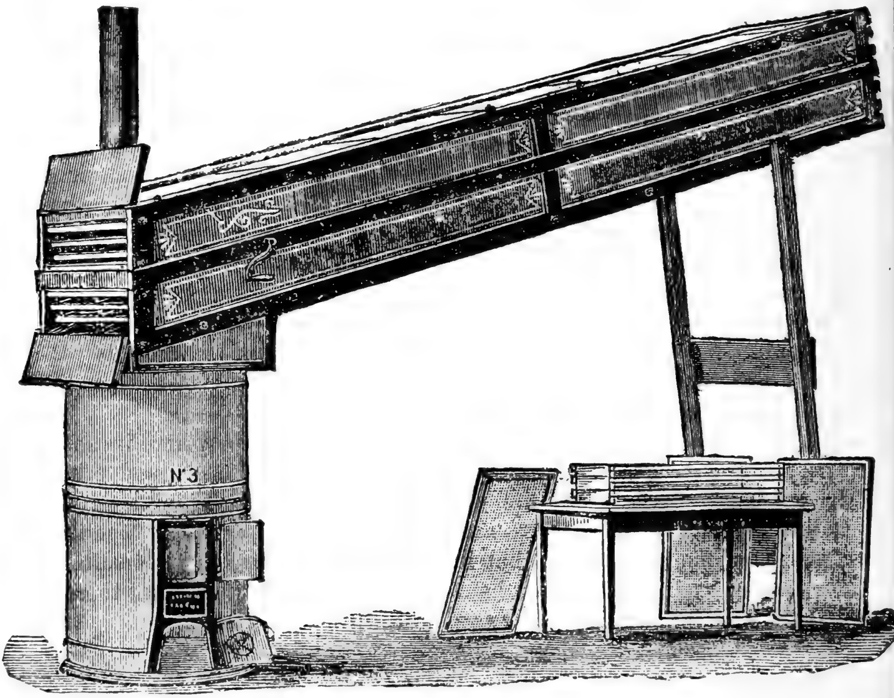


FIG. 155.—THE "INVICTA" EVAPORATOR.

inserted above the others in the case of Plums and other soft fruits, or, in the case of Apples and Pears, it is inserted below the others. In either case the tray at the bottom or top respectively should be removed, and the contents, if dried sufficiently, should be replaced with fresh fruit. By these means the one machine can be kept in constant use. The evaporation in this form of machine also is secured by the heated air passing through the trays, and carrying with it the moisture of the fruit. These larger machines with twelve trays will take from 100 to 180 lb. of fruit, or, if the inner trays be inserted, they will take from 270 to 280 lb.

For household use another machine on very similar lines has been invented, which is placed over the oven in the kitchen range, and thus utilises the waste heat and requires no additional expense of fuel. The trays, as will be seen in the illustration, are somewhat similar to those in the larger machines, but owing to their being shallower they cannot be provided with inset trays, nor can the contents of any of the middle trays be inspected except by raising those above it by hand. By depressing the crossbar at the top the whole of the trays can be raised together.

It must not be supposed that drying improves the value of fruit. It merely prevents waste, and renders a glut of the summer or autumn a

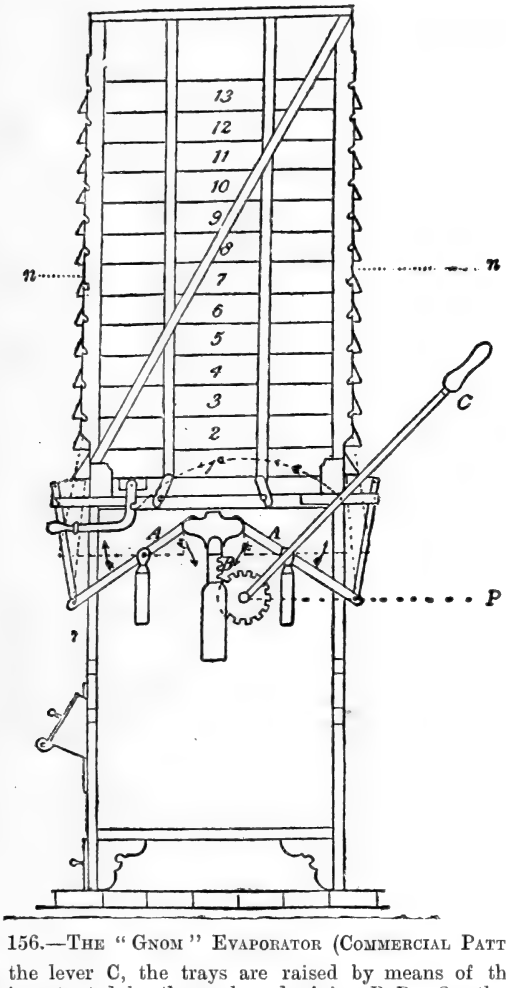


FIG. 156.—THE "GNOM" EVAPORATOR (COMMERCIAL PATTERN).

By pressing the lever C, the trays are raised by means of the compound levers A A, actuated by the rack and pinion B P. On the trays being raised a light iron rod may be inserted in the notches (n) in the wrought-iron frame, which on the lowering of the trays check the descent of those above them, so that any tray may be inspected or withdrawn in any part of the machine.

saleable product in the winter, on the expenditure of a little capital and some trouble. But it is not nearly sufficiently recognised that the evaporation of the moisture renders the fruit or other material more portable and capable of being packed in a very small compass, and that the evaporated moisture can be replaced and the fruit restored to very much its original appearance by soaking for some hours in water. It should always be cooked in the same water.

Had Government or other drying factories been established in England, we should not have had to expend £100,000 a week on dried vegetables in Germany during the recent war in South Africa, and a much larger area of land would have been under fruit and vegetable culture in this country.

Out of eighteen large firms which contract for the supply of dried vegetables to our Navy only one is English, the others being Canadian, French, Dutch, or German; and yet the demand is constantly increasing.

The "Board of Trade Journal," commenting on this fact, says that the principal cause of our failure in this respect is the dampness of our

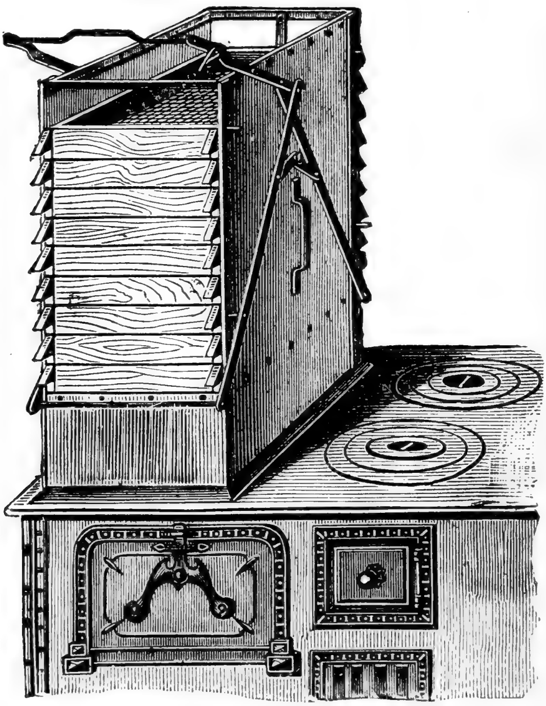


Fig. 157.—The "Gnom" Evaporator (Household Pattern).

climate, there being an excess of moisture in nearly all vegetables grown in this country. The great demand for fresh vegetables and the high rate of wages prevailing here are perhaps some of the reasons why the dried vegetable business fails in England. Nevertheless, the fact remains that, although our Empire depends on our Fleet, our Navy depends on foreign supplies even in time of peace.

Appended are a few general remarks on the best methods of dealing with certain kinds of fruit.

Apples.—The fruit most generally met with in a dried state is undoubtedly the Apple. For many decades whole-dried Apples and "rings" have been on sale in England for a great number of years now under the name of Normandy Biffins, Californian Apple Rings, &c., but little evaporation has as yet been practised in this country.

A firm flesh, adaptability for the paring machine, a relatively high proportion of dried product to the fresh fruit, a small percentage of water whereby the duration of the drying and consequently the cost are much reduced, a small core, and a good shape are the principal points to notice in selecting Apples for drying.

Great care should be taken to select Apples of the right degree ripeness. Under-ripe and over-ripe fruits are equally unsuitable, but with a little care the exact grade in each variety treated can be easily observed.

The Apples are cored, pared, and sometimes cut into rings, and are also frequently sulphured so as to preserve their colour and prevent the oxidation which in many varieties would otherwise occur. Opinions are much divided as to whether this sulphuring is injurious to health or otherwise, and it may perhaps be true that when the operation is carried out in a specially constructed apparatus it is harmless, but is liable to be otherwise when it is carried out at the same time as the drying. The prepared Apples are kept in a vessel of perfectly clean water containing a small quantity of salt until they are put in the dryer, which prevents oxidation and discoloration. The thinner the rings are the quicker they dry; and the lighter their colour when dry the better they sell.

The fruits are laid on the wire-bottomed trays of the dryer, placed in the machine, and the temperature regulated to 180–210° F. Then if a higher temperature, namely 240°, be used, with a strong current of air, the product is dryer, more nourishing, and keeps better, but the flavour is quite changed. The time occupied varies from two to four hours, according to the variety of the Apple, but from two to two and a half hours is the usual time. Whole Apples usually require a much longer time—eight to ten hours, according to the size and variety.

After the evaporation of the water in which it was held suspended, the whole of the "pectin" or fruit gluten remains unchanged in the cells, and is visible in a condensed form on the outside of the fruit, and all germs and ferments are destroyed by the heat. The waste matter (core, &c.) in Apples varies from 25 to 33 per cent., and the finished product weighs from about 11 to 14 per cent. of the fresh fruit. The proportion of water removed from the fruit and the concentration and also formation of sugar in well dried fruits are given by Dr. König, after careful analysis, as follows: Fresh Apples contain on an average, besides other matter, 83·58 per cent. water and 7·73 per cent. sugar; dried Apples yield, however, 27·95 per cent. water and 42·83 per cent. sugar. The relatively high percentage of water found in the dried fruits is, however, due to the fact that they re-absorb a certain quantity of water from the atmosphere when they have been rendered very dry.

Pears are dried much in the same way as Apples, but never in rings. Having a higher percentage of water they take longer time; and as they also have a large proportion of sugar it would seriously injure the product if they were dried too rapidly.

For drying, Pears are best treated when half-ripe, as they thus dry easiest and produce the largest quantity of the prepared product. Fully ripe Pears, which are consequently very full of juice, dry slowly and with difficulty. Most varieties of dessert Pears are not suited for drying, and cooking Pears yield the best result.

To produce a very fine product the Pears are thrown into spring water when peeled, quartered, and the core removed, and then steamed at a high temperature for eight or ten minutes. The original moisture of the fruit is thus more easily evaporated, and the dried fruit has a semi-transparent appearance, which is attractive to the purchaser and demands a higher price.

Whole Pears require seven to nine hours, halved and quartered five to seven hours to dry. The waste (skin, core, &c.) in Pears varies from 14 to 22 per cent., and the dried product averages from 12 to 18 per cent. of the quantity of fruit used. When preparing the Pears before drying the flavour will be improved if a little sugar be added to the water in which they are cooked, and to this may be added the juice of the core and peel.

Flattening the Fruit.—When partly evaporated or dried, the smaller sorts of Pears, and a few other sorts of fruit, are sometimes flattened in order to make them pack better in boxes. The system employed is to take each tray out of the machine when half-dried, and to place the fruits in a wooden clapper, which can easily be made locally, and after they have been flattened, then to complete the drying process. A very portable clapper may be made by cutting two slips of wood $2\frac{1}{2}$ to 3 inches wide, $\frac{3}{4}$ inch thick, and about 2 feet long. The last 8 inches of each are rounded to form a handle, and the two pieces are best hinged at the other end by a strip of leather.

Wider sizes can of course be made to flatten more fruit at once, and a similar attachment can be made to fix to the edge of a table when required. Some practical men aver that this process is unnecessary, as it takes time, and some juice will be lost. They say, moreover, that if the fruit be not dried too hard, it can easily be flattened when being pressed into its box.

PLUMS.—The best varieties for drying are those of which the fruit is large, with a good percentage of sugar and rich in aroma. Other varieties are not so suitable for the purpose on account of their acidity, and give an unattractive brown product.

Mirabelles dry comparatively quickly (six to eight hours): they both look and taste well, and are much sought after in the market. 30 lb. of dried fruit are to be got from 100 lb. of the fresh. Plums should never be dried too much, as they then lose much of their aroma, and the final product is of less weight. As soon as the sugar inside the fruit is concentrated, its keeping properties are secured.

The large egg-shaped plums have both a very soft flesh and a very thin skin, and the regulation of the temperature during the drying is most important. The fruit begins to dry when the flesh has been thoroughly cooked through by the heat of the apparatus, and the drying process can thus be much shortened if the fruits be steamed before being brought into the dryer. The steaming occupies only about six minutes, and the drying occupies eight to twelve hours for steamed fruit, and sixteen to twenty hours for unsteamed fruit. The dried product realised about 25 to 30 per cent. of the fresh. Should it be desired to remove the stones, this is best done when the fruit is partly dried, and the fruit has lost about one half of its water contents. A little incision is then made in the stalk end of the fruit and the stone can then be easily squeezed out.

To make "prunes" proper, as understood on the Continent, the skins of the Plums are removed as follows:—The fruits are steamed in the steamer for about six minutes, or boiled for a minute in a saucepan, and then cooled in cold water. The skins can then be very easily removed. The bright appearance of much of the foreign fruit is due to its now being soaked in a solution of sulphuric acid. The drying should proceed in the usual way at about 120° Fahr., so as to enable a coating to form on the fruit. The skinning enables the drying to be effected more rapidly, as the water in the fruit is more easily evaporated.

It should be remembered that the excellence of the French, Bosnian, and Turkish prunes is due, not only to the variety and good ripening of the fruits, but also to the careful method of drying. In Turkey, the Plums are exposed to the direct rays of the southern sun; in France and Bosnia a very primitive form of oven is used. The French obtain their pre-eminent product only by the constant interruption of the drying process. In Bosnia the fruits are also graded according to how many go to the pound—120, 100, 85, &c.

The drying should be stopped when the sugar has sufficiently condensed, and while the fruit is soft to the touch. In France the finished prunes are packed in flat boxes with fresh bay-leaves which give a fine flavour to the fruit, and the boxes are also lined with paper to preserve the fruit from maggots, mildew, and other injury.

Cherries of a firm flesh are best adapted for drying, as they yield the largest percentage of the treated product. Black Cherries fetch a better price when dried than light-coloured ones, which assume a dirty brown tint when dried. Cherries, especially bitter Cherries, must be as ripe as possible when treated. The duration of drying is reduced if the fruits be previously exposed in the sun. Cherries should be laid on the trays with the stalks uppermost, which after a preliminary drying should be removed. This is done to prevent the juice escaping, which would unavoidably occur if fresh fruit with the stalks first removed were laid on the trays. In order, however, to avoid the additional trouble of removing the trays from the dryer, and replacing them, some people risk the loss of the juice and remove the stalks before drying at all.

In any case the stalk end of the fruit should always be placed uppermost, as the wound not only allows the escape of the juice, but if placed downwards would lead to the fruit bursting on heat being applied. In drying Cherries the trays of fresh fruit are placed at the top, in the coolest place first and gradually brought into the greater heat. These two remarks apply to all stone fruit equally.

One hundred pounds of Cherries, dried for four to six hours, produce about twenty-five pounds of the evaporated product.

"Cherry raisins" can be made by removing the stems and stones from the bright-coloured fruit and then drying.

Eight pounds of dried "raisins" can be made from 100 lb. of fresh fruit. About fifteen pounds of the loss are accounted for by the stalks and stones, and the rest by the water in the fruit.

Apricots and Peaches cannot be dried either in England or in Germany at the prices that the American goods realise.

Apricots are simply cut in two, the stones being taken out and the fruit then dried just like Apples, at from 240° to 250° F. They take from two to three hours to dry. From 100 lb. of the fresh fruit ten to twelve pounds will result. Peaches should first be peeled and then treated similarly to Apricots. The temperature required is 200° to 212° F.

Berries.—Bilberries are dried largely in Germany and partly for export to France, where possibly they are used in wine-making. The berries, which must not be bruised, are laid thinly on the tray, and put into the apparatus, which is kept at 140° to 160° F. As the berries lose much volume, they often fall through the mesh of the wire trays, and it is therefore desirable for the bottom tray to have a fine mesh. The time taken is about eight hours, and the dried product is about 17–18 per cent. of the fresh. Other berries, such as Cranberries, Raspberries, and Currants, are dried in much the same way, but at a lower temperature (100° F.).

Vegetables are also dried in the same machine, and are usually cut or shredded first and then placed on the trays. For making winter soups or for flavouring, this method of their preservation is unequalled, and for transport the great reduction in compass and weight is a great satisfaction.

Both fruit and vegetables can be restored to their normal condition by soaking over-night in cold water or by steaming, but care should be taken to cook them in the same water as they have been soaked or steamed in, since either process extracts some of the goodness from the dried product which would be lost if the same water were not used.

English Experiences in Fruit Drying.

Some experiments as to fruit drying were carried out in the autumn of 1901, under the auspices of the Bath and West of England Society, and subsequently samples of French and Californian dried Plums were bought at 10*d.* and 6*d.* per lb. respectively, for comparison with home-grown and home-dried Plums, and competent judges agreed that in appearance—

'The Monarch'	surpassed	the French	at 10*d.* per lb.
'Prince Engelbert'	,,	,, ,,	,, 6*d.* ,,
'Victoria', 'White Perdrigon', 'Czar'	,,	,, Californian	,, 6*d.* ,,

and that their quality in order of merit when stewed gently for thirty minutes was :—

1. White Perdrigon; 2. Victoria; 3. French at 10*d.* per lb.; 4. Californian at 6*d.* per lb.; 5. French at 6*d.* per lb.; 6. Pershore.

The tenderness of the skins *before* stewing varied in the following order :—

1. French at 10*d.*; 2. Victoria; 3. Pershore; 4. White Perdrigon; 5. Californian and French at 6*d.*

Four varieties of Apples were dried whole, the results being as follows:—

8 lb. fresh fruit of Cellini	gave	1 lb.	12 oz.	dried	product.
10 lb. „ „ „ New Hawthornden	„	2 lb.	8 oz.	„	„
10 lb. „ „ „ Lane's Prince Albert	„	2 lb.	4 oz.	„	„
12 lb. „ „ „ Red Hawthornden	„	4 lb.	0 oz.	„	„

The first named Apples were large, and were dried as gathered from the tree, the three others being small or third-size fruit. The small fruit dried in from seven to twelve hours, and the Cellini in about eighteen hours.

Those dried in seven hours were subjected to a temperature of from 220–250° F., and the others to a temperature of from 180–200° F.

Eight varieties of Apples—viz. Cellini, Bramley's Seedling,* Ecklinville, * Ringer, Lord Suffield, Lord Grosvenor, * Lane's Prince Albert, and * New Hawthornden—were peeled, cored, and sliced. Those marked with an asterisk were small Apples only; the others were large and small, as gathered from the trees.

The best results were obtained from Bramley's Seedling, Lord Grosvenor, Lord Suffield, and Ringer in their order of merit, followed in the same order by Cellini, New Hawthornden, Ecklinville, and Lane's Prince Albert. The average yield was 15 oz. of dried product from 11 lb. of fresh fruit. The weight given is that when the slices were removed from the evaporator; as the dried product absorbs atmospheric moisture, the weight is in a few days considerably increased, but this depends a good deal upon atmospheric conditions.

Mr. Udale is of opinion that if 5*s.* per cwt. can be obtained for good Apples, it is best to sell them undried; but that small Apples might pay for drying and for making into jelly.

Two varieties of Pears were tried: Williams' Bon Chrétien, 10 lb. of which gave 2 lb. of dried product; and Beurré d'Amanlis, 20 lb. of which gave 3 lb. 10 oz. of dried product. They were peeled by the peeling machine, cut in halves, and cored by hand. They dried in nine hours in a temperature of 200–240° F.

Six pounds of Morello Cherries were dried and gave 1 lb. 14 oz. of dried fruit. They dried in twelve hours in a temperature of 160–200° F.

Potatos.—Sharpe's Victor and Sutton's Ringleader were peeled and sliced, and dried in a temperature of 220–240° F. They lost about four-fifths of their weight in drying, and took an average of five hours in the process.

Runner or *Kidney Beans* were sliced by a slicing machine and then dried. Thirty pounds of beans gave 2½ lb. of the dried article when weighed immediately after drying; but these absorb atmospheric moisture in course of time, and increase in weight. One portion dried in four hours in a temperature of 200–240° F.; the other portions were six hours drying in a temperature of 130–140° F.

The *Herbs* experimented upon were subjected to a temperature of 130–140° F.; and Marjoram dried in 45 minutes, Mint in 50, Savoury in 55, Thyme in 60, Sage in 75, and Parsley in 90 minutes. The Sage and Parsley retained their fresh colour, but the others became dull, as when dried in the ordinary way.

The experiments demonstrated that all kinds of vegetables and herbs can be dried successfully, but the trials were not on a sufficiently large scale to show whether or not the results would be commercially remunerative.

The following are some of the lessons learned from these experiments :—

1. Ripe fruit dries more quickly than unripe fruit, the latter being several hours longer in the process, and therefore most costly to produce.

2. Unripe fruit loses a larger percentage in weight during the drying process, and is not a good colour for its kind or variety when dried.

3. Large fruit of the respective kind or variety produces the finest dried article of the same variety or kind.

4. Small specimens of the same variety of fruit or vegetables dry more quickly than larger ones.

5. Stone fruit, such as Plums, Cherries, &c., should be exposed to a low temperature at first for several hours, and have the temperature gradually increased as evaporation proceeds.

6. Apples and vegetables may be exposed at once to a moderately high temperature, and finished in a lower temperature.

7. Stone fruit should be placed on the trays with the stalk ends uppermost.

8. Fruit of different sizes should not be placed upon the same tray, and small should not be mixed with large fruit.

9. Apples and Pears, *immediately* after peeling, should be immersed in a weak solution consisting of one ounce of salt to three quarts of water. If exposed to the air after being peeled they quickly discolour.*

Marmalade, Must, and Mark.

Germans do not practise jam or marmalade making as we English do, nor do they preserve oranges for breakfast and other purposes. In place of whole-fruit and other jams they have a series of preparations named Marmalade, Must, and Mark. The first has much added sugar, and is boiled for a short time; the second (Must) has but little sugar, but is boiled longer, and therefore keeps equally well. Mark has no sugar and is made from such fruits as Tomatos &c.

The preparation of the three materials is very similar. The fruit is pulped,† boiled, and bottled or put into jars. For preparing the pulp two sorts of hand-presses may be used. The first can only be employed for Apples, Pears, Tomatos, and soft fruits, and those which have no stones. The trough of this has straight wooden sides, and the semicircular bottom is made of perforated zinc. The fruit, having previously been boiled, is placed herein, and is forced through with a roller shaped like a

* See *Journal of the Bath and West of England Society*, vol. xii. (1902), p. 97 *et seq.*

† The first official appearance of the word "jam" is in Bailey's Dictionary (1730–6), where it is conjectured that it was derived from "J'aime (I love it)," which, Bailey explains, "children used to say in French formerly when they liked anything." Dr. Johnson owned that the little word was a puzzle to him; but modern authorities agree in surmising that it simply comes from the verb "to jam," and means something made by squeezing.

mallet, the feet of which revolve. The pulp is caught in a dish beneath and is then again boiled and the scum removed. It can at the same time be sweetened to taste. The hard parts of the fruit, as cores, stems, and skins, remain in the trough.

The other form of pulper is applicable to all kinds of fruit, the hand and power machines being on the same model. The boiled fruit is placed in a copper trough, the bottom of which is of perforated metal, through which the fruit is forced by a spindle ratchet, at the foot of which are one

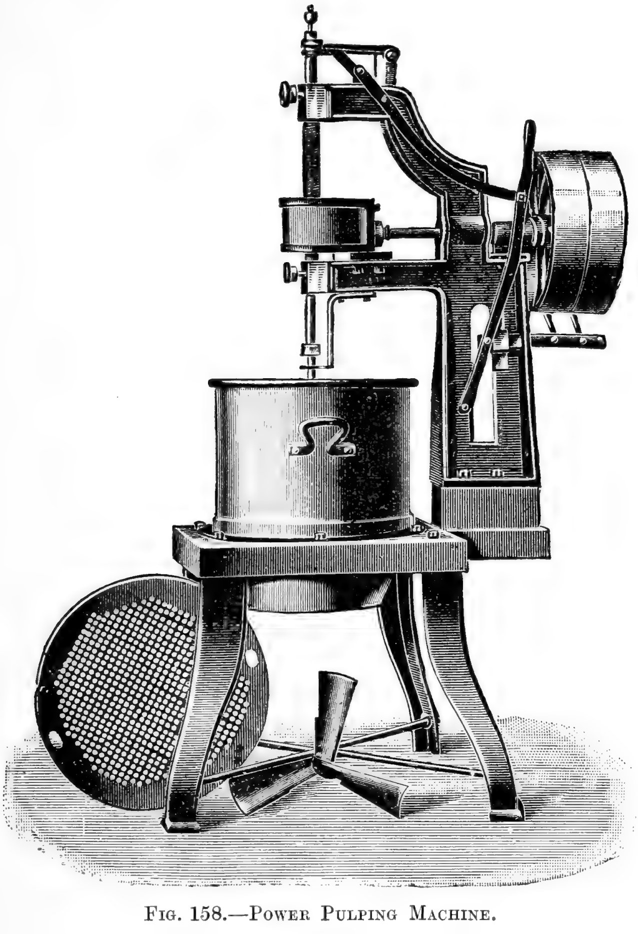


Fig. 158.—Power Pulping Machine.

fixed and one (or for power machines two) *spring* spuds. The spring spuds force the material through, whilst the fixed spud prevents it from caking. One great attraction of this method to the saving mind of the Teutons is that it enables all sorts and qualities of fruit to be used up, and all skins, cores, and even odd fruits to be applied with advantage. Sometimes also Apples, Pears, Plums, over-ripe or unripe, are worked in together for consumption as household marmalade and sold at $2\frac{1}{2}d.$ per lb.

The Germans are now seriously considering the question of preparing jam in the English manner, much of which would find its way to the

English market, and one summary report on the English jam and marmalade industry has already been published.

It is worthy of remark in passing that this method of treating fruit was in vogue in this country as far back as 1653. Nicholas Culpeper, in "The English Physician Enlarged" (1653), gives the following recipes:—

> "*Of Conserves.*—Conserves of Fruits, as of Barberries, Sloes, and the like, is thus made: First scald the Fruit, then rub the pulp thro' a thick hair Sieve made for the Purpose, called a Pulping Sieve; you may do it for a Need with the back of a Spoon; then take this Pulp thus drawn, and add to it its Weight of Sugar, and no more, put it in a Pewter Vessel, and over a Charcoal Fire; stir it up and down till the Sugar be melted, and your Conserve is made. The Way of keeping them is in Earthen Pots.
>
> "*Of Preserves.*—Fruits, as Quinces and the like, are preserved two Ways.
>
> "First Boil them well in Water, and then Pulp them thro' a Sieve, as we shewed you before; then, with the like Quantity of Sugar, boil the Water they were boiled in into a Syrup, *viz.* a Pound of Sugar to a Pint of Liquor; to every Pound of this Syrup, add four Ounces of the Pulp; then boil it with a very gentle Fire to their right Consistence, which you may easily know if you drop a Drop of it upon a Trencher: if it be enough, it will not stick to your Fingers when it is cold.
>
> "Secondly, Another way to preserve Fruits is this: First, pare off the Rind, then cut them in halves, and take out the Core; then boil them in Water till they are soft; if you know when Beef is boiled enough, you may easily know when they are; then boil the Water with its like Weight of Sugar into a Syrup; put the Syrup into a Pot, and put the boiled Fruit as whole as you left it when you cut it into it, and let it remain until you have Occasion to use it" (pp. 379-80).

Fruit Paste.

Another very favourite method for making up fruit in Germany is that known as paste, which is made up in the form of tablets, and is the really dried pulp (Mark) of various sorts of fruit. It keeps good for a very long time, and can always be reduced to a delicious compote by reboiling. The method originated in France, and is largely carried out on a commercial scale in Normandy, one firm in Abbeville having made 500 tons of Apple paste in one year alone; and Apricot paste is mostly made in Auvergne. At present this method has met with but little encouragement commercially in Germany, although it is largely treated of in all the best manuals on fruit preservation and is thoroughly taught in the Government Fruit Schools. There is, however, one German factory (Fr. Wahl, Feuerbach, Stuttgart) where its manufacture is carried out on a large scale, and the experience gained here goes to prove that there is no better means than this for the utilisation of windfalls and of unsaleable but yet usable fruit than this. Moreover, the unripe, overripe, and otherwise defective fruits, or surplus crops in record years, can all be turned to good account by this means.

The finest pastes are made from Apricots, Mirabelles, and Quinces, after which come Apples, Pears, Cherries, the larger sorts of Plums, and the Bilberries, so much beloved in the Fatherland. Some fruits, such as Strawberries, require an addition of Apple jelly to bind the whole together, for which purpose in Russia gelatine is added.

The Russian recipe, for which I am indebted to Herr Goethe of Geisenheim, is as follows :—The fruit should be thoroughly boiled and then pressed. To every pint of the juice thus gained add $1\frac{1}{2}$ lb. of sugar, and to each pound of this mixture is added one egg whipped to a lather. The whole mass is then worked up with wooden spoons by several people at the same time, and this is then poured into long flat wooden trays. After it is cold it is dried at 105–115° Fahr. for about twenty-four hours. The pulp weighs about half what the fresh fruit does, and is usually re-thickened by the addition of sugar of from one-tenth to one-fourth of the weight of the pulp, according to the kind of fruit under treatment. This addition of sugar gives the finished products a very fine transparent appearance, but retards the drying. The thickening is effected most quickly in a copper kettle over an open fire, which must be kept stirred all the time, so as to avoid burning the brew. According to an old confectionery recipe, the stirring should be in the figure of eight.

On the thickening process being completed, which occurs when fruit and sugar have fused, as in jelly, the product is laid on sheets of greased or otherwise waterproof paper in wire-bottomed trays, and smoothed down ; and the whole is then dried in one of the usual drying machines. This then looks something like tablets of soft butter-scotch, in varying tints, and can be cut through best by a specially constructed instrument which resembles a series of circular knives fixed at one-inch intervals on a narrow rolling-pin.

This paste is already well known in England, either in the form of rings, often threaded on a thin stick, or as "true lovers' knots," which are generally to be found in boxes of mixed crystallised fruit.

A German recipe for soup or sauce of this material is so truly strange that I must give it here before closing my remarks on this subject :—Dissolve some of the material in water, add to two pints of the above compote or stew a quarter of a pound of flour mixed in a quarter of a pound of melted butter. Then add half a pint of wine, and cinnamon, citron, or other flavouring to taste. In this soup should be stirred black-bread crumbs, with dried Currants or baked Corn.

Crystallised Fruits.—The crystallisation of fruit is admittedly a French business and but little practised in Germany. The one factory I visited carries it out to some extent, and, so far as I could learn from a most uncommunicative conductor, the method pursued is to place first-class fruits, carefully peeled and slightly boiled, in a strong sugar solution and allow them to soak for some days before drying on trays, which will cause the sugar to dry on the outside. I do not, therefore, propose to discuss this question here, as there will be a lecture on the subject of the Crystallisation of Fruit and Flowers by Mr. Senn on December 5.

Bottling Fruits.

Whether tins or bottles are used, the preserving of the fruit is conducted in much the same manner. To secure good results, care must be exercised to add the proper quantity of sugar and to use the right degree of heat.

The sugar should first be dissolved in water, and serves mainly to improve the flavour, and to help the fruit to maintain its shape. No general rules can be laid down on the subject of the density of the sugar solution, as the kind of fruit, its ripeness, and personal tastes, and other points, all have to be considered. The fruit is then placed in the sugar solution, preferably steam-jacketed pans, boiled until soft, and then placed in a basin or other vessel till cool. The pans should be skimmed as the fruit stews, and due care should be exercised in noting the proportion of sugar used and time of boiling for future guidance. The fruit is afterwards placed evenly in the tins or bottles, and the receptacle filled with the liquid from the boiling pan. If soft fruit be placed in the bottles while hot, it is liable to break, and in any case it contracts after boiling, and a certain portion of the bottle is found to be filled with clear juice, which should be strained off by tilting the bottle on its side, and the space should then be filled with fruit. About five bottles full of hot fruit will fill four bottles with cold fruit.

Various kinds of fruit are treated in different ways, some of which are described under the head of bottling. Great care should be taken to pack the fruits close together in the bottles, and a long spoon formed by binding a teaspoon in a cleft stick, bending the bowl as desired, will be found useful for deep bottles or jars, and the fruit should be gently pressed from the top or the bottles jarred on the table as the packing proceeds.

Methods of Fastening.—When the tops of jars are covered with vegetable parchment, this should first be cut into squares larger than the diameter of the vessel, and then soaked in clean cold water so as to expand the material. It should be laid over the neck of the jar when wet, and tied tightly with string. As the parchment dries, it will again contract until, when dry, it forms a drum-like appearance.

When corks are used they should always first be boiled, and the neck of the bottle or jar should, when corked, be dipped in a hot melted composition of paraffin and beeswax, or into hot sealing-wax, with a view of excluding the air.

When screw-capped bottles are used, care should be taken to screw the caps down tightly, and it may frequently be possible to make another half-turn in the cap a short time later, especially if the fruit be put up in a hot state.

Tins.—The old-fashioned tins with the lids soldered on, and the steam allowed to escape by a hole to be soldered up when the tin becomes cold, are hardly ever used in Germany now.

There are now two new forms of tin which are rapidly making their way to the front in the Fatherland. The first consists of a tin tube, lacquered inside, with the top and bottom rim bent outwards. On this is laid a disc of metal of slightly wider diameter, the edge of which is bent over and clinched round this lip by a simple machine, which revolves after the manner of a potter's wheel. This forms the bottom of the tin, and the top is fastened in the same way. By this method the use of solder is almost abolished, but it is necessary to see that the tins are full of cold, cooked fruit or vegetables, otherwise the contents would contract on becoming chilled and be unusable. In larger factories the whole of the tins are made on equally simple machines, and much cost is saved to the proprietor. These machines are already on the English market, but the system of tins with sunk heads have not yet been seen here, and this is the only method by which tins can be used more than once.

The Vacuum Process.

By far the most popular method in Germany is the vacuum process, and this is already gaining public favour in this country extremely

Fig. 159.—Spring for Single Bottles.

For use when the stand is not employed. The spring holds the cover in position until the vacuum is completed.

Fig. 160.—Opening Sterilised Bottle.

When it is desired to open a sterilised bottle, it is only necessary to pull the lip of the rubber ring, which thus admits the air, and the cover becomes loose.

Rubber Ring.

rapidly. It also has an additional advantage inasmuch as it enables the fruit or other foodstuffs to be cooked and the bottle secured at the same operation, should it be desired. The contents are also thus sterilised, since fungoid growth and other damage are always caused either by spores or by the action of the atmosphere, and the spores are killed by the boiling and the atmosphere excluded.

To create the vacuum it is necessary to force out all the spare air at the top of the bottle, and to prevent any more from entering. This is done by placing a rubber ring between the cap and the jar, and securing the latter with a spring.* The whole is placed in water sufficient to cover the bottles and boiled. As the fruit expands with the heat, the air is expelled above or below the rubber ring, and forms momentary bubbles in the water. When the bubbles have ceased occurring, it is certain that the whole air is exhausted. The bottle is removed and placed on one side

* Glass bottles with glass caps are undoubtedly the best, but they are also the most expensive method, and can only be employed for home use or when the bottles are made returnable like mineral water syphons.

to cool, before the spring is removed. The fruit then gradually contracts as it cools, and the cap is kept pressed down on the rubber ring by suction of the vacuum thus created. To open the bottle it is best to admit air by piercing the lid, if metal, or by displacing the rubber ring. The newest form of rubber ring is that shown in fig. 160, which has an extra lip of rubber, and in order to open the vessel it is only necessary to pull the lip, which enables air to again enter the bottle and so release the cap.

In placing these bottles of fruit in the kettle or vat, care should be taken that the bottom of the bottle does not touch the bottom of the kettle, since the metal being so much hotter than the water above, the lower fruit might burst or pulp before the vacuum is completed. This may, however, be easily prevented by having a false bottom, perforated, or placing a net of galvanised wire in the kettle and putting the bottles or jars in a wire stand, as shown in the illustration.*

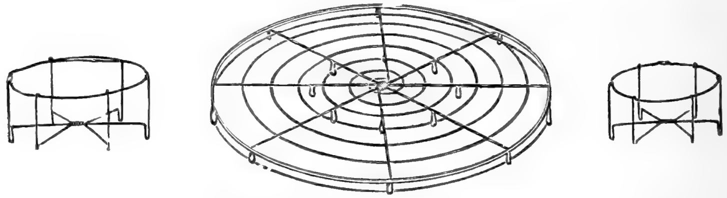


FIG. 161.—WIRE TRAY AND STANDS.

The history of the system of excluding the air by creating a vacuum dates back to early in the last century, when the French Government offered a prize for the machine which should enable foodstuffs to be kept for an indefinite period in as far as possible an unaltered condition, and a French cook, Appert by name, was the first to keep foods fresh by the exclusion of air. A great improvement on his somewhat primitive method is now available in the German apparatus figured on p. 581. This consists of a large kettle, through the lid of which a thermometer is set. The material having been placed in jars, whether glass or earthenware, is covered with a cap of glass or metal, resting on a rubber ring, and is then placed on a stand, as shown in fig. 163. This stand consists of a wooden base, having a central shaft terminating in a handle. Collars slide up and down the shaft, and can be fixed by pins in any position. From these project springs, which, pressing on the top of the cap, hold it in position until all the air in the bottle has been exhausted. The stand, with the bottles upon it, is then removed from the kettle and left to cool.

The kettle is also supplied with a steamer, which, as will be seen from the illustration, consists of a smaller but similar vessel, perforated both at the bottom and round the sides. This is not only useful for steaming certain forms of fruit before they are dried (see p. 570), but it has also been found to be a better way for preparing vegetables rather than boiling them in water by the old-fashioned method, since by the latter means the vegetables lose a considerable proportion of their nourishing properties, and if they are put into the glasses uncooked they fall together into a

* In some larger factories there is an apparatus for instantaneously sealing jars, bottles, and pots by vacuum cold process; but although it has many advantages the initial cost is prohibitive for small users.

mass and lose all attractiveness in their appearance. Moreover, by treating either vegetables or fruit for a few minutes in this manner, all bacteria and germs are destroyed and the matter becomes sterilised. In vegetables with a sharp, bitter taste, they lose a great deal of their bitter-

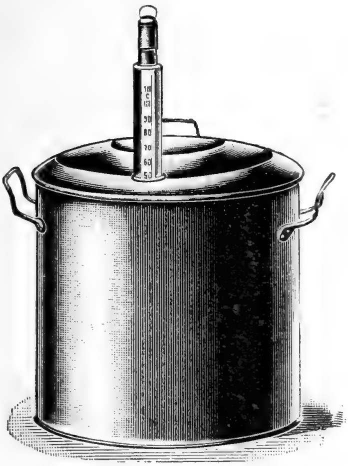


Fig. 162.—Sterilising Kettle.

Fig. 163.—Sterilising Stand.

ness in the steaming, as it thus runs away through the holes in the bottom of the steamer. In the case of vegetables or fruit which have no bitter taste, a solid plate can be placed in the bottom of the steamer, so that all matter which is extracted from the fruit or vegetables is thus

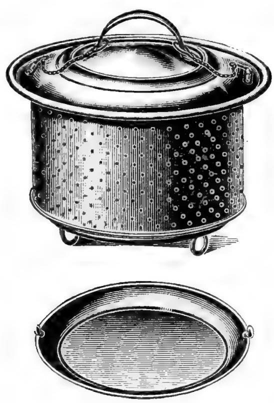


Fig. 164.—Steamer.

caught in the plate and can be poured over the fruit when it is placed in the bottles.*

A few hints as to the using of this and similar forms of bottling may not be out of place at this juncture. These have mostly been compiled by a fruit instructor, Herr Max Hotop, in Hamburg, and are largely

* Since the above was written Viscountess Galway has brought out a book on *The Art of Conserving*, which deals largely with the use of the machines here mentioned.

extracted from the second edition of "Koche auf Vorrat!" (Cook with Care!), which appeared this year (1905).

"The rubber rings can never be used for excluding the air when the contact surfaces of either the bottle or cap are at all rough, and should such faults be detected the vessels should at once be withdrawn from use. Otherwise the glasses, caps, and rings can be used over and over again, and in some places it is proposed that the glasses should be regarded as returnable, just as mineral water syphons are now.

"Before using the rubber rings for the first time they should be washed in a warm solution of soda and water, and before they are again used care should be taken to see that they are undamaged. The rings are best kept lying in a cool room, not exposed to draught, which dries the rubber and is liable to destroy its elasticity. The springs are best kept from rusting by being wiped with a dry cloth after using and then rubbed over with vaseline or other greasy compound. The great essential to success of any of the methods mentioned in this paper is strict attention to cleanliness. By using a vacuum process it is unnecessary to add sugar, salt, alcohol, vinegar, or any other preservative, though this may be done to suit individual tastes."

Fruits for bottling should be gathered in dry weather, and as clean as possible, since any necessary washing of the fruit always damages both its appearance and its flavour. Should the fruits, however, have become soiled, despite the greatest care, they can be wiped with a damp cloth. Soft fruits, such as Strawberries, can be placed in a sieve or in the steamer mentioned above and easily freed from any adhering dirt by being dipped several times in cold water. Fruits bought in the market should always be washed, as one never knows through how many or what hands they have passed.

Only perfectly sound fruits, neither too ripe nor too unripe, should be used. The first would immediately collapse in the glass, and the latter have not formed the flavour of the variety to which they belong. Their acidity is also too great and cannot be overcome by the addition of larger quantities of sugar, and such fruit remains flavourless. The fruit should be bottled as soon as possible after being gathered.

The placing of the fruits in bottles is an art in itself. The two main objects should be so to fill the bottle that the fruit cannot be shaken out of position and to attract the eye of possible purchasers. The filling of the bottle is best accomplished by having the fruit in a separate receptacle, and by placing it piece by piece in the bottle with a long spoon. Such a spoon can easily be made by binding the handle of an old teaspoon in a cleft stick of wood, and then bending the bowl into such a shape as may be found most convenient. Split fruit should always be laid with the flat side at bottom, Pears should be placed with the stalk end uppermost, and other fruit are generally laid as found most convenient. After the bottles have been filled with the fruit, a sugar solution is poured over it so as to fill up all the space to the neck of the bottle. The quantity of sugar solution required is on the average about one-third of the capacity of the bottle. The strength of the solution depends entirely on the varieties of fruit, their condition as to ripeness, and individual taste.

It is better to allow the boiling to continue for rather five minutes too long than too short a time. A wide bottle naturally requires a longer time than a narrow one, and during the process the kettle must be kept closed tightly.

In bottling Strawberries by the vacuum method a sugar solution of about 1 lb. of sugar to 1 pint of water is required. The fruits, having been placed in the bottle and covered with the solution, are placed in the kettle (or steriliser) and gradually heated up to 90° Celsius. They are then removed from the fire and the following day are placed in the glasses, covered with the sugar solution, and heated for fifteen minutes, so as to allow the solution to operate on the fruit. In this manner Strawberries do not lose their colour, and they continue to maintain their shape and to fill the glass bottle.

Apricots are, on account of their fine, aromatic flavour, the favourite fruit for sterilising or bottling. All varieties are not equally suitable for this form of treatment, but in any case the fruit should be equally ripe all over, have a bright golden flesh, and come away from the stone easily. The smallest fruits are treated whole, and the others halved and skinned. The skinning should be done with a horn knife, as otherwise the beautiful golden colour of the flesh is lost. So as to skin the fruits easily, they should be dipped in boiling water and immediately afterwards again dipped in the coldest water possible. By this means the skin is made to come away from the fruit quite easily. It is advisable to place in with the fruit about six kernels from the stones after they have been peeled, so as to give an extra flavour to the whole. The sugar solution best adapted for apricots is about $\frac{1}{2}$ lb. to a pint of water.

Peaches should have as white a flesh as possible, and come away from their stones easily. The best varieties for the purpose are undoubtedly the 'Great Mignon' and both the 'White and Red Madeline.' So as to remove the skin, the fruits are placed in boiling water for one to three minutes, according to the ripeness of the fruit, and when the skin has begun to crinkle the sieve or steamer, with the fruit, is dipped into cold water and the skin comes away very easily.

Figs should not be too ripe, and, after being pricked with a thorn, should be laid in glasses, and after being covered with the same solution as in the case of Apricots and Peaches should be heated to 90° C. for about twenty minutes.

Pears should always have the stalk left on, but if it be too long it can be shortened. After being peeled the fruit is laid in cold water, to which a few drops of citric acid can be added. This prevents the fruit from becoming brown, which would soon occur if it were left exposed to the air. The fruit is laid in the glasses, and a sugar solution of 1 lb. of sugar to three pints of water having been poured over it, the fruit is heated for about thirty minutes.

Apples are treated in a similar way to Pears, but many people prefer the sugar solution to be stronger.

Conclusions.

We hear a good deal at the present day about sugar bounties and our threatened jam industry, but I would point out that we seldom hear anything about the scarcity of home-grown bottled fruit, whilst our grocers' shops and table-delicacy warehouses are fully supplied with bottled fruits bearing American, French, and German labels. I have, moreover, been told recently on the highest authority that many of the English bottles of fruit are bottled in this country from foreign-grown tinned fruit. Such a disgrace to our commercial integrity is a great hardship to the honest traders in this country.

There are several tentative movements in the same direction in England. A proposal is on foot to start a large fruit and vegetable drying factory on a new vacuum principle in East Anglia; but it should be noted that this locality has been chosen so as to ensure a plentiful supply of raw material by importation from Holland and Northern Europe in the event of the home supply giving out!

One preserving company dries fruit by a current of hot air, but it is alleged that this system is three times as costly as the vacuum method of drying.

I must apologise if some of these remarks have seemed pedantic or truistic, although they were not so intended, and I feel sure that there is a great future for English fruit-culture, if the growers will but bestir themselves and recapture the trade which lies within their grasp. The days of general co-operation in the distribution or utilisation of fruit may still be far distant, but it is open to the fruit-growers of any locality to grow certain sorts and certain varieties of fruit or vegetables, and thus soon secure a reputation of being able to supply such produce, of uniform quality and in considerable quantities. As the acreage under the increased crop increased, a small factory might be added on co-operative or joint-stock principles.

That our growers are capable of making excellent preserves is clearly to be seen in the Exhibitions held by our Society, and I for one look forward with confidence to the time when all our dried fruit, bottled fruit, and jams will be home-grown and home-preserved, and all fresh fruit required for our markets will either be grown at home or be provided by the Colonies of our Empire.

APPENDIX.

Various Notes on Fruit Preserving.

The United States Department of Agriculture's Farmers' Bulletin, No. 203, referred to at p. 572, deserves to be reproduced in this country in its entirety, but owing to space limitations it is only possible to quote the following general instructions :—

> The process of making a syrup is very simple, but there are a few points that must be observed if syrup and fruit are to be perfect. Put the sugar and water into the saucepan and stir on the stove until all the sugar is dissolved. Heat slowly to the boiling point and boil gently without stirring. The length of time that the syrup should boil will depend upon how rich it is to be. All syrups are better for boiling from ten to thirty minutes. If rich syrups are boiled hard, jarred, or stirred they are apt to crystallise. The syrup may be made a day or two in advance of canning time. The light syrups will not keep long unless sealed, but the heavy syrups keep well if covered well.

*Canning.**—The success of canning depends upon absolute sterilisation. If the proper care be exercised there need be no failure, except in rare cases, when a spore has developed in the can. There are several methods of canning; and while the principle is the same in all methods, the conditions under which the housekeeper must do her work may, in her case, make one method more convenient than another. The best and easiest are cooking the fruit in the jars in an oven; cooking the fruit in the jars in boiling water; and stewing the fruit before it is put in the jars. The quantity of sugar may be increased if the fruit is liked sweet.

It is most important that the jars, covers, and rubber rings be in perfect condition. Examine each jar and cover to see that there is no defect in it. Use only fresh rubber rings, for if the rubber is not soft and elastic the sealing will not be perfect. Each year numbers of jars of fruit are lost because of the false economy in using an old ring that has lost its softness and elasticity. Having the jars, covers, and rings in perfect condition, the next thing is to wash and sterilise them.

Have two pans partially filled with cold water. Put some jars in one, laying them on their sides, and some covers in the other. Place the pans on the stove where the water will heat to the boiling point. The water should boil at least ten or fifteen minutes. Have on the stove a shallow milkpan in which there is about two inches of boiling water. Sterilise the cups, spoons, and funnel, if you use one, by immersing in boiling water for a few minutes. When ready to put the prepared fruit in the jars, slip a broad skimmer under a jar and lift it and drain free from water. Set the jar in the shallow milkpan and fill to overflowing with the boiling fruit. Slip a silver-plated knife or the handle of a spoon around the inside of the jar, that the fruit and juice may be packed solidly. Wipe the rim of the jar, dip the rubber ring in boiling water, and put it smoothly on the jar; then put on the cover and fasten. Place the jar on a board and out of a draught of cold air. The work of filling and sealing must be done rapidly, and the fruit must be boiling hot when it is put into the jars. If screw covers are used, it will be necessary to tighten them after the glass has cooled and contracted. When the fruit is cold wipe the jars with a wet cloth. Paste on the labels, if any, and put the jars on shelves in a cool, dark closet.

In canning, any proportion of sugar may be used, or fruit may be canned without the addition of any sugar. However, that which is designed to be served as a sauce should have the sugar cooked with it. Fruit intended for cooking purposes need not have the sugar added to it.

Juicy fruits, such as berries and cherries, require little or no water. Strawberries are better not to have water added to them. The only exception to this is when they are cooked in a heavy syrup.

Canned Fruit Cooked in the Oven.—The work is easily and quickly done, and the fruit retains its shape, colour, and flavor better than when cooked in the preserving kettle.

Cover the bottom of the oven with a sheet of asbestos, the kind plumbers employ in covering pipes. It is very cheap and may usually be found at plumbers' shops. If the asbestos is not available, put into the oven shallow pans in which there are about two inches of boiling water.

Sterilise the jars and utensils. Make the syrup; prepare the fruit the same as for cooking in the preserving kettle. Fill the hot jars with it, and pour in enough syrup to fill the jar solidly. Run the blade of a silver-plated knife around the inside of the jar. Place the jars in the oven, either on the asbestos or in the pan of water. The oven should be moderately hot. Cook the fruit ten minutes; remove from the oven and fill the jar with boiling syrup. Wipe

* By canning is understood bottling as well as tinning in America.

and seal. Place the jars on a board and out of a draught of air. If the screw covers are used tighten them after the glass has cooled.

Large fruits, such as Peaches, Pears, Quinces, Crab Apples, &c., will require about a pint of syrup to each quart jar of fruit. The small fruit will require a little over half a pint of syrup.

The amount of sugar in each quart of syrup should be regulated to suit the fruit with which it is to be used. The quantity may also be increased or diminished to suit the taste.

Canned Fruit Cooked in a Water Bath.—Prepare the fruit and syrup as for cooking in the oven.

Fill the sterilised jars and put the covers on loosely. Have a wooden rack in the bottom of a wash boiler. Put in enough warm water to come to about four inches above the rack. Place the filled jars in the boiler, but do not let them touch one another. Pack wads of hay or, perhaps better, cotton rope between and around the jars to prevent them from striking one another when the water begins to boil. Cover the boiler and let the fruit cook ten minutes from the time the water surrounding it begins to boil.

Draw the boiler back and take off the cover. When the steam passes off take out one jar at a time and place in a pan of boiling water beside the boiler, fill up with boiling syrup, and seal. Put the jars on a board and do not let cold air blow upon them. If screw covers are used, tighten them when the glass has cooled and contracted.

Selection and Handling of Fruit for Jelly-making.—An acid fruit is the most suitable for jelly-making, though in some of the acid fruits, the Strawberry for example, the quantity of the jelly-making pectin is so small that it is difficult to make jelly with this fruit. If, however, some Currant juice be added to the Strawberry juice, a pleasant jelly will be the result; yet, of course, the flavour of the Strawberry will be modified. Here is a list of the most desirable fruits for jelly-making. The very best are given first: Currant, Crab Apple, Apple, Quince, Grape, Blackberry, Raspberry, Peach.

Apples make a very mild jelly, and it may be flavoured with fruits, flowers, or spices. If the Apples are acid it is not advisable to use any flavour.

Juicy fruits, such as Currants, Raspberries, &c., should not be gathered after a rain, for they will have absorbed so much water as to make it difficult, without excessive boiling, to get the juice to jelly.

If berries are sandy or dusty it will be necessary to wash them, but the work should be done very quickly so that the fruit may not absorb much water.

Large fruits, such as Apples, Peaches, and Pears, must be boiled in water until soft. The strained liquid will contain the flavouring matter and pectin.

It requires more work and skill to make jellies from the fruits to which water must be added than from the juicy fruits. If the juicy fruits are gathered at the proper time, one may be nearly sure that they contain the right proportion of water. If gathered after a rain, the fruit must be boiled a little longer that the superfluous water may pass off in steam.

In the case of the large fruits a fair estimate is 3 quarts of strained juice from 8 quarts of fruit and about 4 quarts of water. If the quantity of juice be greater than this it should be boiled down to 3 quarts.

Apples will always require 4 quarts of water to 8 quarts of fruit, but juicy Peaches and Plums will require only 3 or 3½ quarts.

The jelly will be clearer and finer if the fruit be simmered gently and not stirred during the cooking.

It is always best to strain the juice first through cheese-cloth and without pressure. If the cloth be double the juice will be quite clear. When a very clear jelly is desired the strained juice should pass through a flannel or felt bag.

The juice may be pressed from the fruit left in the strainer and used in marmalade or for a second-quality jelly.

To make jelly that will not crystallise (candy) the right proportion of sugar must be added to the fruit-juice. If the fruit contain a high percentage of sugar, the quantity of added sugar should be a little less than the quantity o fruit-juice. That is to say, in a season when there has been a great deal of heat and sunshine there will be more sugar in the fruit than in a cold, wet season; consequently 1 pint of Currant juice will require but three-quarters of a pint of sugar. But in a cold, wet season the pint of sugar for the pint of juice must be measured generously.

Another cause of the jelly crystallising is hard boiling. When the syrup boils so rapidly that particles of it are thrown on the upper part of the sides of the preserving-kettle they often form crystals. If these crystals are stirred into the syrup they are apt to cause the mass to crystallise in time.

Jellies should be covered closely and kept in a cool, dry, dark place.

The late Prof. Goff, of the Wisconsin Experimental Station published some recipes for canning and preserving American Plums, including the following:—

The native Plums, especially those with firm pulp, after being treated by any of the methods mentioned below, are well adapted to all purposes for which the foreign Plums are used. As a rule, more sugar is required for the native Plums, but the preparations are rich in proportion. The harshness in the skin and stone of some native Plums is readily removed by steaming them in an ordinary cooking steamer until the skin cracks; or pour over them boiling water to which has been added common baking soda in the proportion of half a teaspoonful to a quart. The thicker-skinned varieties may be readily peeled by placing them in boiling water two or three minutes. The recipes follow:—

Canning.—Pick the fruit when well coloured but a little hard, steam or cook in a porcelain-lined kettle until tender, put in cans that have first been treated to boiling water, and cover with boiling syrup made of equal parts of granulated sugar and water, filling the can to the top; then run a silver knife around the can inside and let out the air, and seal at once. Plums cooked in the syrup are likely to be tough. Canned Plums may be used for pies and for mixing with or flavouring other fruit. Plums are often canned without sugar to be used in winter for making fresh Plum butter. The juice of canned Plums makes excellent jelly. One lady recommends splitting native Plums to the stone on one side before cooking to avoid crumbling.

Drying.—De Soto, Wyant, and doubtless other varieties may be pared, pitted, and spread on plates, lightly sprinkled with sugar and dried, first in the oven and later in the sun. Cook like dried Peaches.

Plum Jelly.—The fruit should be gathered when only part ripe—about half-coloured. This point is very essential. Put Plums in a large granite or porcelain kettle—the latter is best—with barely enough water to cover them. Cook until tender, but not until they are in a pulpy mass. Having previously covered a large jar with a cloth, strain the fruit in and let the juice drop through, but do not squeeze. When all has drained through, strain once or twice more through another cloth until the juice is perfectly clear To one measure of juice provide one measure of granulated sugar, but do not put together at once. A very important point in the making of all jelly is that only a small quantity should be cooked at one time. Into a medium-sized kettle put, say, four tumblers of juice; let it boil briskly fifteen or twenty minutes, then add the four tumblers of sugar, and in a very short time—usually from three to ten minutes—the jelly will be finished, light, clear, and delicious. To test the jelly dip a spoon in the boiling juice and sugar and hold it up; when the jelly clings to the spoon in thick drops, take it off quickly and put into jelly glasses. The Plum pulp which is left can be put through a cullender and used for Plum butter.

Another recipe—*Plum Preserves.*—Take equal weights of fruit and sugar, place in stone jar a layer of fruit, then a layer of sugar, alternating thus until quantity desired is reached. Let stand overnight; in the morning drain off the syrup that will have formed into a porcelain kettle, place same over a fire and let syrup come to a boil, then pour it over fruit in jar again; repeat this every day until the fourth heating, when fruit and syrup are both put in kettle and boiled for a few minutes. Place same in glass jars while hot, seal, and put away in some cool and preferably dark place.

Still another recipe. To each pound of Plums add a pound of sugar, put the fruit into boiling water until the skins will slip, peel and sprinkle sugar upon each layer of fruit in a bowl, allowing them to stand overnight, then pour off the juice, bring quickly to a boil, skim, and add the Plums; cook very slowly till tender and clear, which will take about a half-hour; take them out carefully and put into a pan, boil the syrup for a few minutes longer until it thickens, pour it over the fruit, seal or tie them up.

In the autumn of 1902 eight varieties of American Plums were preserved at the Central Experimental Farm, Ottawa, in order to learn what differences there were in these kinds for the purpose :—

These were preserved with and without the skin. In nearly every case the peeled fruit made the best preserves. The Bixby, however, cooked with the skin on was the best of all those tested, having a better flavour than any of the others, both peeled and unpeeled. With some varieties 1 lb. of sugar to 1 lb. of fruit was found to make the preserves too thick; on the other hand, ¾ lb. sugar to 1 lb. of fruit in some cases did not make them quite sweet enough. None of the varieties tested were found markedly astringent, though most of those cooked with the skins had a flavour, not unpleasant, but peculiar to the American Plums. The proper proportions to be used in preserving each variety will have to be learned by experience. The following are some of the notes made on the preserves, arranged in descending order of merit :—

Bixby.—1 lb. sugar to 1 lb. fruit, unpeeled; good colour, good flavour, skin tender.

Cheney.—1 lb. sugar to 1 lb. fruit, peeled; attractive amber colour, good flavour.

Cottrell.—1 lb. sugar to 1 lb. fruit, peeled; amber colour, sweet, rich, good.

New Ulm.—1 lb. sugar to 1 lb. fruit, peeled; attractive, pale, good flavour.

Mankato.—1 lb. sugar to 1 lb. fruit, peeled; pale, clear amber, good flavour, but too sweet.

Bouncer.—1 lb. sugar to 1 lb. fruit, peeled; attractive, but too thick, good flavour.

Bixby.—1 lb. sugar to 1 lb. fruit, peeled; too sweet, not as good as unpeeled.

Cottrell.—¾ lb. sugar to 1 lb. fruit, unpeeled; attractive colour, not as good as peeled.

Silas Wilson.—1 lb. sugar to 1 lb. fruit, peeled; dull amber colour, good, but too rich.

Bouncer.—¾ lb. sugar to 1 lb. fruit, unpeeled; attractive colour, good flavour, but skin tough.

Mankato.—1 lb. sugar to 1 lb. fruit, unpeeled; fairly attractive colour, but too sweet.

New Ulm.—1 lb. sugar to 1 lb. fruit, unpeeled; attractive colour, good flavour, but tough skin

Silas Wilson.—1 lb. sugar to 1 lb. fruit, unpeeled; good flavour, but skin tough.

American Eagle.—$\frac{3}{4}$ lb. sugar to 1 lb. fruit; deep red, rather tough skin, medium quality.

Cheney.—1 lb. sugar to 1 lb. fruit, unpeeled; unattractive colour, but skin breaks well.

Figs.

In the United States considerable attention has been paid to the preservation of Figs, and it has been found that where a very superior variety is grown it may occasionally be profitable to use any dryer, in order to save a crop that might be injured by inclement weather; but, generally speaking, localities where artificial drying is necessary are not suited to the most prolific production of commercial Figs, as any extra handling greatly increases the cost of the product. Figs with a rough and tough skin, intended for drying—whether sun-dried or artificially—are also especially benefited by being dipped in a hot solution of salt and saltpetre, or even lye, but the best grades are not improved thereby. In dipping, the Figs should first be placed in a perforated bucket and rinsed in cold water to free them from dust. They should then be transferred to a kettle containing boiling lye, made of 1 lb. of potash to 10 gallons of water, where they should remain from fifteen to sixty seconds, according to the size of the Figs and the pliability and thickness of the skin. Boiling salt water may be substituted for the lye water for the dipping of some Figs, different varieties requiring different solutions to secure the desired result. When salt or saltpetre is used, $1\frac{1}{2}$ lb. of either to 50 gallons of water is a good proportion, and the saltish taste generally improves the flavour.

For canning, Figs should be picked when still firm enough to hold their shape. To secure the best results they require the use of more sugar than do some other fruits. If under-sweetened they seem tasteless and lacking in quality. The amount of sugar used and the method of procedure vary greatly in different households. A pound of sugar to three or four pounds of fruit would probably suit most tastes, though some prefer the regular "pound for pound" preserve. Ginger-root or orange-peel is sometimes added to give variety of flavouring, and Figs are often made into sweet pickles by adding spices and vinegar. Figs are sometimes peeled before canning, and this is considered to increase their delicacy of flavour. More frequently, however, they are cooked unpeeled and with the stems on, just as they come from the tree. They hold their shape better and look more attractive when treated in this way, and the difference in flavour, if any, is very slight.

There seems to be no reason, aside from the larger quantity of sugar required, why Figs should not be grown and canned as cheaply as Peaches. If this were done, the demand would soon be very large. It is in this direction, if at all, that there seems to be an opening for the building up of the Fig industry in the South.

The processes used by the factories in canning Figs differ somewhat from household methods. They also differ among themselves. Each factory has worked out a plan of its own, the details of which are regarded to some extent as trade secrets. In one factory, whose product has been much admired, the process consists of boiling the fruit at first in a very slight syrup, allowing it to cool, and then transferring it with successive heatings and coolings to syrups of gradually increasing density. The whole process requires nearly two days. In the finished product the Fig, while holding its shape perfectly, has become partially transparent, and as the final syrup is clear and free from sediment the fruit is very attractive.

Pineapples.

The Americans also are beginning to preserve Pineapples by canning, and in view of the large imports of these fruits at the present day, the following recipes may be useful to those who prefer to make their own preserves :—*

For Home Use.—The Pineapple is easily canned for home use. The peeling is removed carefully, the fruit quartered or sliced, and the core taken out. The cans, preferably glass jars, are filled with sections and boiling syrup poured on to fill the jars. These are then set into a kettle of boiling water for fifteen or twenty minutes, then they are removed from the kettle, and the cap, which, with the rubber, has been sterilised, screwed on.

For flavouring, the Pineapples are secured as fully ripe as practicable. The peeling and slicing is done much as for the canning. The sections are then ground and put up in cans and jars of suitable size. Just as little cooking as possible is done when the fruit is intended for flavouring. To avoid sterilising by means of heat, preservatives of various kinds are used to preserve ground fruit, but this method of putting up fruit for flavouring is reprehensible. Even healthy persons would probably suffer certain injury if small quantities of any preservative were consumed by them daily for any considerable length of time. The fruit to be used for flavouring may also be prepared by treating the ground fruit in the same way as the sliced fruit. This has the disadvantage of losing a part of the flavour, but more of the product may be used and thus avoid the bad effects or the chance of ill effects of the preservative used.

For Medicinal Purposes.—It is well known that this fruit contains an active principle called "ananasine," which possesses active digestive properties. Advantage has been taken of this fact in the manufacture of Pineapple digester and in separating the active principle for medicinal purposes.

The Government Agricultural Department in Canada pays considerable attention to the fruit industry, and as far back as 1896 published, in the Report of the Experimental Farms, some interesting observations made by their horticulturist (Mr. John Craig) on "Evaporating Apples," which recorded the results of some practical experiments as to the relative values of some of the commoner varieties of Apples. "The principal objects in view were: 1. To ascertain the shrinkage in each case caused by paring, coring, and drying; 2. To note the differences in the appearance and quality of the evaporated product from the several kinds tested." He reported as follows :—

Five pounds of the fruit of each variety were used. The Apples were pared and cored with a "Family Bay State Parer, Corer, and Slicer," and evaporated, without sulphuring, in the No. 1 Evaporator, kindly loaned by the G. H. Grimm Manufacturing Co., 84 Wellington Street, Montreal, Quebec. The dimensions of this are: Width, 26 inches; depth, 24 inches; height, 48 inches. The evaporating chamber holds six wire trays, 22 × 22 inches. It is made of galvanised iron. This size is intended for family use, and is not large enough for evaporating fruit on a commercial scale. It is probably economy, in the long run, to purchase a larger size to begin with, as there is little difference in the amount of time or attention required to operate one successfully. In order to secure true evaporation a high temperature is necessary. This demands the closest attention, as the fruit will crisp and burn quickly if not attended to at the right moment. Cheese-cloth was used to prevent the pared Apples sticking

* "Pineapple Growing," by Peter H. Rolfs (*U.S.A. Farmers' Bulletin*, No. 140, 901, p. 36).

to the wire screens. A temperature uniformly between 200 degrees and 210 degrees Fahr. was maintained as evenly as possible, each sample being removed when, according to our judgment, it had reached the proper state of dryness. It will be seen that this would admit of, even with the exercise of the greatest care and best judgment, considerable variation in the condition of dryness of each sample.

DEDUCTIONS. *Weight.*—As evaporated or dried Apples are always sold by the pound, the most profitable variety for this purpose, other things being equal, will be that one giving the largest amount of dried product for each bushel of Apples.

Graded by this standard, some of our best known commercial Apples take a high place. A new variety, Patten's Greening, stands at the head with the remarkable yield of 16 lb. of dried Apples to the bushel of green fruit. This may be exceptional. The flavour of the dried product is not equal to that of many others. Following this variety come Baxter, Ben Davis, Golden Russet, Northern Spy, King, Ribston Pippin, Twenty Ounce, and Pewaukee. Summer varieties, being soft and juicy in character of flesh, are unsuited for this purpose. Commercially they are rated as giving 4 to 5½ lb. of dried Apples per bushel, while winter varieties yield 6 to 7 lb.

Colour.—The flesh of some kinds quickly changed colour, turning brown on being cut, while that of others did not discolour either as rapidly or to the same extent. Sulphuring largely overcomes this defect, but an Apple whose cut surface dries white instead of brown on exposure to the atmosphere is distinctly to be preferred to one that rapidly turns brown under the same treatment.

Among varieties that retained their colour well may be mentioned Baxter, Duke of Connaught, Lawver, Missouri Pippin, and Walbridge.

Texture.—Most of the varieties when dried retained their original characteristics of texture. This was dependent somewhat upon the state of maturity and ripeness. Over-ripe Apples lost colour more rapidly and showed a greater shrinkage than did those in good condition. The dried product of these was also inclined to be brittle. To obtain the best results Apples should be evaporated before they reach a state of maturity—perfect maturity from the dessert standpoint. The evaporated product will have better texture and colour if manufactured when the Apple is still crisp, firm, and somewhat green. If evaporated at this stage the flavours are more fully retained in the dried article, in the same way that sauce made from partly ripened Apples contains more of the delicate aromatic flavours than is found in the same variety if cooked when fully ripe and in good eating condition.

GENERAL REMARKS.—In speaking of evaporated Apples and the old-fashioned dried product, it is well to point out the important difference between the two. Sun-dried fruit is that which has lost a large part of its water by natural evaporation. Very little, if any, chemical change has taken place in its constituent parts. Evaporated fruit is that from which the moisture or water has been extracted by being subjected to rapidly moving currents of hot air. This air is heated to a temperature of about 220 degrees Fahr. The fact that the sliced Apples do not burn or become cooked in this high temperature is based upon the principle that the evaporation of water is a cooling process, inasmuch as the vapour carries with it a large amount of heat in latent form, thus keeping the temperature of the Apple far below that of the surrounding air. It is also claimed that by this treatment the albumen is coagulated instead of being dried. Chemical changes are also said to take place in the pectins which are converted into forms of sugar not easily decomposed. In other words, the moisture is extracted at the same time that the fruit is sterilised. The process, of course, requires specially constructed apparatus. There are now many kinds of evaporators.

Variety	Weight pared and cored		Weight dried		Length of time drying		Percentage of water evaporated	Weight of dried product in each bushel of 50 lb.		Remarks upon appearance and character of dried product
	Lb.	Oz.	Lb.	Oz.	Hrs.	min.		Lb.	Oz.	
Ben Davis	3	6	0	15	1	45	72·2	9	6	Brown, corky; subacid.
Baxter	4	2	1	0	2	43	75·7	10	0	Pinkish-white, tough; subacid.
Colvert	3	9	0	11½	1	50	79·8	7	3	Yellow, brittle; acid; fair.
Cross	3	4	0	12	2	00	76·6	7	8	Brown, brittle; mild subacid.
Cinnamon	3	9	0	10½	2	30	81·5	6	9	Chocolate, brittle; poor flavour.
Canada Baldwin	2	13	0	12½	1	38	72·2	7	13	Yellow, tough; acid; good.
Duke of Connaught	3	6	0	11	1	40	79·6	6	14	White, tough; insipid.
Fameuse	2	14½	0	11	1	20	76·3	6	14	Yellow, brittle; rather insipid.
Gideon	3	9½	0	10	2	25	82·6	6	4	Brown, brittle; insipid; over-ripe.
Golden Russet	2	14	0	15	1	25	67·4	9	6	Brown, tough; mild subacid.
Greening, R. I.	3	6½	0	13½	1	40	75·1	8	7	Brown, tough; subacid; good.
Hartshorn	3	4½	0	12	1	45	77·1	7	8	Brown, brittle; sweetish.
Hurlbut	3	7½	0	12½	1	53	77·4	7	13	Yellow, tough; woody; insipid.
Hibernal	3	9	0	8½	2	15	85·0	5	5	Brown, tough; sharp acid.
Haas	3	1	0	10	1	45	79·6	6	4	Brown, brittle; good flavour.
King	4	1½	0	14½	2	38	77·8	9	1	Yellow, tough; fine texture; good.
Lawver	3	2	0	12½	1	55	75·0	7	13	White, tough; mild acid; over-ripe.
Longfield	2	12	0	9½	1	32	78·4	5	15	Brown, brittle; sweet; insipid.
Late Winter	3	12	0	11	2	5	81·6	6	14	
Malinda	3	4½	0	13½	1	45	74·2	8	7	Yellow, tough; sweet; insipid.
Mo. Pippin	3	1½	0	13½	1	35	72·7	8	7	White, tough; subacid; good.
Melonen	3	2½	0	9½	1	55	81·1	5	15	Yellow, tough; insipid; over-ripe.
McMahan	4	2	0	13	2	15	80·3	8	2	White, brittle; subacid.
Northern Spy	4	1	0	15½	2	50	76·1	9	11	Yellow, tough; good flavour.
North Star	3	8½	0	8½	...	...	84·9	5	5	Brown, tough; sharp acid.
Pewaukee	3	11½	0	13½	2	30	77·3	8	7	Yellow, tough; acid.
Pewaukee (6 lb.)	4	5	0	14½	2	40	78·9	7	9	
Plumb's Cider	3	10½	0	10½	2	45	82·0	6	9	Yellow, tough; acid.
Patten's Greening	3	7	1	0	1	35	70·9	16	0	Yellow, tough; insipid.
Princess Louise	2	15	0	10	1	35	78·7	6	4	Yellow, tough; subacid; over-ripe.
Ribston Pippin	3	7½	0	14½	2	4	73·8	9	1	Yellow, rather brittle; subacid; good.
Romna	3	8½	0	12	2	5	78·7	7	8	White, tough; acid; pleasant.
Rawle's Janet	2	10	0	12	1	30	71·4	7	8	White, brittle; brisk subacid.
Scarlet Pippin	3	5	0	10½	2	34	80·1	6	9	
Spitzenberg	3	6	0	13	1	40	75·9	8	2	Brown, tough; flavourless.
Scott's Winter	2	11	0	8½	...	...	80·2	5	5	Yellow, brittle; sharp acid.
Snyder	2	10½	0	8½	1	50	80·0	5	5	Brown, brittle; subacid.
Sops in Wine	3	2	0	10	1	20	80·0	6	4	Yellowish-white; brittle; insipid.
Swayzie Pomme Grise	3	0	0	13	1	28	72·9	8	2	Yellow, tough; good flavour.
Simbirsk, No. 4	3	4½	0	9½	2	0	81·9	5	15	Chocolate, brittle; fair flavour; over-ripe.
St. Lawrence	3	1	0	10½	1	35	78·5	6	9	Yellow, tough; good flavour; over-ripe.
Sharpe's Russet	3	1	0	12	1	40	75·5	7	8	White, tough; brisk acid.
Twenty Ounce	4	3	0	15	2	20	77·6	9	6	Yellow, tough; mild subacid.
Winter Bough	4	2½	0	11	2	20	83·4	6	14	Brown, brittle; subacid; poor.
Watterson, No. 3	3	2	0	13½	1	35	73·0	8	7	White, tough; acid; good.
Walbridge	3	3½	0	11½	1	37	77·6	7	3	White, tough; sharp acid.
Wealthy	2	15¾	0	7¼	2	26	84·6	4	8	Yellow, tough; brisk acid.

Packing the Dried Fruit.—The fruit should not be packed for twenty-four hours after drying. It is then packed in paper-lined boxes holding 25, 50, or 75 pounds. A 50-pound box is 24 inches long, 12 inches deep, and 12 inches wide. Evaporated Apples are packed in the same manner as the raw article: that is to say, the head is "faced." To do this nail on the cover and take off the bottom, line it with paper, upon which a layer of rings is regularly placed, with each ring overlapping the others. After "facing" one or two layers the box is filled and the bottom replaced; the box is then properly branded, and it is ready for the market.

In the October 1904 number of the "Agricultural Gazette of New South Wales" there appeared some practical notes on the preserving of fruit for domestic use, notable among which is the following:—

"The reason some people have poor success in keeping their fruit well may be found in the improper care of the jars. Always wash and scald the jars and caps as soon as they are emptied, and dry the caps, right side up, on the stove. Turn the jar bottom up until thoroughly dry, then put the same cap on the same jar; then when needed they are rinsed with some clear water, and they are ready for use. In buying, select jars which have glass tops, as they can be used again and cannot be acted upon by the fruit acids, while the soft metal tops are likely to get bent in so that they will not fit closely. It is best to get new rubber rings for the jars each year, although old ones may be cleaned by washing in quite strong ammonia water, and by dipping in the white of egg before using they will sometimes keep successfully.

"The most important point is to have the jars and cans perfectly air-tight, and the tin cans should have wax pressed closely into the grooves, and more wax added until the crevice is full; and you must depend on good rubbers for the glass jars. Test each jar by filling half full of water, properly adjust and fasten the top, and invert for half an hour. If any water leaks out the jar is imperfect. A good plan is to gather the old jars together and make one task of cleaning them. First rinse them, then put them in a boiler with water to cover them and add enough pearline to make strong suds, then allow them to boil twenty minutes. Cans that have become discoloured and sour cannot be sufficiently cleaned by mere washing, and the boiling process is not only the best, but the quickest and easiest way to clean the jars, and after rinsing and draining them you will find them perfectly clear and bright."

The great difficulty is that in many districts the fruit and vegetable resources of some splendid little patch of soil lie dormant because no one in the family has any special knowledge of either growing the crops or of converting them into marketable shape. Perhaps in time to come there may be provided facilities for the acquirement of such information through the medium of central and local classes for women and girls in practical fruit and vegetable growing and in preserving or otherwise converting the produce into a commercial article, or perhaps there may be expert demonstrators who could—as the travelling dairy instructors years ago did—visit centres for a week or a fortnight's series of practical demonstration in the various branches of the work, the produce handled being provided by the students, and the land used in tillage lessons by some one whose place is easily accessible. Naturally, from a commercial point of view, such an industry would be more successful if considerable capital were expended upon a large proprietary or co-operative factory, but it is worth remembering that in a young country things have to grow. The American canning industry, which is responsible for the output of sufficient tinned vegetables, fruits, and other small farm products to provide about 40 lb. of such commodities per annum for every man, woman, and child comprising the seventy millions of the United States, is the growth of thirty years, and it has been built up practically from nothing.

To show how such an industry spreads itself over the year, and how many avenues of choice of crop it affords, the following calendar of Californian canning operations compiled by a writer in the "Californian Fruit Grower," who has had the work under observation for a great many years, may be of interest (the seasons in California are practically the inverse of ours):—"Asparagus packing begins April 1 and lasts until June 12; Strawberries, from May 1 to October 23; Peas, May 13 to June 21; Red and White Cherries, May 29 to July 2; Currants June 6 to 28; String Beans, from June 13 to December 1; Blackberries, June 19 to September 11; Apricots, June 21 to August 25; Greengage Plums, July 19 to September 18; Egg Plums, July 20 to September 23; White Free-stone Peaches, July 22 to October 15; Yellow Free-stone Peaches, July 23 to October 17; Nectarines, July 25 to September 6; Pears, July 25 to

September 26; Yellow Cling-stone Peaches, July 29 to October 12; Golden Drops, August 7 to September 5; White Cling-stone Peaches, August 10 to October 9; Damson Plums, August 20 to October 23; Tomatos, August 28 to November 16; Grapes, September 4 to October 30; Quinces, September 14 to November 10."

Referring to the manner in which canned fruits and vegetables had established a position in the everyday dietary of people, a retired admiral of the United States Navy once said: "The paths of our war vessels across the seas could be traced by the empty cans, the contents of which had varied the fare of sailors and officers from salt-horse and hard tack to a variety of vegetables and fruits, which the grandfathers of the present generation would have looked upon as the greatest luxuries, and which are now as essential to the health and well-being of our soldiers and sailors as they are to all the people of this fair land of ours, as were the staple and but little varied diet of fifty years ago."

In a recent issue of the "Manufacturing Record," one of the managers of the East and West Texas Railroads, who has taken a practical interest in the development of truck-farming, or market-gardening, as we would call it in New South Wales, along the railroads he controls, points out that last year enormous losses were experienced by the truck-growers, because their fruit and vegetables were a little late, and went to waste in the fields for lack of immediate market for them. A cannery could have taken them up, and put them into shape to be disposed of at leisure.

As to whether women can achieve success in such an industry as converting into the most profitable form for market the products that can be raised at small cost on well-chosen little patches on an ordinary farm or orchard holding, and where a man can do the occasional bit of ploughing and carting of the few loads of manure from the sheep-pens or stable-yard, many living examples can be quoted. The outlay for the enterprise on a farm or orchard comprises a few pounds' worth of fowl and pig-proof fencing, a wheelhoe and fittings for working the soil, destroying weeds, or cultivating between the rows to conserve moisture, a digging fork or spade for turning under manure, a wheel-barrow, 5*s.* worth of seeds, the occasional loan of a horse to draw a few casks of water on a skid, an ordinary copper-boiler, and a set of tins, and soldering outfit. Sugar for the preserved fruits, jams, and jellies; vinegar, condiments, and salt for the pickles and brined vegetables; glassware, packing, and labels, will be the heaviest items; but there does not seem to be any reason why a pig, or two or three, in the course of the year, might not be kept handy to fatten on the scraps and otherwise unusable vegetables and fruit. This is the most cleanly way of disposing of the waste, and the chances are that the returns from the pig-sty may go far towards covering the cost of materials that have to be purchased. If a drought does set in, the owner of a vegetable patch who can get even a very limited supply of water, but plenty of mulch of straw, grass, or leaves, rotted sufficiently to mat and not blow away in the winds, has the consolation of getting high prices for fresh vegetables. Indeed the dry seasons are generally the best for the skilful vegetable grower; though the plantations indicated would be for the production of vegetables and small fruits for preservation.

THE LAWS OF DEVELOPING LANDSCAPE: SHOWING HOW TO MAKE THICKETS AND WOODLANDS REVEAL THEIR NATURAL BEAUTY.

By J. Forsyth Johnson, F.R.H.S.

Introduction.

"To see, to see, really to see; here is where they all fail! 'Have you eyes?' is a question that may be for ever addressed to this eternally chattering and listening world, in which gaping takes the place of seeing. Whoever has really seen knows how he stands with it!"

This is an extract from the last letter written by Richard Wagner, January 31, 1883, thirteen days before his death.

This article is intended as a guide to the comprehension of natural, infinite beauty. What shall we see? Level lines come from man's habits. Curved lines come from the infinity of nature. Each in its proper place is right. Buildings require straight lines, while nature requires the curves. A determination of the laws of beauty would advance man's outlook on the world, and give him more power to gain results from nature than can at present be foreseen.

Landscape consists of a series of undulations. Natural scenery is not a matter of likes and dislikes. It has its truths of existence that reveal its infinity to all true observers. Impressions of mere imitation and limitation of boundaries cannot develop the infinite beauty of nature, however polished the ignorance may be or expensive the work. Knowledge of the natural impressions of land, water, plant-life, and sky effects is necessary for landscape development.

It is the object of landscape development to reveal plant beauty. This is accomplished by developing character with suitable association, and putting the right plant in the right place.

Where to plant or build, or where not to plant or build, are questions which must be decided before commencing work. These can be best determined by plans of outlines, for the smallest plan in this article would give hundreds of pictures for the photographer. As many pictures can convey only a very limited lesson in landscape, it is necessary to grasp the whole of a subject before proceeding to the arrangement of details. The land surveys are useful, but the revealing of land objects is guided by the view lines.

The knowledge of the schools registers the practical learning of natural knowledge coming forth from human labours, establishing the steps of human advancement, and forming its Jacob's ladder. Between the school and natural learning much suffering often comes. The school delights in calling the natural illiterate, whereas the ignorance is not always on the natural side. As an instance, once on a time Lord Brougham was showing a distinguished party over Barclay and Perkins's celebrated brewery in London. The head man who made the ales was appointed to explain the process of manufacture, but his lack of knowledge and his wrong placing of his H's caused Lord Brougham to step forward and stop him, remarking, "I know all about brewing. I will explain." And so he went through the great establishment, giving his description in that beauty and flow of language for which he was so celebrated. As the party was going away, one of them said to the head man, "Isn't Lord Brougham a wonderful man?" "Yes!" was the reply, "but everything he has just said is all d—— lies!"

The immense tracts of natural land in America possess capabilities of landscape development beyond comprehension, if their beauties could be revealed and their disadvantages concealed or removed; for the woodland possesses the beauties, and merely awaits the application of the knowledge of the art of revealing. It is precisely the same in Europe and even in England, though there the tracts of natural land are necessarily much smaller. Still, they are not difficult to discover by the eye that can perceive the beauty of nature. The effect for each plot possesses its own advantages and disadvantages, and if the land be planted (as the woodland), or is to be planted, it does not change the natural prerogatives of the land itself.

Observation Sites.

The first use of the knowledge gained respecting beauty will be to arrange the various particulars in due order. One must first select the sites which afford the greatest variety of scenery the proportions of the ground can give, and then form the principal outlines, such as long distances, recesses, promontories, and groups, in accordance with the natural undulations and other circumstances of the domain, the effect of the boundaries, or whatever wants may be apparent. Thus, when the general outlines are decided upon, the characters of vegetation may be chosen to clothe the earth according to the directions given, attention being paid to the curvature of each character, and the harmony of the whole.

Observation points are shown in all the figures, the scenery revealing itself by radiation in character therefrom. The fixing of these points before work is commenced is of the very first importance, wherever there is anything to be seen, long or broad lands, objects of woods, waters, &c., so that they can be used for building roads, objects of interest taking the visitors to the right spots to observe. The figures on contour and profile show laws that govern these sites. The object is to give landscape life to residences, roads, &c., the earth's plant life, land and water, and hide all undesirable objects.

Observation sites, the places from which one can see the longest and most expanded effects, are of the first consideration. These are called salient points.

From these salient points can best be seen the land and its objects. If these points be fixed rightly, hundreds of other things can reveal themselves to the sight in harmonious character. The fixing of observation sites gives power to the arranger to develop scenes and scenery, and so the salient points of view must always first be known.

In land the highest and lowest points are not always the best points

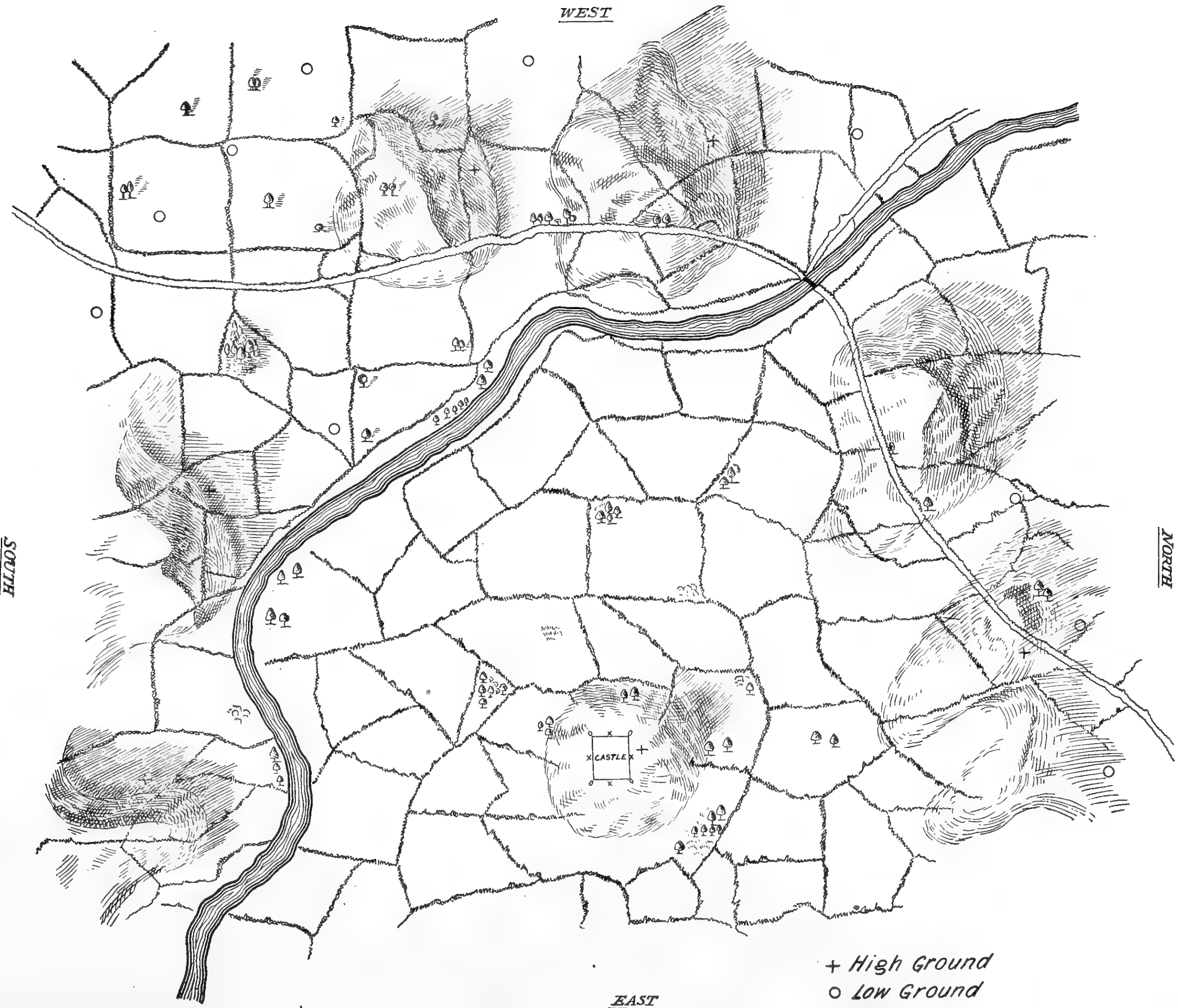


FIG. 165.—NATURAL LAND.

(To face p. 597.)

of observation. It can often be shown in high land views that the salient points are somewhat lower than the top of the high ground, as a slightly lower position will bring many other points and features into view, and still lose none of the extensions of the highest effects.

In Fig. 165 a few hundred acres of land are supposed to be examined, and for the sake of explanation the high and low points of the land are taken as salient points; for although these are not really so on land, as already indicated (for the real salient points are always near the highest and lowest lands, and they are always important features to compare with other sites), we are justified in fixing them as salient points, for a plan of explanation.

Undulations.

Landscape consists of a series of undulations, composed of infinite lights and shades. To command their object, we have to arrange the characters of undulations. Undulations reveal their advantages by view lines, are governed by the laws of contour and profile, and produce their effects by perspective and radiation.

When anyone in the early stages of thought looks at the parts of scenery, he is apt to be bewildered. He considers scenery as being all alike, whereas he will find, after learning to look properly, that scenery is infinite and gives infinite impressions.

There are no lines in nature. We use lines to delevop, but not to make, nature; nature is light and shade, producing impressions by character. It enters our senses through our eyes, like music through the ears, but a thousandfold more powerful than any music, for music gives impressions of sound more or less vanishing, while landscape gives the substance of music, a real, not vanishing, impression, and a permanent joy. If scenery were developed in accordance with the character of vegetation which each land naturally produces, the earth would arouse perpetual joy in the observer, such as few ever dream of. Man's work in the production of real beauty can only be accomplished by strict obedience to natural laws. Nature, therefore, must, as it were, be developed by nature, and by close discernment of the various aspects and requirements of the soil; so man must work in accordance with nature's laws, and thereby learn how best to develop those beauties of which the mind of man is able after all to form but a faint conception.

In arranging objects intended to beautify and adorn, we shall find it absolutely necessary to summarise, mentally as well as with the pen, the various hills and vales, heights and hollows, sites and views, that characterise and diversify the soil.

All lands contain peculiar beauties and advantages. Every piece of land contains its own pictures, and the first law of natural development is to learn to see them, while the others deal with their development, according to their own natural requirements.

Proportion is essential in all things. It must be observed, or harmony cannot be attained. To learn true proportion one must study the sizes of land, its high and low parts, and its object, the lines of distances belonging to the land, the character of its formation, &c. All these must be comprehended before the work is commenced, for the first lines of work laid off comprehend and contain the view of after-development. Whether the work to be done is small or large, it is necessary to comprehend the whole before a stake is placed in the ground.

Fig. 165 shows land in the rough, consisting of high and low ground, fenced in the usual wild manner. The + marks denote several risings in the land, one of which is selected as the site for the residence or castle.

The building forms naturally the chief point of observation, and therefore the views that radiate from it must receive development; one must show the natural pictures which the land itself possesses, from the point of observation, and study them for development of objects.

The first work on every piece of land is to learn to locate the salient points. In this rough land (Fig. 165) they are indicated by + for hills, O for low grounds, suitable sites for main pictures, and ▢ for a suitable site for the building. Thus three important bases of development are marked—the high and low grounds, and the best building site.

Fig. 166 shows the results attained from these three salient points of development—fences removed, showing how the land possesses beauties of its own, by the most preliminary work of development. Wherever a line is shown, a picture is possessed by the land; and by planting the high ground, and enlarging the water, infinite beauty will commence to unfold itself. Of course a large area, say five hundred acres, would be required for such a development. But the same principles can be carried out on a small site of only a few acres.

By referring to Fig. 166 it will be found that this land, with its seven rising grounds, gives a picture naturally wherever there is a line, and these lines give the sites for developing the various characters of silent life. The water is expanded where the views cross in the greatest abundance, and in front of the house is converted into a small lake, with an island placed so that its boundaries cannot be defined from the house.

Radiation.

Radiation is inherent in nature. The flower radiates from the stem, the tree radiates from its roots, the hills radiate from the higher mountains, the ravines from the valleys, and the valleys from the country-side, the rivulets from the brooks, the brooks from the rivers, and the rivers from the oceans. Light radiates from the sun, and mankind sees, breathes, and lives by radiation. Land, water, and life move and have their being in radiation, and mankind receives and gives impressions by the powers of radiation. Fig. 166 shows the important power of development upon the radiation lines of the salient points. By looking over the plan, features of value will be observed. Distance impressions are a part of radiation.

Radiation sways the direction of the curvature. The excrescence often seen in so-called landscape gardening is caused by the fact that the arranger does not follow the radiation of his scenery in forming the curvature of his landscape.

Fig. 167 shows a simple outline growing into a multitude of curves harmoniously simple, by the development of its character on its radiation lines. This explains how natural principles sway small as well as large expansions of scenery.

Fig. 166.—Development of Natural Land and Water

(To face p. 598.)

LANDSCAPE.

NATURAL LAWS OF DEVELOPMENT FORMING FOUNDATION FOR BEAUTY.

In order to plan, build, or lay out, so as to gain due advantages from land and buildings, there are seven fundamental laws, each of which fulfils some special aim, and possesses, within itself, infinite powers to assist the development of impressions of beauty.

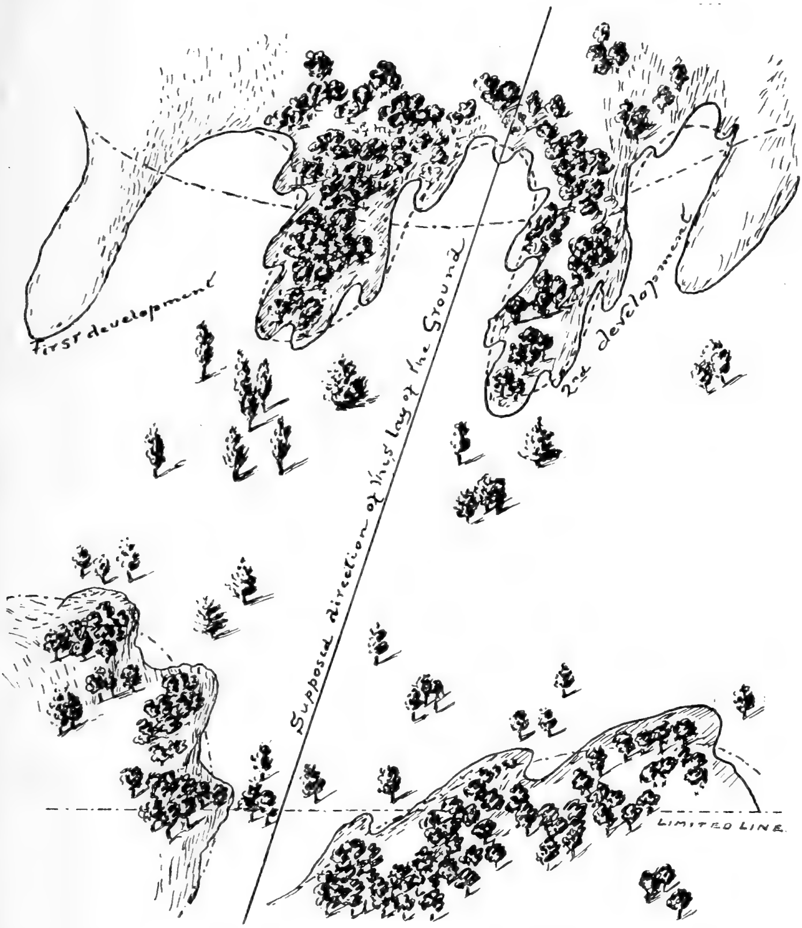


FIG. 167.—DEVELOPING OUTLINES OF SCENERY FROM LIMITATIONS TO INFINITE IMPRESS.

These seven laws are paramount in revealing natural scenery, in showing the sites of observation, how the eyes see, and what to see, so that the powers of admiration may assist the development of ideas.

Earth's forms and colours of landscape are swayed by darkness and light, radiating for life. Man builds for his own protection and develops lands for his own development, for the life of his body and the life of his thoughts—to gain impressions for his infinite impulses. Landscape is the transformation of silent into perpetual life.

We commence our labours on the earth, finding sites to build upon, sites to plant, sites for roads, plants to thin, &c. Upon commencing to build a house, it is necessary to know how to build; it is of no use to tell a man to put in a certain sort of door, window, or arch if he does not know how to make one or the other. We like our residences to be in parklike surroundings, in town or country. All, knowingly or unknowingly, aim to give themselves such environments. These should give the landscape various characters of beauty, in harmony and repose. To gain a right introduction to landscape is the germ of development for the artist, as learning how to design and paint is for the painter. To design is the foundation of his work; to paint is the planting and developing of the plant life already on the ground. The aim of this work is principally the design, so that he can give proper character and place to his aims. When he has found a true object and learned its true character, he can go to work and show forth true creations to residential lands.

The development of landscapes is the proper placing of everything—the proper selection of sites for everything. Nothing is of greater moment: for on every hand persons are found who, after they have spent their money, realise, only too late, that they have selected wrong sites for their various objects. Yet they will lead their friends to do likewise, and ignore any artistic knowledge within their grasp, as being merely visionary and of no real value!

Effects are particular or general according to the point of observation. The following plans not only show the best effects and point of development in land, but often prove that no other point is as good, and thereby give the suitable sites for the various wants.

For ages, artists have enriched the souls of men by their efforts on canvas and upon the bare walls of buildings, and by modelling dead matter into lifelike impressions; yet, in spite of this dead matter, how delightful and beneficial are the impressions given by artists to humanity! Nevertheless the artist in dead matter cannot attempt to give the smallest indication of any grand scene in landscape, for each scene contains many impressions within itself, according to the spectator's power of observation, far beyond the power of canvas to portray. All views of landscape are seen to their greatest advantage from observations taken somewhat above the foreground; but no painter can give a view at all looking downwards on the foreground. Yet we never gain an impression in its highest development without water in the foreground, for that brings hundreds of impressions to the observer beneath the horizontal line.

Now dead matter in general receives the benefits of all men's artistic genius; but when land receives these same benefits it will produce results above comprehension.

To be closeted in a room, however far away from any landscape, with the greatest of canvas views for a few days, will assist some to understand better the value of landscape. The landscape view from a window can excel any war picture. Take a sheet of plate glass of first quality, fifteen feet by five (more or less, according to requirements), and place it in a window opposite to a properly developed landscape view of moving and silent life; place the best wall view in comparison, and nature will excel the canvas, as natural beauty excels the beauty of the interior of dwellings made by man, as any view of nature, with its natural beauty, covered with an infinite blue sky-roof, golden with sunshine, or lighted by stars of night, will excel the impressions of one's own residence.

The seven laws of development are as follows :

1. Observation, salient points.
2. Radiation.
3. Contour { Distances and Mass.
4. Profile.
5. Scenery, centre and outlines.
6. Roads.
7. Planting. { Sky-line. Mid-distance. Carpeting.

CONTOUR.

"I am monarch of all I survey ; my right there is none to dispute !"

The thousands of acres of grass and tree lands kept by landowners for beauty and use are an inestimable public benefit. The productive value of tree lands above mere bare plateaus is an acknowledged fact, while the beauty of these gives a growth to human beings not equalled by any other earthly products.

The question for the laws of observation to answer is : How can we grasp from radiation the beauties of nature ?

By examining our visual powers, we find that by the law of contour and profile we see the objects of sight.

Laws of contour. { Mass and Distances

The lines curving towards the reader, mass and perspective lines, as shown in Fig. 168, give those which will present most material to the mind at once. The perspective lines furnish those which will give most thought to the mind. Distances observe these curves. These two principles furnish the bases in all the arrangement intended to exhibit scenery characters, land, water, and vegetation variations of undulation. Their effects are first to be noticed and to be laid down in proportion ; moreover they will give place to all lesser forms in such accordance as is required for vegetation. Thus, in developing scenery, they confer full power to create any feelings of which the land is capable, in accordance with the character of the position, each site exhibiting its own particular effect.

Figures 168 and 169 show the three principles of contour. The mass line gives the scenery to the mind, 90 degrees being the extreme limit, while some say we cannot grasp more than 60 degrees.

The laws of contour give the greatest possible results of scenery to the human mind.

Fig. 169 (A) shows how broad views are often wasted at a great cost, cutting the curvature of nature into imitations of streets.

Fig. 169 (B) shows how their development is attempted all over the world; Fig. 169 (C) shows how they are developed according to the natural principles of contour.

When straight lines are placed upon lands to take the principal place in the impression, the arrangement is false, untrue to nature and art, and untrue to the wants of the mind. It gives mere impressions of limitation, instead of impressions of infinity.

When a man first comes from his office or workshop, when his mind is filled with streets and buildings, he unknowingly lets the impressions of his life arrange silent matter according to the habits of his past life, and not according to the wants of real life (if he only knew it); and

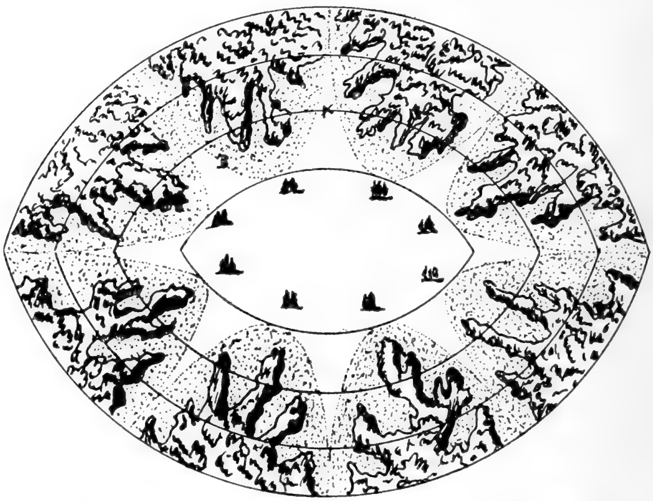
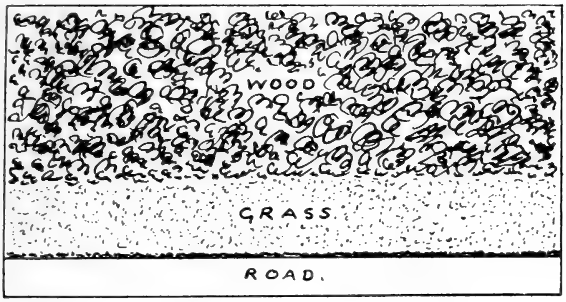


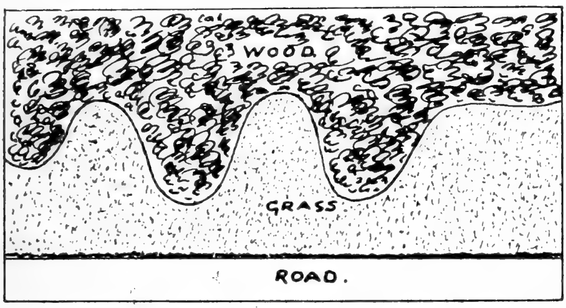
FIG. 168.—LAWS OF RADIATION FOR MASSING AND EXTENT.
Three natural principles of scenery—viz. mass, distance, and radiation.

according to Fig. 169 (A), (B) thousands of what are really mass pictures, if properly developed, can be seen arranged around the residences.

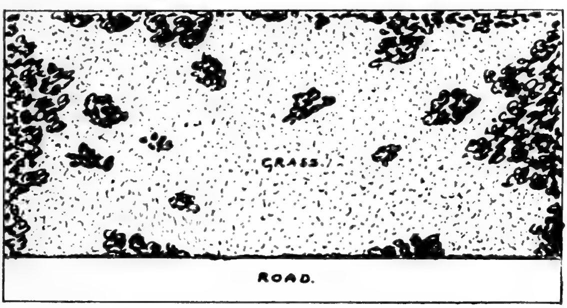
Fig. 169 (B) shows the lines adopted by the persons who call themselves landscape gardeners, landscape engineers, &c., but who cannot see the pictures of the land, or at least have only gained the first steps of seeing, and therefore cannot develop them. They put banks and excrescences on to the wood outlines, destroying the principles of development in every way, and showing they are blind to the pictures of the land. Fig. 172 shows how the natural laws of contour and radiation govern a broad picture where the principles are governed by mass lines. Looking from the centre of the road, the lines of sight radiate as shown; the details are indicated by distance development from corners &c. But in Fig. 169 (C) all these views are made to appear shorter than they really are; instead of giving infinite impressions, it develops but limitation, and impressions not responsive to the mind. The importance of understanding contour lines is so great that it cannot be overestimated, as they form the foundation of all scenery impressions, and the bases of all the impressions of profile; for contour-forms give the place to build the profile; by them profile is



(A) Common cutting system.



(B) Excrescence arrangement. Commonly used.



(C) Practical results of mass principles. Natural arrangement, showing masses and distances of landscape in the infinite varieties of light and shade to give impression of life.

FIG. 169.—DEVELOPMENT OF BROAD VIEWS, SHOWING THE PRACTICAL RESULTS OF MASS PRINCIPLES.

shown, and they give the points of observation that show the infinity of profile.

DISTANCES.

All scenes of natural subjects arrange themselves together to the sight, as either long views or broad views. The observations of Fig. 169 (A), (B), and (C) are of the latter kind, but Fig. 170 (A), (B), and (C) shows long views, or, more properly speaking, distance views of landscape. Fig. 170 (A) shows the common way of arranging the distances; Fig. 170 (B) shows a common, false way of developing them, already noted in broad views; Fig. 170 (C) shows the proper way to develop the distances, and how perspective laws greatly assist distances when the circumstances give proper place for their utilisation.

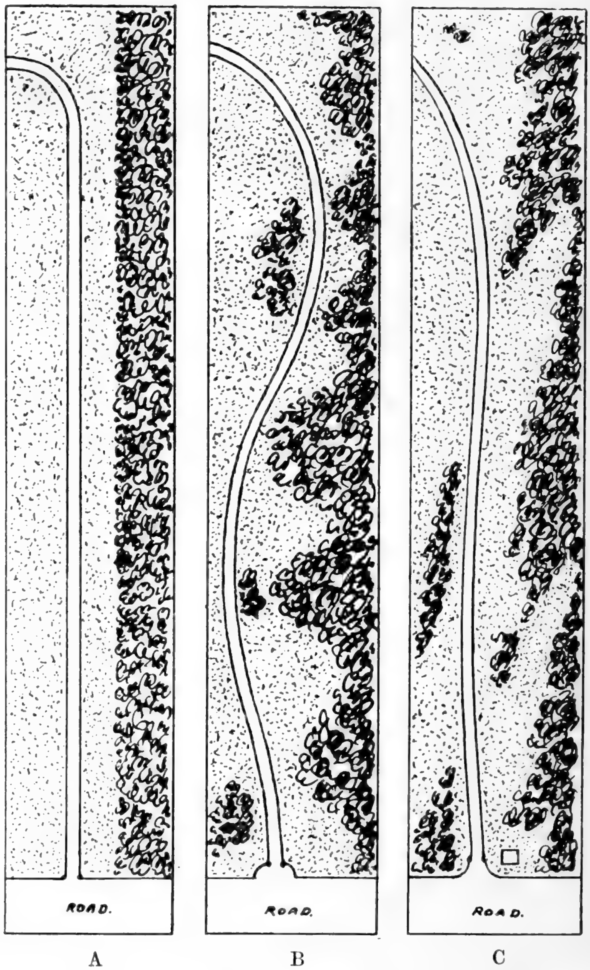


Fig. 170.—Development of Long Views: the Practical Results of Development of Natural (Distances) Pictures.

(A) Cutting system of arrangement. (B) Excrescence arrangement common about London and elsewhere. (C) Natural ways of development, showing the picture (length) of shade and light of all views.

In examining the great laws of mass and distance, we find all landscape impressions are given to the senses by one of these laws. Thus every picture of land is commanded by one or both of these laws; generally both are displayed. one being subservient to the other. If the picture is long the law of distance becomes the principal one, and the law of mass shows the details; if the picture be broad the law of mass becomes the principal, and the law of distance shows the details.

Straight lines, level ground, walks, &c., connected with buildings, are harmonious, and a comparatively small portion of straight lines and level ground in landscape is useful as a contrast to show off the surrounding beauty, but only as a contrast.

We can see nature only in part; we can never see the whole. The common remark of making "things look larger than they are" is folly. To show the most possible is a duty, but much must necessarily remain unseen.

True arrangement shows far more of scenery than is possible by false arrangement. To reveal the advantages in a beautiful manner is the true object of the arranger; and when these are hid or injured it is false arrangement. The principles of arrangement are distances and mass, shown in Fig. 168, which, while they cannot show the whole of a scene, still show the most that the mind can conceive. By developing the long line shown in Fig. 170 (C) instead of the short cross view shown in Fig. 170 (B) great advantage will be gained, and the great disadvantages of limited impressions avoided.

Profile.

Trees are the life of landscape. The various heights of vegetation, its trees, shrubs, and flowering plants, are given in books, but little is given upon how to develop their beauty.

Trees give variation of sky-lines; shrubs, variations of mid-distances; flowering plants, the variations of ground-lines. Each has at least three divisions: the high, the medium, and the small. The shrubs and flowering plants can be divided into many more than three, but finished planting must be done on the ground itself, as a painter adds colour to his canvas, uniting all in harmony, so that no division can be seen in his finished picture.

As the foundations so absolutely necessary to a residence hold the house, but become subdued when the house is complete, so the minute *Arenaria balearica* may veil a nook of land, and grass may veil the general ground formation with many square yards of Roses rising from it. Trees which rise above shrubs, as the Mountain Ash, the Birch, and many others, break away above the mid-distance. Above these Maples can form their pictures of true scenery. Such trees as Elms and Tulip trees, forming the high towers of the scenery, unite their impressions to the skies.

In all scenes one subject should be principal. As a scene of Maples might have its prominent points, so also might Tulip trees, with their dark foreground touched with occasional Silver Birches. In taking general observations of trees, many minor views unite in forming the general prospects from grounds and skies.

Buildings have their pictures with ground-line, and distance, and sky-line; the ground-line effect being produced by its base, terraces, steps, &c., according to requirements; the mid-distance effects by the windows, doors, &c.; and the sky-line effects by the union of chimneys, roofs, towers, &c., with the circle of the skies above.

Shrubs are often the keystone to beauty, for they enable the arranger to show off what is worth seeing and hide the bad defects. That every plant in its proper place is better than any other is known to all true observation; in high development evergreen shrubs are very important, as they give the power to produce great variety in small space. The Rhododendrons have rich masses of foliage all the year, and their glorious flowers in season undoubtedly make them the queens of mid-distances. To see the want of a scene is necessary to its development. In an old wooded scene of large timber, for instance, for immediate effect I have planted Silver Birches fifteen feet high, with the quick-growing, climbing Roses, which gave pleasure to all observers, and when they were in flower carpeted the ground and rose to the tops of the trees. While the effects of the Rhododendrons properly grouped, and of the Silver Birches with climbers, are very opposite, yet, as they are of different elevations of growth, it is possible to use them advantageously. The evergreen shrubs are much neglected in American planting, and time is required to gain their effect. They do not grow as fast as the deciduous shrubs, but they last many years longer.

The Rhododendrons possess many varieties, from the glories of Indian species, available for land where strong frost never enters, to the hardy varieties which, by proper selection and right planting, will grow almost anywhere. Yews are plentiful in England, and full of youth even when several hundred years old. Yews will do well in all parts of America by selecting the variety suitable to each district. The well-known *Ilex crenata* (Holly) has lately become known in America for its hardiness. I have never seen it burnt by winters that have scorched even Spruce trees. It is a valuable plant and will soon grow into size if planted in two or three feet of good, loamy soil, and its dark green leaves will claim attention and admiration.

Among the multitudinous parts of scenery, each part has its own character, but must unite harmoniously with surrounding characters. When knowledge is gained as to what makes up the principal parts of scenery, art is enabled to assist Nature to develop and reveal herself so that the beauties of each and all may develop in the fulness of their natural growth. Nature takes too much time to develop for the "survival of the fittest," whereas man, when he knows the "fittest," can assist its development, and gain in a few years a beauty of untold loveliness. Thus the laws of natural principles become the guiding fingers of action to reveal earth's beauties. In arrangement we do not attempt to give everything at once, but a proper fulness to each scene, with proper succession of varieties in other scenes; for in commencing to develop the bare waste land that money often endeavours to give to beauty, these natural laws are the guiding principles to direct the hand in giving silent life back again to the land; to give that infinite beauty that never tires the eye, taste, or mind of the beholder. If these natural laws are ignored, no matter how much money is expended, the scenes will pall upon the taste and become ignored after their mere novelty wears off; whereas if the land beauty is developed according to natural principles, so that the eyes can see it, it will grow upon the beholder in its beautiful repose, so that it continually reveals new beauties.

The power of sight in profile has its limits as shown in Fig. 171, as so excellently particularised by Repton, who states that $28\frac{1}{2}$ degrees limits the sight above the horizontal line, and $58\frac{1}{2}$ degrees below it. This is a simple commencement into thousands of varieties of development. Whenever any plant or building is raised above the ground, the profile of the landscape is raised.

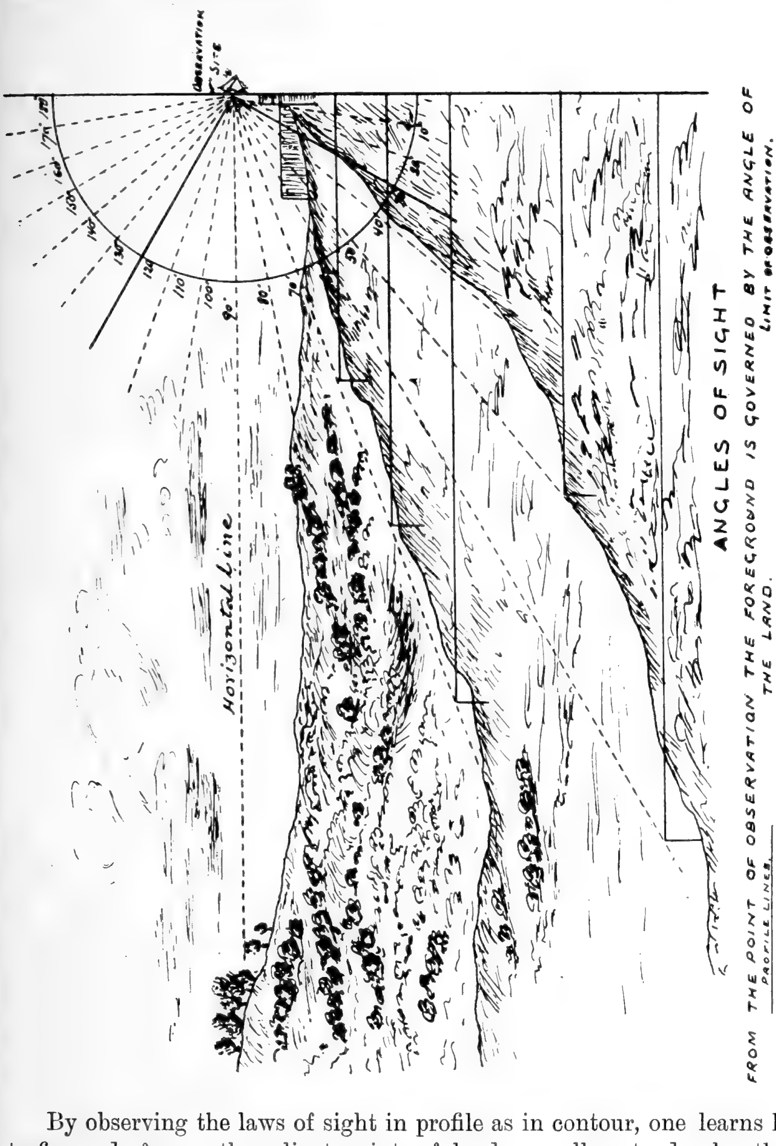


FIG. 171.—THE WAY TO SEE NATURAL OBJECTS &c.

By observing the laws of sight in profile as in contour, one learns how to fix roads &c. on the salient points of land, as well as to develop therefrom. All effects should possess infinite impressions. Terraces around mansions, for instance, are often completely injurious to the building, and all the beautiful value of a terrace to a house is lost by a foolish idea, given in some books, that a terrace should be two-thirds of the height of a house in width, or some other idea, which does not take into account the local circumstances. The terrace is governed by the wants of the base and the size of the building, so as to make the building harmonious to the curvature of the surrounding lands.

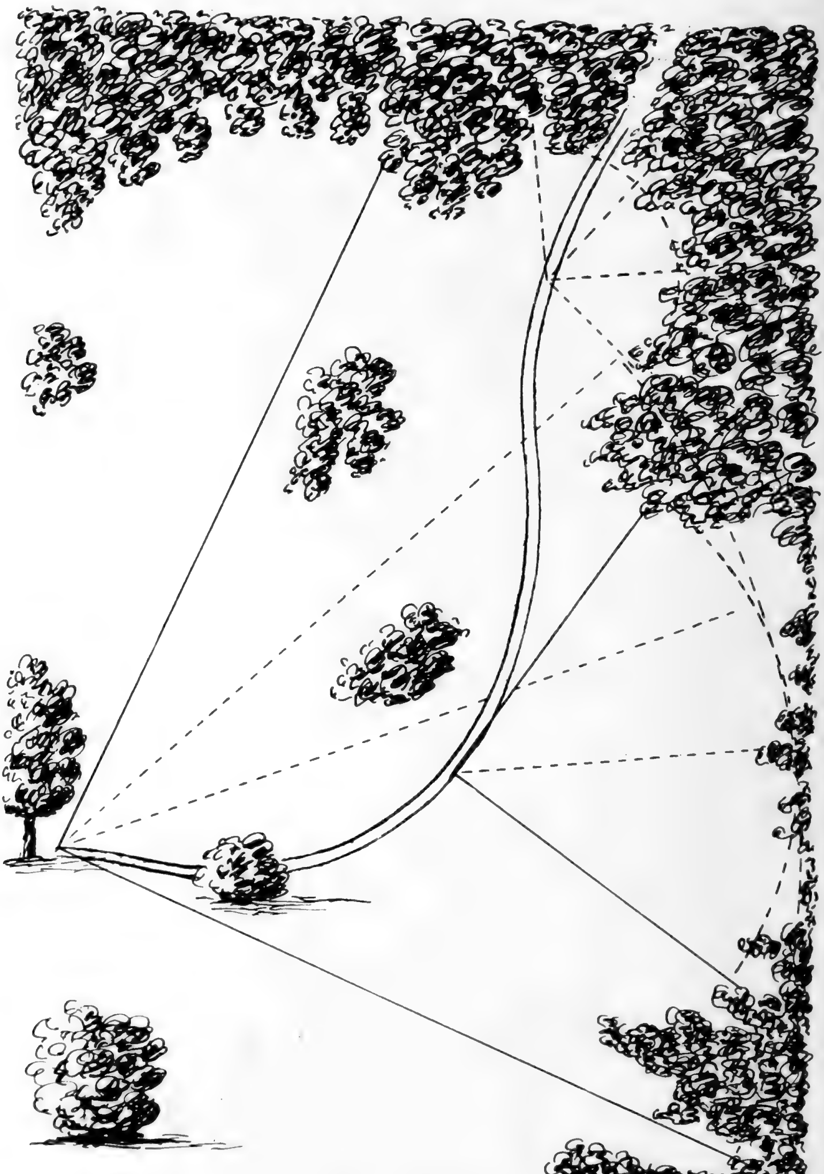


FIG. 172.—CONTOUR LINES.

In taking roads around gardens, woodlands, parks, &c., there are thousands and thousands of varieties of profile; but these three, the ground-line, mid-distance, and sky-line, are the leading principles. The possession being given by placing the sites according to limits of sight, of course the contour of 90 degrees must also be observed.

Contour and profile are always combined in every natural picture, and in the contour plans already given much profile is shown. Fig. 172 shows how contour helps profile by low-growing vegetation merged properly into higher forms.

Nature is ever one. Trees unite to ground-lines, and flowers and trees and shrubs to everything—the lines of ground, mid-distance, and sky-lines—and they live so unitedly together, when properly arranged, that one cannot tell where one commences or where the other ends.

Roads.

Man is ever working, as action is a part of his life, and he is ever labouring to build up or destroy something.

How to build good roads is generally known to be of permanent use for the travel of our day. They require to be 18 inches deep, of what is called macadam on Telford foundation. When properly made and cared for, they will last for ages, especially if properly laid off. Particulars of formation will be supplied by any good engineer in the district in which the roads are required.

To arrange properly is to put the roads in the right place, uniting opposites and developing the character of silent life to the roads as the foregrounds to scenery in general.

The routes often require much judgment, going to and fro, the objects opening from buildings to public roads, beauties, and the general land objects. These roadways should assimilate or go with the contours of the land, only cutting and embanking the earth where absolutely necessary to the required objects, and then the cutting or embankment, as the case may be, should be made to assimilate in curvature to the contour and the characteristics of the land pictures.

A road should never be made for itself. It is made for the objects of the ground. It is not necessary for a road to go the shortest way, but it should be made impossible to go a shorter way, so it should always take the shortest route possible to its object, while fulfilling the wants of the domain. One that is made for several objects, of course, will be longer in general than one which unites but two or three objects. Thus a properly laid road never impresses one uncomfortably, for every curve has an object.

We require simple pathways of a few feet in width for walking, or paths for our horses or cattle. We require our roads to provide large concourses where many carriages &c. can meet together, for us to develop our ideas or exchange the world's produce. We require big roads as bases to our large buildings, whereon the inhabitants can walk and converse together on natural formations or magnificent terraces, according to the requirements of the bulding.

Roads in general are very properly made with parallel sides, but sometimes these lines may be varied for the purpose of providing seats, statues, fountains, &c., and other objects to relieve any possible monotony.

Size of Roads.—When we make a road, it should be suitable to the place. A palace may require the chief drive to be fifty or even eighty feet wide, whereas twenty feet will be enough for ordinary houses, and six or twelve feet will be wide enough generally for foot-roads; eighteen feet are required for carriages to pass; twelve feet for single roadways.

Not infrequently, we have in our grounds walks that are dry and firm, and that would be comfortable to tread on except for their being constructed too high in the centre. This very much detracts from their utility, and renders them exceedingly unsightly from all the views of which they form a part. The sides and centre of a road, edging grass or whatever it may be, must be of the same level; ridges of roadways above the grass level spoil the landscape very often, for if it be properly made, there need not be more than one half of an inch of fall, in any ordinary road, in order to shed the water from the centre to the margin next the sides; one in sixty is enough curvature for any rough public road. A badly made road will always wear into holes, and raising its centre will not cure this defect. For instance, in a carriage-drive 30 feet wide, the level side of the road is to be 1½ inch below grass edge; that gives a fall of 1½ inch in 15 feet, which is enough for a well-made road. Eyelets every 50 feet will take all the water away before it accumulates in currents. Therefore it is absolutely ridiculous to make roads and use half their surface for waterways, as is done in some places.

Public Entrance.—The entrance to a domain should be in accordance with the character of the place and the means of the proprietors. The entrance gates should also be in full character with the place. In large and beautiful domains, the magnificent approaches, among variations of noble trees, lawns, deer, &c., may be entered by gigantic iron gates, glittering with their gilded ornaments; but in the quiet domains a quiet lodge with wooden gates, oiled and varnished in their natural colours, will be found much more harmonious and appropriate.

An admitted canon law for entrances from public roads into a domain is, that the best place for it is in a bend of the road, the reason for which is quite apparent, as such a position gives an easy curvature from either side of the entrance to the public road. Thus it is very often convenient and even necessary to make a kind of recess, curving V-like towards the gates, in proportion to the requirements. That the lodge itself should never be seen from the residence is a long admitted fact; but its windows should be prominent, so that the roads can be seen from them in all directions, and the approach of carriages watched.

Entrance to a House.—There are three canon laws governing the entrance to a house, as follows:

First: The first view from the drive should not show the house too soon or too late. If the former be done, the dwelling will appear too small for its possessions; if the latter, it cannot be grasped at all.

Second: The first view should be a perspective view, taking in two sides of the house, say the north and west sides, with adjacent offices: this shows residence and environments.

Third: The drive should bring the carriages to the entrance door in a clean, bold, easy sweep, so that they can come full gallop if necessary, free from any obstructions of curves or high grades, landing the carriage door directly at the entrance steps, the head of the horse naturally coming into position without any twist from the coachman.

All entrances are wrong that do not fulfil these canon laws. Entrances made so that a carriage has to stop and twist half-way around before the occupants are able to leave it are false both to taste and to use.

Curves. Cross-roads.

Curves.—A road should never once change its direction without a reason for doing so ; such reasons may be had in the land, trees and undulations, and the development of objects on the grounds. Roads cutting up grounds for their own appearance show gross ignorance on the part of those who laid them off.

Cross Views.—Roads should always be arranged to go with the landscape flow, never visibly against it. Roads, small or large, are absolute eyesores when they come right across the foreground of views, as is often seen from houses on expensively developed grounds.

When a walk proves absolutely requisite in a case like this, it will be best to endeavour to take it across the view at a lower level than the surrounding land, and hide it by the grass sides, and planting, as much as the character of the view will allow.

Broken Curves.

The curve of a road should always have a life. This life is often broken by ignorance. Where two curves meet to make a compound curve, there is, according to the "ease" or "quickness" of the curves, a more or less straightness at the point of union ; and ignorance tries to do away with this, thus breaking the curve. Practice and observation will remove this too common defect.

Ninety degrees being the limit of our observing powers, sufficiently beyond to help the infinite in an impression in massing lines, Fig. 172 shows how this will give the sites for roads, so that the observer can grasp the scenes, also showing that the sites will lose observation power if placed in any other position. So, in fixing upon the position of roads, it is necessary, first, to go over the land and put in stakes on those observation sites that show the masses and distance views of the landscape, and other objects in the land. These stakes will be the better for having flags, so that they will help to gain the general sweep of the curvature from one to the other.

For the long views that the land is capable of disclosing, the roads ought to come so that the eyes can see these naturally.

Depth and height, hills and valleys, and objects such as gigantic trees and plants of smaller growth, buildings, &c., and anything that commences to build itself above earth, are seen by the laws of profile. (See Fig. 171.)

Roads go over the observation sites of the land, and must be made for the convenience of the land, and to give beauty at every step. Correct roads bend into curves, ever advancing to their objects of beauty. Great care is necessary to avoid making the curves unshapely.

Roads should have no meaningless bends and turns ; there must be a reason for every curve ; otherwise one must create a reason, by the land, plants, rocks, or water. Winding roads approaching houses in a sort of corkscrew fashion are wasteful, ridiculous, and false to beauty. Roads are a necessity to minister to the beauty of a place, but are by no means, nor can ever be considered of themselves alone, the beauty itself.

General Curves.—In roads for convenience it is otherwise. Here the line should not be curved so as to increase the distance much, but only enough to impart a pleasing diversity of outline, and thus to make the most of the land. Lines, in regard to planting trees and otherwise, must be boldly curved, for the more numerous the outlines are, properly developed, in proportion to the length with which we have to deal, the more beautiful will prove the results.

Drives, which are frequently made to run along the side of a wood, may with much advantage be carried through it, thus creating bold and striking outlines, and preventing a wrong direction being given to the road.

A road made for the convenience of a dwelling-house ought not to be carried far out of the proper curvature for that convenience, unless indeed good reason can be shown for it, seeing that the principle of the construction which we must hold in view is the accommodation of the household. Drives, on the other hand, round a park, to show its effects, may generally be made according to the scenery, so that all its beauties may be fitly unfolded to view. Walks in gardens, shrubbery, &c., should be varied, so as to exhibit the more striking features of the ground, and to display the different vegetable growths in their fullest perfection ; and in respect of scenery it will be better, for the most part, that the introduction should not be too abrupt. For, as an able speaker will not immediately enter into the heart of his subject, but with simple yet forcible remarks will endeavour to arouse the interest of his audience ere he rivets their attention with the treasures of his eloquence, so, in like manner, should the eye and the attention, as it were, gradually be prepared, until the entire landscape shall be disclosed in all its loveliness.

WALKS.

General Principles.—When the surrounding scenery is beautiful, walks should be conducted over rising ground ; but when the opposite is the case, then they should be conducted through low grounds, so as to confine the view to the scenery immediately surrounding.

Walks rising and falling in natural and easy curves, in accordance with the ground, impart a pleasing undulation to the soil, and produce a very agreeable impression, and one infinitely superior to any that it is possible to obtain by massing heaps of earth in unnatural and unsightly forms in the midst of nearly level walks.

BOUNDARY ROADS.

Avoid making limitation. Roads should not show the limitations of a place. A ground properly laid off has no impressions of boundaries. A boundary road around the property is more or less necessary, but it must never expose the boundaries. Central roads help to give pleasure and convenience in developing property, but great care must be exercised to avoid dividing the park into two halves, as is often seen in town parks.

Grass Roads.

Grass roads in shrubberies are often very charming, as these resorts are very much used in fine weather, and the soft grass is delightful to the tread of the feet. Of course these roads can seldom be made where any object is required beyond mere sight of the beauties of the land production, although in dry, rocky soils, slightly covered with a good foot of soil, rough broken stones may be placed under the grass. Woodland roads may often be rendered very charming. These roads are very useful where they cross views, thus preventing the serious objections of cutting up the harmony of a scene.

Roads around Corners.

Vegetation is frequently left in a mere lump when roads go around a corner. This is not correct; the corners should show their beauties to the passer-by, quite as much as any other portion of the land, as they certainly gain their full share of observation.

Road Grouping.

Roadside planting is a very praiseworthy object, as roads are a perpetual foreground. All people attempt to plant their private roadsides more or less, but unfortunately they seldom display any natural knowledge. This planting should always be subservient to the scenes that belong to each view. Single plants, be they trees or small plants, should apparently be a part of the promontories of the scene, belonging to the prospects. Flowering plants in more or less quantity suitable to the character of the scenes should ever be abundant.

When the roads are going with the scenery, the plants and grouping on their sides can be arranged somewhat with the road. But by no means must these single plants or groups be placed at right angles (as we see them in every country), as if our eyes were in our ears.

The grouping of silent life upon the sides of the roads gives opportunities to show the details of the more lovely forms and colours of plant life; and these, arranged with the scenery, will carry the observation to the scenery beyond. Roadside grouping should spring naturally from the road with the scenery.

Shades and Lights, or Succession of Character.

Roads are a series of foreground to the scenery; and while they should not be covered with trees, they should have plenty of shade, and also plenty of light; for when we have received impressions of shade our senses require impressions of light, and *vice versa.*

Whenever a great scene opens in the prospect, the observation site should be well shaded with large umbrageous trees or otherwise, as we can then see more and better from shaded points of observation than we can from light points.

It is not always convenient to give shade to small pathways in gardens and shrubbery near a house by means of large shade trees; nevertheless they should have their succession of lights and shades of themselves. The path itself may often be beautifully shaded over with plants for a distance suitable to the proportions of the scenery. Blue Clematis over Silver Birches can be made eminently successful; Golden Roses can cover Birches over the paths in a similar manner, and many other such charming impressions can be secured in suitable climates. When trees are used for climbers, only those must be chosen with roots that do not destroy the climber. Many suitable species of Hawthorns can be found. Lombardy Poplars and Silver Birches are most useful for this purpose, as they give a special winter effect by their white bark, and thus provide pleasantly for the whole year effect.

The Residential Promenades.

Any house, no matter what its size, requires a good promenade in connection, shaded and made delightful with sweet-scented plants. Such a promenade should be twenty or thirty feet wide. These can often be of

Fig. 173.—Outlines of Vegetation, for the Terminus of a Lawn.

great assistance to the house, in forming base work to develop the buildings; in this case shade trees have often to be scarce, but then the shaded part of the house can be selected for walking in summer-time, and the sunny side for winter. Sweet-scented plants should ever surround a house so that every open window is bathed in the perfume.

Parklands are developments of the beauty of trees and grass. They are not woodlands of what the woodmen call sticks—poles with a mop on top. Tree beauty is seen only in full development when the branches, leafage, fruit, and flowers all have the full enjoyment of their existence. This perfect development is only attained when space for growth is given, so that they not only do not touch each other, but space between is given for the circulation of air.

Large masses of trees cannot be seen near at hand, but have to be looked at from distances in proportion to their sizes. Fully developed trees in proper spaces apart give far richer and deeper and higher impressions than any tree packing, be it square or round, by nature or man, as they are more infinite in impressions instead of producing limited impressions of packing.

In making woodlands into parks the interwinding of grass gives a charm to beauty, and the trees protect the grass and make it richer and of longer duration, being protected from cold of winter and heat of summer.

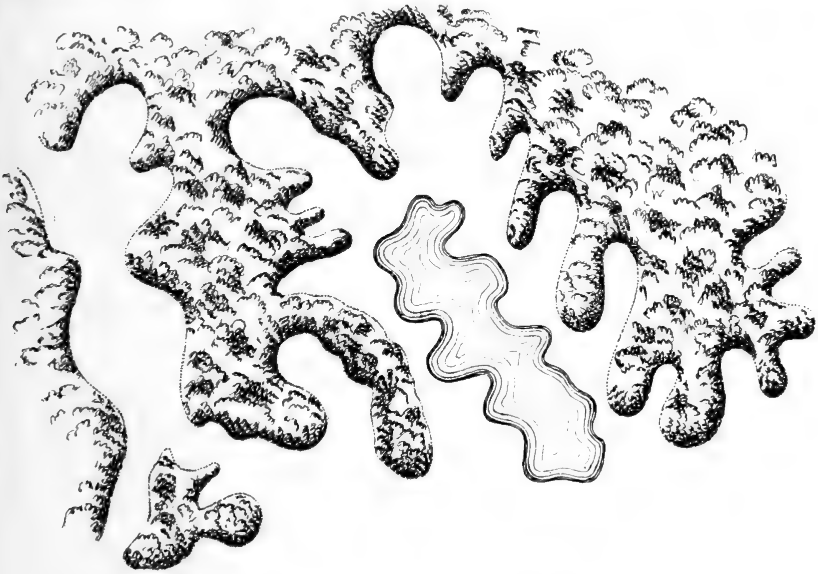


FIG. 174.—GENERAL OUTLINES, FOR THE UNION OF TREES, SHRUBS, AND WATER. Carpeting plants and walks, to be arranged according to the levels of the ground. Outlines curvature of a regular nature.

In parks flowers and shrubs are, and should be, often abundant, but trees are ever the principle of parks, and should have space allotted to their characters.

In planting parks, when the lines of sight are observed, the high and low points of the lands, water, sky, and objects of interest, such as possible good trees, rocks, &c., one or more of these are ever present, and these vary so much that they always give an original design for tree-planting or tree-thinning with far more diversification than any lands properly laid out will exhibit. The proper development of any large timber-growing trees requires considerable space to exhibit its impressions of character.

The Figures 173, 174, 175, 176, 177, 178, and 179 have been designed for tree-planting. Fig. 173 is an outline for various trees where space is small and cannot be given to tree development, as in a promontory or recess where one or more is supposed to be allotted to a species. Fig. 174 is

Fig. 175.—Various Perspective Recesses for Wild Woody Scenery.

designed for outline effect of Sycamore (*Acer Pseudo-Platanus*). Fig. 175 is for outlines for effects of the Beech (*Fagus sylvatica*). Imagine a drive half a mile with these Beech views! What an infinite charm! In spring I have often gazed long upon their unfolding beauties, until I

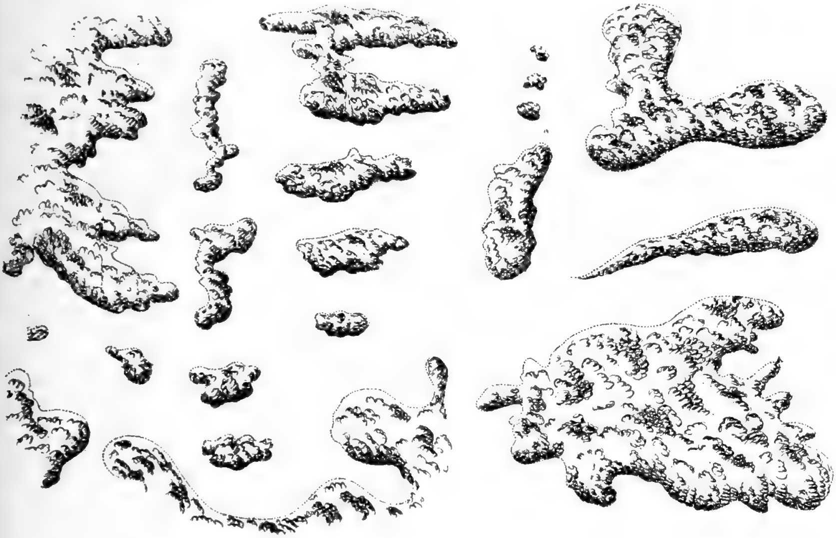


FIG. 176. GROUPING VEGETATION IN THE CENTRE OF SCENERY.

almost seemed to be floating in an atmosphere free from cares. Fig. 176 is a design for American Lindens, a central scene grouping of trees. The Linden family seem to adapt themselves to the promenade, both the

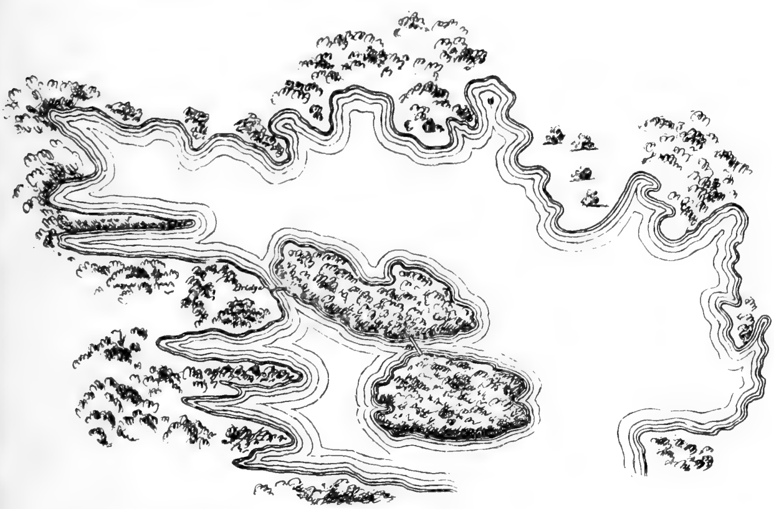


FIG. 177.—OUTLINES OF WATER FOR A LAWN, SUITABLE TO RECEIVE THE BENEFIT OF VEGETATION.

American (*Tilia americana*) and the European (*Tilia europæa*). Fig. 177 is a central scene for water and White Oaks (*Quercus alba*). Its romantic picturesque beauty would show itself in some such suitable character of outlines. Fig. 178 is a waterway development, with a suitable character for the English Willow (*Salix fragilis* syn. *S. Russelliana*), a large thick-

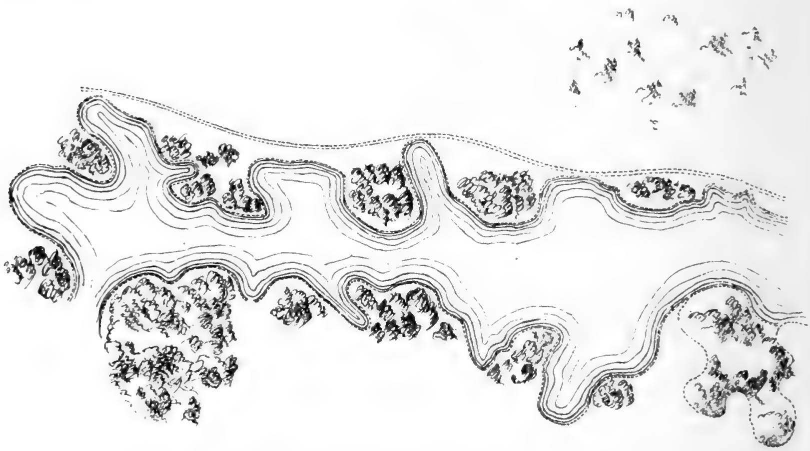


FIG. 178.—A STREAM WITH OUTLINES SUITABLE FOR VEGETATION.

stemmed, quaint, quick-growing tree. Fig. 179 is for a lake development suitable for the gigantic growth of the American Elm (*Ulmus americana*).

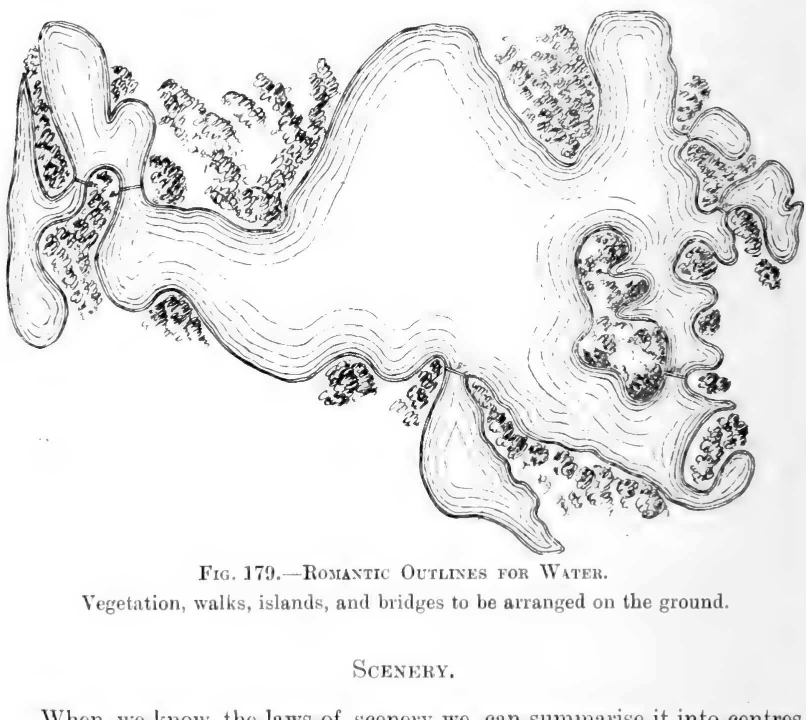


FIG. 179.—ROMANTIC OUTLINES FOR WATER.
Vegetation, walks, islands, and bridges to be arranged on the ground.

SCENERY.

When we know the laws of scenery we can summarise it into centres and outlines; for, however small or large a scene may be, it has its centres and outlines.

Extensive scenery contains many, many scenes; each should be complete within itself, and they should unite harmoniously in forming larger and more extensive expansions of natural impressions.

In looking over the undulations of scenery, we see the scenery by the laws of contour and profile. These unite into a general formation of two leading features: centres and outlines.

All scenery is composed of centres and outlines. The first are more or less occupied with low vegetation and water, over which the view-lines show the effects. The principle of the second, outlines, is height; principally shrub and tree effects, buildings, &c., thus outlined, form the features of the scenery, and the centres show the scenery.

Centres and outlines develop each other. They are ever varying as the salient points of scenery are observed or the observation points change.

Outlines.

In developing landscape by planting or thinning, it will be found that contour really makes the outlines, and these outlines are composed, in proper development, of promontories and recesses, according to laws named, in both large and small effect, these giving place to everything suitable to the size and wants of the ground.

Centres are governed by the characters of the outlines. All the designs herein shown are developed by the character of the ground, and

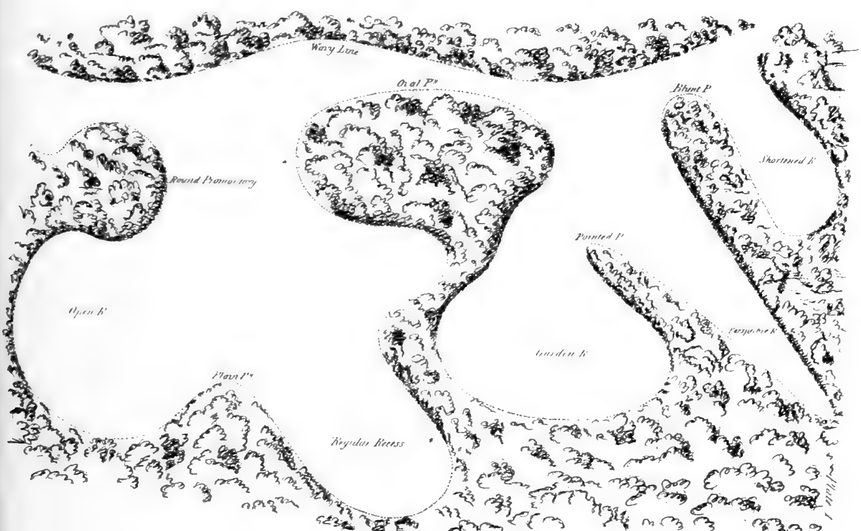


Fig. 180.—Different Forms of Recesses and Promontories.

the objects placed in the figures show how outlines ever vary under the development of natural principles; whereas one finds in public parks generally only the excrescence of Fig. 180; therefore we admire in these parks the silent life, the beautiful grass and specimens of plants, but detest the arrangement that injures plant life.

Outlines depend upon the trees. The gigantic impressions of England are composed of Elm, Oak, Sycamore, Lime, Horse Chestnuts, Spanish Chestnuts, Pines, Cedars of Lebanon, Beech, Willow, &c., all of which require large space for their growth, and large space to see their growth. Puny efforts of mere fancies and the planting in masses of plants of one size are seen in our parks &c., and dozens of trees are planted in masses where one of that particular large growth would be ample.

In America most of the trees mentioned above do well, and beyond these the Tulip tree towers above them all, forming an entirely new world of undulation, suspended above the possible undulations below.

In America plant-life beauty remains to be developed. The Scarlet Oak in autumn is as brilliant as a Scarlet Geranium, and the Maple, Hickory, Dogwood, and Sourwood trees contain worlds of brilliancy waiting for art to develop their glorious life impressions of colours.

When land is to be planted for silent life principally, in such places as the foregrounds of a mansion and town parks, the natural wish of everyone is to have perpetual impression for the whole year; in fact all planting should fulfil this very proper wish.

The mixing of the giants (trees) can only be attempted in large scenes, and then it requires skilful handling and very careful consideration, so as not to interfere with the character of each.

Scenery (Water).

All the Figures in this article show different line formations to impress upon the reader the fact that no two developments should ever be alike, for there is always some reason in nature for them to differ—variations of the land, rise and fall of the land, distance views, fine trees, rocks, water, &c.

Every low land has its own special effects. Sir Thomas Dick Lauder, Bart., makes an excellent classification of the marked effect of the low lands as follows: strath, vale, dale, valley, glen, dell, ravine, and chasm. The name of each conveys its meaning. A country-side might contain many or all of these.

The perfection of low lands is water; that is, when it can be given with its crystal pureness; its clear lights and shades give us so many advantages. The place for water is the centre of the scenery, for lowness is the principle of the centre and creates an infinity of scenes, and it is better to have the water-level twelve inches below the general ground-level around it, where the views will unite with water and grass. The land can be lowered near the margin, so that grass and water unite free from any interruption.

Water is the life of low ground, as trees are the life of high lands; then height is given to hills and depth to valleys, making an infinite power of developing charms everywhere, and the best of everything in scenery can then be revealed to us.

Water develops everything: it makes valleys appear lower and hills to appear higher, and it makes the blue sky enamel the lands.

It gives a freshness to every tree and flower, and when properly developed itself gives infinite charm everywhere in its environments.

The formations of artificially made water are usually the most unnatural that anybody ever saw, being generally mere lumpy pools, regarding neither the land formations nor the characters of the scenes they are to enhance. The outlines of water should be ever varying according to the character of the surroundings. Figures 177, 178, and 179 show that the formations of different sheets of water, pools, or lakes need never be alike, but that each one can be made to suit the character of its surroundings.

Pure, clear water is a joy to life. In peaceful moments it is the mirror of nature, a very mirror of magic, showing all surroundings, from the smallest, wee grass-blade, the flowers, the noble trees, and the stately rocks, to the very scenic skies themselves, distinctly giving some of the variations of a double existence—an existence of impression and an existence of earth. Between these two a gulf is fixed, for earth is limited in its capacity, but impression is infinite everywhere.

Moving water in sunshine puts to shame all the jewels the eyes of men and women ever saw, for such water in natural developments produces worlds of brilliants as it goes sparkling on its dazzling career.

Water attracts all and feeds our impressions with its loveliness; from the smallest to the largest quantities of pure water, all give a charm, a life, a welcome impress to our being.

Amidst our lakes, rivers, ravines, &c., beautiful bridges are an assistance to scenery. Properly made bridges are one of the best mediums as unions of the formal art of man's building and the informal and infinite beauties of natural formations.

Character.

When the impressions of beauty are known to us, known so as to move and sway our impulses, we learn somewhat of the reality of those impressions and their immense power.

The benefits of infinite impressions are so much to the inner life of our existence that we are apt to endeavour to analyse them, and give names to them, calling these impressions characters. Then, when we can analyse somewhat, we are able to denote some of the advantages that these impressions make upon our real life. We name these characters according to their results—graceful, stately, sublime, tender, &c.—whether they unfold to us knowingly or unknowingly.

Character is impression of beauty, and causes human beings to forget their bodily existence by its power of displaying the beauties of silent life. We receive these advantages only when we have learned to gather these impressions truly. These impressions are so far beyond language that words cannot do more than act as finger-posts to guide or point to characters of beauty, for the true impressions of beauty are those of inspiration.

Impressions form every being, and continue such formation, while the body may be asleep, awake, in action, or at rest; in fact, under any or all existences of body, the human being continues developing its real life according to the impressions received.

To learn character is to learn the advantages of beauty, to learn true admiration; for only by the power of true admiration is beauty known.

Information respecting character as developed is very small in comparison to its immensity. There are continents, islands, and countries of beauties that have not a single finger-post; the arts of man's technical labours have received far more of man's genius than any studies upon impressions. Botanists have given wonderful and minute information of the world Flora, creditable to man's efforts and beneficial to his wants; but this information has been gathered with the object in full view of man's bodily wants. However just and praiseworthy this object may be, we require from silent life something more than help to our bodies; for although a chicken may not be able to come forth without entering through a period of shell life, still, however much it may respect the shell that is necessary for its present life, it nevertheless must aim at other pursuits to become a full-fledged bird. Thus it is with man: whatever time is required for bodily development, there is necessity for the development of his thoughts also.

If a fair portion of the world's artistic thought were employed by the powers that be upon the world's beauty, for its preservation and development, the desolation that marks man's footsteps (such as is seen around large towns in Europe and the railroads of America) would not contaminate man and his human senses as it does at the present moment.

In observing the manner in which horticulturists have endeavoured to embellish the soil, we find that in many instances, instead of assisting, they have gone exactly counter to nature, and, to all appearances, have been actuated by no appreciable canon of art. On the other hand, we find cases where the arrangement is really beautiful, an instinctive feeling of love for nature having unwittingly guided the operator's hand. In fact, where good feeling and correct observation are the rule, results will follow frequently much surpassing our expectations.

Beauty is of the infinite, therefore it cannot be seen or understood by mere materialists. Beauty is akin to the realness of human life—its spiritual existence. It is the breath of pure impressions to our souls, and belongs to the "still small voice" that cannot be transmuted into words, although in its results it is more potent than thunder or the roar of many cannon. It is of the innate being of God-like man; he sees and lives in its heaven, by the inner sight and the grasp of life, according to his developed being.

The object of beauty is man's development; character gives to man the objects of beauty, and in character rests the art of arrangement to move the human impulses. When natural principles and laws of development are known, all arrangement becomes the development of character. Man uses the same eyes to see every subject, and the same aspirations to satisfy, knowingly or unknowingly. Man's aspirations require the satisfaction of all his wants, and, to gain this end, nothing less will do than the edification of man himself. To be above mere animal life is the natural innate desire of all men. The raising of man's life above animal life is the development of his ideal—namely, that all things affecting his development of the higher life should develop infinite impressions—so that when one arranges silent life for buildings, parks, gardens, farms, streets, roads, &c., one gives each style its proper character; but in all

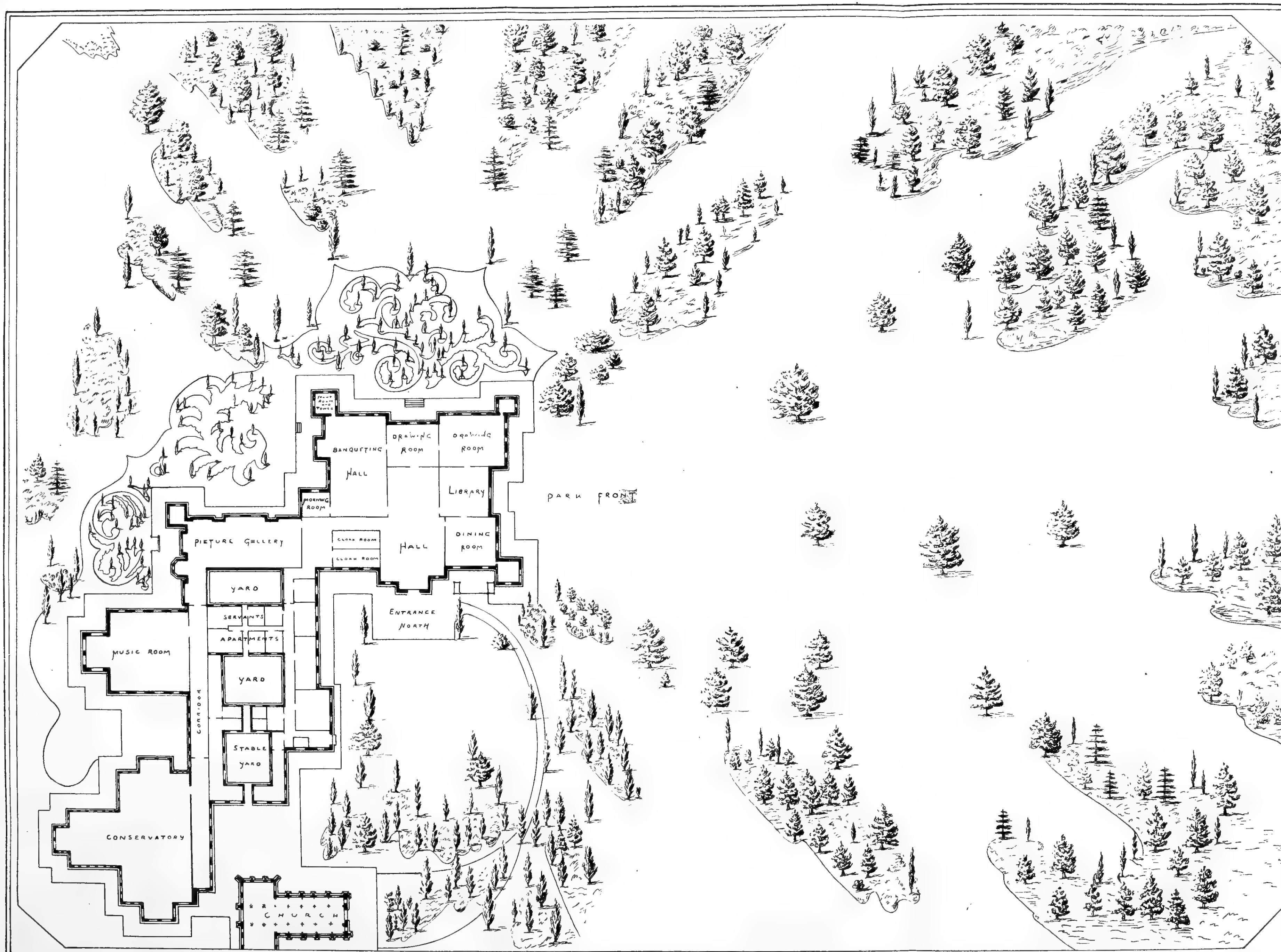


Fig. 181.

(*To face p.* 623.)

arrangements one must respect the natural laws of sight, and that innate aim for the infinite that belongs to the objects of beauty.

We have noted scenery with outlines and centres, but when we arrange everything properly in rotation, every site that the feet can stand on will change into new scenes of beauty. The mere arrangement of scenery that looks well from one site of observation alone shows ignorance of the grossest kind, for if every effect occupies simply the space necessary for its own effect, space will always be left for the development of other views of the requirements. Scenery consists of scenes within scenes, containing general views, particular views, and objects.

When we plant the large growing objects, first allowing space for them to develop into their full beauty, we still have space left to fill up all the effects wanted by the subjects that grow at the various lower elevations until we come to the wee carpeting plants that veil the feet of the gigantic timber, and require only a few square yards of space to show their characteristics.

When we throw the littleness of mankind aside—the results of his habits, his patchwork—we gain the power of admiration by learning with humility and industry to see landscape with her beauties of perpetual impressions free from all repetitions, ever showing her mysteries to the highest and the lowest classes of human observing powers, in charming repose.

Plant life, small and large, shows its impressions by characters of beauty; therefore we treasure a plant for its rareness and love it for its beauty, not as one being better than the other, for each is best in its own character of beauty, its own place, and in its own proportions. In planting one should plant just enough of each kind; more or less than enough will not do, and the repose that is so necessary to developed scenery cannot be acquired except by proper proportions. It is most requisite that our landscapes should manifest character in outline, massing and foliage forming the base of the observation from the principal sites. In tree and shrub arrangements outlines and masses are of the first importance. In small plants the foliage takes first place. Much advantage will be found in the growth of leafage, how it masses itself into lights and shades as well as into its own particular forms, even in arranging outlines and masses; the study of leafage and its assemblage will often lead onwards to the characteristics.

The lines of vegetation vary greatly, imparting various impressions of their features, according to the period of the year and the stage of their own existence. The features of a plant in general may be summed up under the nine following heads:—Outlines, massing, young leafage, perfect leafage, fall of leaf, flowers, fruit, stem and size. Students making out catalogues of these observations would learn far more upon real landscape arrangements than is generally attempted in the best of park lands.

Touching.

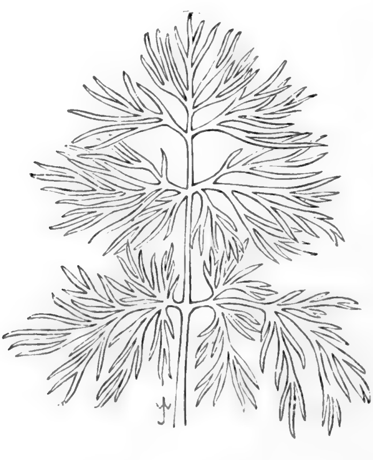
When the great work of arranging land is done, landscape requires touching, particularly for the first few years after planting. Touching is planting groups or single trees, shrubs, and smaller permanent plants, and any rearrangement that circumstances demand. These, first of all, must be in harmony with the scenes; that is, they must form a part of those scenes; and, more, they must assist to develop them; thus a scene which is apparently too flat in its character would require to be touched with erect forms.

Suppose masses of Cedars of Lebanon, becoming too numerous, so that they appear heavy, then groups or single trees of *Abies nobiiis* syn. *Picea nobilis*, touching up some of the promontories and high points, would be required; but care must be taken not to injure the scene itself. In developing the scene, by no means must the least new idea be introduced to destroy its character.

Ignorance commits more injury in touching than is generally dreamed of by owners of good homelands. A homeland is developed by an artist who brings out its infinite impressions; then afterwards an agent or gardener, who is a good cultivator, and has gained the confidence of his employers, who consequently presumes that, as he can cultivate so well, he must also know artistic development, at once commences to destroy the character by contrasts, destroying the depths and heights of the scenery, and actually planting specimen trees, &c., in the centre of the grass-view lines, and therefore destroys the infinite views. Whereas, if cultivators would attend to the growth of silent life, they would be public benefactors. When they interfere with scenes that have been properly developed they destroy more than they build.

Single trees ought not to form dots, as it were, but should harmoniously unite with the scene around. Groups, indeed, should be in strict unison with the outlying landscape. Masses ought to produce the effect of strengthening the more precarious details; and, generally speaking, flower-beds and single plants alike must all combine to produce desirable permanent results.

Desirable combinations are not to be attained by planting trees here and there, showing perhaps but a third of our shrubs, nor in the mere levelling of our soil. Each subject of the scene must fulfil its part, and adequately contribute to the harmony of the whole.



THE WEST INDIAN FRUIT INDUSTRY.*

By WILLIAM G. FREEMAN, A.R.C.S., B.Sc., F.L.S., Superintendent of the Colonial Economic Collections, Imperial Institute, London.

IN the following pages no attempt is made to give a comprehensive account of the fruits of the West Indies, but rather to sketch the main features of the West Indian fruit industry, and the efforts being made to improve it by agricultural workers. Considerable attention has been devoted to the commercial aspects of the question, but this will be justified, I trust, by the fact that these Exhibitions of Colonial Fruits are intended to make the products of the Colonies better known in the Home Country, and to promote the commercial interests of both.

Fruit forms at the present time the third export in value from the West Indies. In making this estimate, the term "fruit" has been restricted to its commercial significance, and only those fruits included which are exported in the fresh or preserved condition for human consumption. It should be remembered, however, that Cacao, Cocoanuts, Pimento, Coffee, Nutmegs, and limejuice are essentially fruits or fruit products, and should these be included then fruit is the most important West Indian industry. The following table shows the comparative positions occupied in the list of exports by the chief West Indian products in 1902-3, 1894-5, and 1883-4 :—

PRINCIPAL PRODUCTS EXPORTED FROM THE WEST INDIES.

Product	1902-3	1894-5	1883-4
	£	£	£
Sugar, molasses, and rum	1,438,235	2,302,546	3,102,408
Cacao or Cocoa	1,302,761	765,778	565,552
Fruit	1,262,694	490,222	253,332
Coffee	130,775	356,734	98,869
Spices	117,519	93,539	98,186
Cocoanuts	84,931	72,433	66,396
Ginger	46,615	44,574	21,080
Limejuice	50,374	16,074	13,656
Arrowroot	21,817	38,278	23,941

The study of this table brings out several interesting points. In the first place, it will be noticed that, excepting the last three, the relative positions of the principal products have remained unchanged during the past twenty years. Sugar, with its by-products, Cacao, fruit, Coffee, spices, and Cocoanuts, occur in exactly the same order in 1902 as in 1894 and 1883. Similarly, throughout the entire period sugar, Cacao, and fruit form a class by themselves as the great industries of the West Indies.

* The substance of this paper was given as a lecture at the Show of Colonial-grown Fruit, held at the Society's Hall at Vincent Square, in December 1904. The lecture was illustrated by lantern slides of statistical diagrams and by specimens, reference to which is omitted in the paper as printed. The blocks (with the exception of Figs. 185 and 186) inserted in the text have been kindly lent by Messrs. C. W. Hancock & Co. from their interesting publication on West Indian Fruits.

The relative importance of these three principal industries has, however, undergone great modification. Sugar during the twenty years has decreased in value by more than 50 per cent., whilst Cacao has increased by 100 per cent., and fruit by no less than close upon 500 per cent.

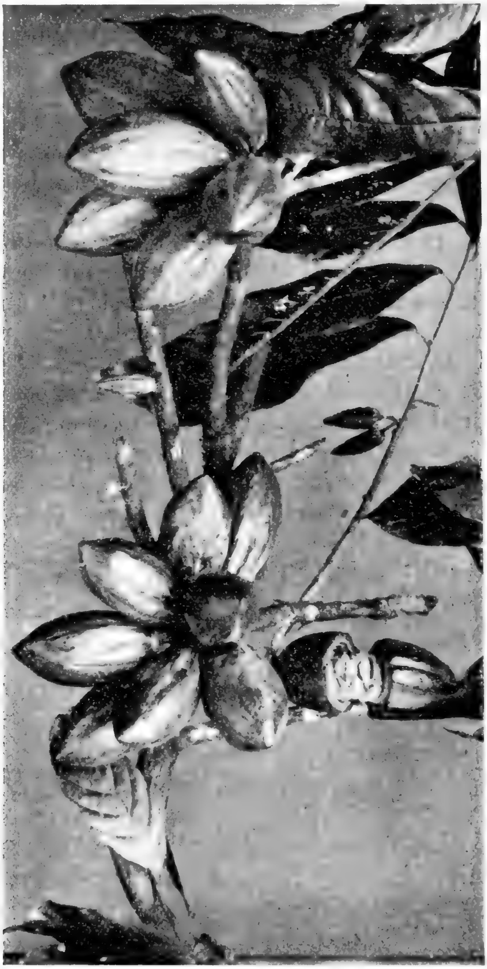


Fig. 182.—Cocoa.

Regarding sugar as the staple industry of the West Indies, we can indicate the relative importance of fruit in the years under discussion as follows, taking the value of sugar for each year as 100 :—

	1902-3	1894-5	1883-4
Sugar	100	100	100
Fruit	87·8	21·3	8·1

Fruit, which twenty years ago was exported to the value of only about one-twelfth of that of sugar, has increased to such an extent as to be now nearly equal to sugar in value. It must, however, be remembered that during this period sugar has fallen greatly in price, and that these figures, whilst indicating the great strides made by fruit in relation to sugar, also bear melancholy witness to the period of depression through which the staple industry of the West Indies has passed. Apart from this

FIG. 183.—COCOANUT.

question of relative importance, the fruit exported has actually grown from one-quarter of a million in value in 1883 to well over one and a quarter million sterling in 1902.

PRINCIPAL FRUIT-PRODUCING COLONIES.

Jamaica is at present by far the principal fruit-producing colony in the West Indies. In 1902-3 fruit to the value of nearly 1,250,000*l*. was exported from Jamaica, whilst the export of all the other colonies together amounted in value to only about 14,000*l*. The detailed figures are as follows:—

Jamaica	£1,249,544
Barbados	6,119*
Leeward Islands	5,061
St. Vincent	1,586
St. Lucia	384

* Fruit is grouped with vegetables in the Barbados returns, and Yams, Sweet Potatos, &c. probably form the greater portion in value of the total here given.

Active steps are now being taken to foster fruit industries in several of the islands, and we may hope that in the future other colonies will occupy a more important position.

Chief Fruits exported.

It having been already shown that Jamaica occupies the predominant position as the fruit-producing colony of the West Indies, it will be sufficient to consider in detail the exports from this colony to ascertain which are the commercially important West Indian fruits. For the year under consideration the official returns are as follows :—

Jamaica Fruit Export, 1902-3.

Bananas.		
To United Kingdom	£90,114	
Canada	6,137	
Bermuda	522	
United States of America	1,037,977	
		£1,134,750
Oranges.		
To United Kingdom	£5,872	
Canada	7,743	
Other British Possessions	888	
United States of America	86,688	
Other Foreign Countries	4	
		101,195
Grape-fruit.		
To United Kingdom	£939	
Canada	1,201	
Other British Possessions	42	
United States of America	7,007	
		9,189
Other Fresh Fruit.		
To United Kingdom	£1,328	
Canada	809	
Other British Possessions	578	
United States of America	1,690	
Other foreign countries	5	
		4,410
Total fresh fruit exported		£1,249,544

Pineapples form an appreciable item of the "other fruit" exported from Jamaica. In addition, the Pineapple industry of Antigua is worthy of notice, the value of the fruit exported being some 2,000*l.* per annum.

Tamarinds are also exported on a moderate scale from Antigua and Barbados.

Bananas are clearly thus the principal fruit exported from the West Indies, followed at a great distance by Oranges, Grape-fruit, and Pineapples.

Direction of Trade.

The analysis given above of the Jamaica fruit trade indicates clearly that at present the United States of America receive by far the greater portion of the fruit exported. Thus of 1,134,750*l.* worth of Bananas exported, no less than 1,037,977*l.* worth were sent to the United States, the United Kingdom receiving Jamaica Bananas to the value only of 90,114*l.* The proximity of Jamaica to the States and the well-organised and frequent service of fruit-boats make it only natural that a large portion of the trade should be in this direction. On the other hand, the United Kingdom offers a very large market for Bananas, and is at present but very poorly supplied from British sources, in spite of the increasing import of Jamaica Bananas. The following figures will illustrate the possibilities of expansion in this direction :—

Imports of Bananas into United Kingdom, 1903.

From British Colonies	£153,640
From foreign countries	918,123
	£1,071,763

That is to say, only about 14 per cent. of the Bananas imported into the United Kingdom are derived from British Colonies.

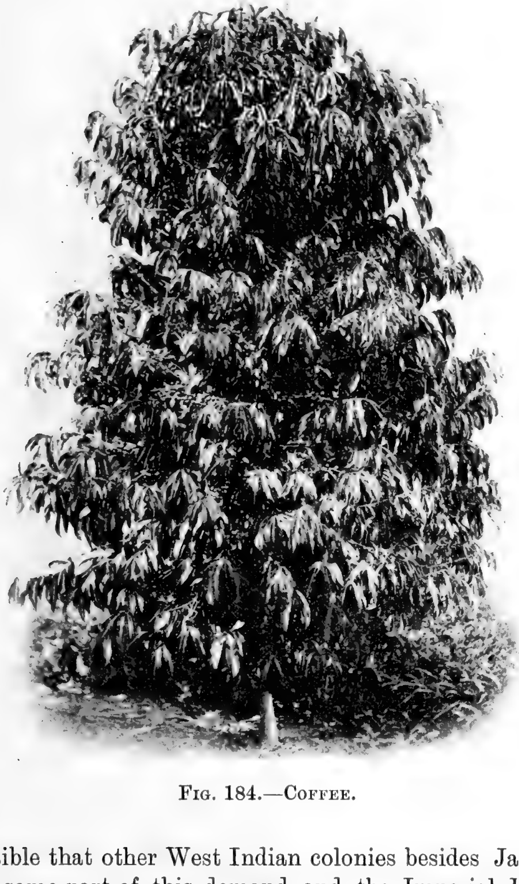


FIG. 184.—COFFEE.

It is possible that other West Indian colonies besides Jamaica may be able to meet some part of this demand, and the Imperial Department of Agriculture has, during the past three years, made successful efforts to initiate a trade between Barbados and the United Kingdom. As, however, this question will form the subject of a separate communication, I need not do more than refer to it in passing.

The remarks concerning the possibility of expansion in the Banana trade between the West Indies and the United Kingdom apply equally well

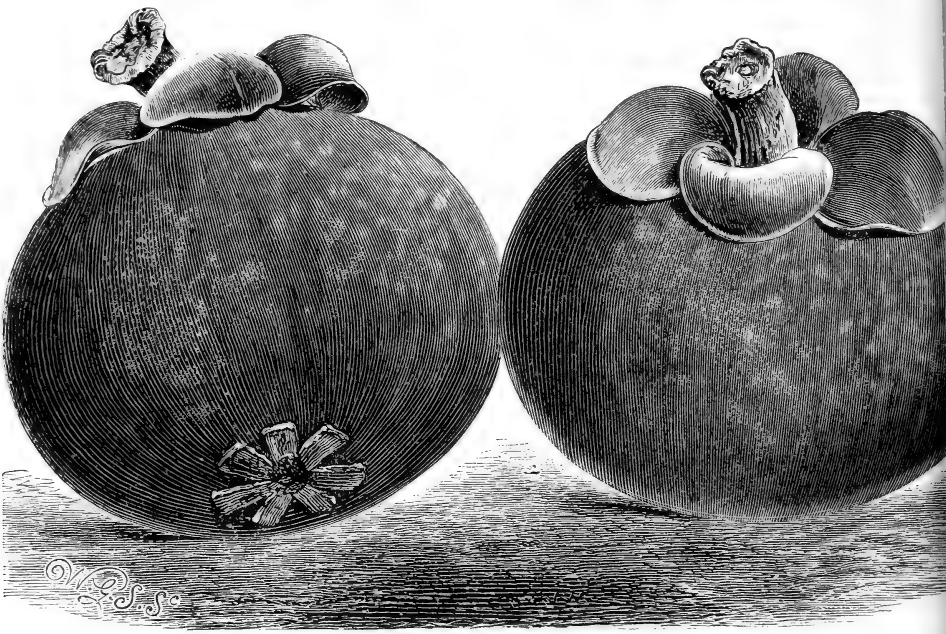


FIG. 185.—THE MANGOSTEEN. (*Gardeners' Chronicle.*)

to the Orange export. Jamaica Oranges can be put on the English market in excellent condition at a time of the year when other Oranges are not

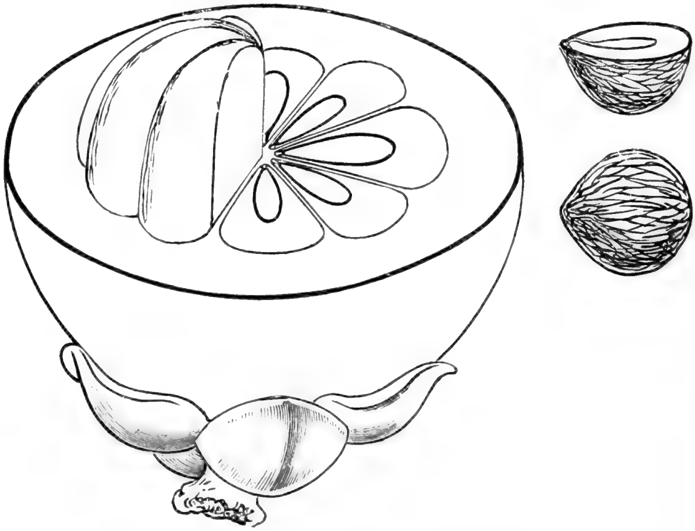


FIG. 186.—THE MANGOSTEEN, SHOWING THE SEEDS SURROUNDED BY THE EDIBLE PULP. (*Gardeners' Chronicle.*)

available. Yet the quantity sent at present is insignificant compared with the total quantity of Oranges imported.

Oranges imported into United Kingdom, 1903

From British Colonies	£43,307
From foreign countries	2,235,096
	£2,278,403

Towards this total the West Indies contributed about 40,000*l.* worth, or approximately one-sixtieth of the total quantity of Oranges imported into the United Kingdom during the year.

FIG. 187.—PINEAPPLE.

It should also be borne in mind in this connection that great efforts are being made to develop the fruit industries of the American possessions in the West Indies. The export of fruit from Porto Rico has recently increased largely, and in the future it is by no means certain that the American market will be so favourable as at present. For this reason, if for no other, it seems advisable to turn attention to increasing the trade in fruit with the United Kingdom, and also with Canada.

REQUIREMENTS FOR A SUCCESSFUL FRUIT INDUSTRY.

We will now turn to the requirements for a successful fruit industry, and then review briefly some of the efforts being made to attain these desiderata. The principal requirements are :—

1. The introduction, distribution, and cultivation of good varieties of plants.
2. Establishment of plantations near the shipping port, or in easy communication with it.
3. Careful attention to picking, grading, and packing the fruit.
4. Regular service, at sufficiently frequent intervals, of properly equipped steamers.

Introduction of Plants.—The introduction of fresh plants forms an important portion of the work of a department responsible for the promotion of agricultural industries. These fresh plants, so introduced, may

FIG. 188.—BANANA.

either be species completely new to the locality or better varieties and races of species already there. A few examples will serve to demonstrate that careful attention has been and is being given to this work in the West Indies.

The Mangosteen (*Garcinia Mangostana*) was introduced from the East into the Royal Botanic Gardens, Trinidad, where it first fruited in 1875, and has since continued to do so at irregular intervals. It has also fruited in the Botanic Gardens in Jamaica, and at St. Aroment, Dominica. (Specimens from the latter locality, grown by Dr. Nicholls, were exhibited at the Show.)

The famous Malayan fruit, the Durian (*Durio zibethinus*), has also been introduced into the West Indian islands, and has fruited in Dominica.

Varieties of Mangos, Bananas, Pineapples, are constantly being received in the West Indies from various parts of the world, frequently through the Royal Botanic Gardens, Kew, which department has accomplished so much in successfully spreading economic plants throughout the Empire and founding new industries. From this source alone the Botanic Station in Dominica has received during the past five years plants of some thirty of the finest varieties of Eastern Bananas. These have

FIG. 189.—ORANGE.

been grown and propagated in Dominica, and distributed thence to other parts of the West Indies.

Many of the introductions are of long standing, and some of them took place in curious ways. For instance, in 1782 Rodney captured and brought into Jamaica a French ship which had a number of economic plants on board, amongst others the now well-known No. 11 Mango. The plants so captured were cared for by the Government, propagated, and distributed over the island.

The accumulated result of the long-continued work of plant introduction may perhaps be best appreciated by dividing the better known of the West Indian fruits into two groups, (*a*) native and (*b*) introduced plants. In doubtful cases a plant has been grouped as native, but even then it will at once be seen how much the West Indies owe to plant introduction for their chief fruits.

(*a*) *Native Fruits.*

Pineapple, Sapodilla or Neesberry, Cashew, Sugar Apple, Soursop, Mammee Apple, Star Apple, Papaw.

(*b*) *Introduced Fruits.*

Banana, Plantain, Orange, Grape-fruit, Shaddock, Lime, Mango, Cherimoyer, Breadfruit, Tree Tomato, Avocado Pear, Pomegranate, Tamarind.

The list of introduced fruits might be considerably extended; it is sufficient to note that the Banana and the various Citrus fruits, which

FIG. 190.—MANGO.

between them constitute almost the whole of the present large fruit export, have been introduced, and are not native to the West Indies.

Distribution of Plants.—Adequate provision for the distribution to planters and others of fruit plants is afforded by the botanical departments of the West Indies. The Imperial Department of Agriculture has under its control small botanic gardens, or botanic stations, as they are usually termed, in the following islands:—St. Kitt's, Nevis, Antigua, Montserrat, Dominica, Barbados, St. Lucia, St. Vincent, Grenada, and Tobago. The botanical departments of Jamaica and Trinidad also maintain gardens in these two colonies. The garden, or station, in each island forms a centre from which economic plants may be obtained at nominal cost, and reliable information afforded as to the mode of cultivation. In addition, newly introduced plants are tried to ascertain their suitability to local conditions, manurial experiments carried out, tests made of methods of combating plant diseases, and bulletins and pamphlets distributed embodying the results of the experiments in a form accessible to all. The following

FIG. 191.—CASHEW.

extracts from the annual reports on the botanic stations in Montserrat and Dominica for 1903-4 will sufficiently serve to indicate the activity displayed in the work of plant distribution:—

Montserrat.—Total number of plants distributed during the year, 20,966, of which the following were fruit plants:—

Limes	10,676
Papaw	1,293
Oranges	920
Bananas	105
Pineapples	108

Dominica.—Total number of plants distributed during the year, 53,500, including:—

Limes	24,154
Spineless Limes	750

Budded Stock.

Washington Navel Oranges	917	
Jaffa Oranges	43	
Sicily Lemons	24	1,008
Grape-fruit	18	
Bergamot Oranges	6	
Sour Oranges (for stocks)		750
Vanilla		1,870
Pineapple Suckers		335
Grafted Mangos		27
Durians		38

The botanic stations are thus carrying on the most important work of spreading through the islands valuable economic plants which will in time,

FIG. 192.—MAMMEE APPLE.

if conditions be favourable, result in the establishment of new industries or in the improvement of those already existing. The distribution of over 1,000 budded Citrus plants and some forty grafted Mangos from the Dominica station during one year serves to indicate the quality of the work. Similar work is carried on at other stations, although not in all to the same extent, Dominica being one of the islands well suited to fruit culture; and if in the future a considerable fruit industry be established in this island, it will be due in great measure to the laborious, painstaking work quietly carried out at the botanic station.

Plant Selection and Improvement.

Spineless Lime.—The ordinary Lime tree (*Citrus Medica* var. *acida*) bears on its branches stout, sharp spines, which often render it very

Fig. 193.—Custard Apple.

difficult to gather the fruit from the tree by hand without injury. In 1892 there was noticed on the Shawford Estate, Dominica, a Lime tree without the usual spines. Seeds from this plant were collected and sown, and about 75 per cent. came true.. A plot of "Spineless Limes" has been maintained for several years at the Botanic Station, Dominica. These plants fruited a few years ago, and from the seeds of this, the second generation, a third generation has been raised, and has bred true to the original parent plant. Spineless Limes now form part of the regular stock of the station, and figure in the return given above for 1903-4 of plants distributed.

In the Annual Report on Dominica Station for 1901-2 (see also "Agricultural News," vol. i. p. 180) Mr. Jones says:—"This variety differs from the ordinary Lime cultivated in the island in having a more erect habit of growth, smaller fruits, with fewer seeds, superior bearing qualities, and greater acidity of juice."

Samples of the fruit of trees of the spineless and the ordinary (spiny) varieties, grown side by side in the garden, were sent to Mr. Francis Watts, the Government analytical chemist for the Leeward Islands, for analysis, with the following results :—

	Juice of Spineless Lime.		Juice of Ordinary Lime.	
	Oz. per Gallon.	Grains per Ounce.	Oz. per Gallon.	Grains per Ounce.
Free acid	16·88	46·15	14·10	38·55
Real citric acid . . .	16·60	45·39	14·32	39·15

In the following year fruits were again analysed, this time in comparison with those of the ordinary Lime, and also of the Villa Franca

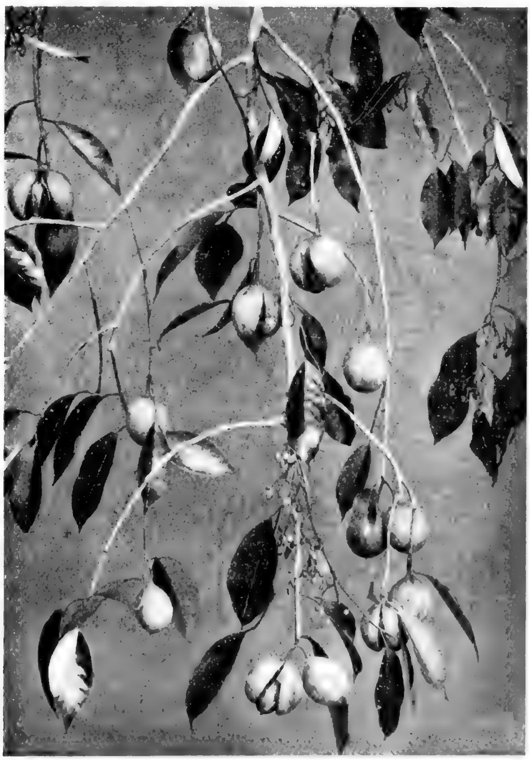


FIG. 194.—NUTMEG.

Lemon grown in Dominica. The results of Mr. Watts's analysis were as follows :—

Citric Acid.	Oz. per Gallon.	Grains per Ounce.
Spineless Lime	13·80	37·73
Ordinary Lime	13·22	36·15
Sicily Lemon	11·05	30·22

Commenting on these results Mr. Jones remarks ("Annual Report," Dominica Station, 1902-3, p. 10) :—"In this instance the fruits had matured during the wet season, and the results are therefore lower than those on a former occasion, when fruits which had matured during the dry season were analysed. The spineless variety again stood at the top of the list.

"The merits of the Spineless Lime should be considered by shippers of Green Limes to the United States, where a large coarse Lime is not required. The medium-sized, smooth-skinned, almost seedless and juicy fruit of this variety, containing a large quantity of acid, should be just the thing required for that market. It is evident that green Limes would be gathered much quicker and with less damage from trees devoid of spines

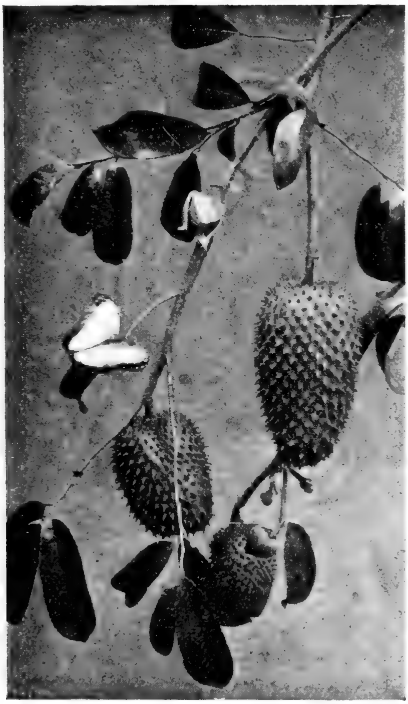


FIG. 195.—SOURSOP.

than from the common formidably armed trees. At the time when complaints are frequent as to the condition in which Limes arrive in New York, anything that would tend to save the fruits from damage in picking seems worthy of attention from those interested in the trade."

Plants are also being distributed to the other botanic stations and gardens in the West Indies, and if after further trial the variety retains the popularity it has already gained, Spineless Limes may ere long become the "ordinary" variety cultivated in the West Indies.

Seedless Limes.—A second desirable improvement in the Lime would be the production of a "seedless" variety, as has already been achieved with other fruits of the Citrus family. This desideratum will possibly be obtained by work which is now being carried on at the Trinidad Botanic Gardens.

In the "Bulletin of Miscellaneous Information, Trinidad," for October 1903, Mr. J. H. Hart, the Superintendent, records the discovery at La Brea, Trinidad, of a Lime tree bearing fruits of ordinary size, character, and flavour, but entirely seedless. Steps were immediately taken to propagate this plant by budding. These efforts have been successful, and in the Bulletin for October 1904 Mr. Hart stated "that he hoped to be able to distribute a certain number of stock plants amongst botanic gardens and stations early in the coming year."

Hybrid Pineapples.—Experimental work was initiated in 1901 at the Hope Experiment Station of the Botanic Department, Jamaica, in

Fig. 196.—Avocado Pear.

hybridising Pineapples, "chiefly with the view of getting a variety combining the delicious flavour of the 'Ripley' with the fine appearance of the 'Smooth Cayenne.'" An account of the progress of this work is given in Mr. W. Fawcett's "Annual Report on Public Gardens and Plantations, Jamaica," for 1901-2, 1902-3, and 1903-4. In 1901 some fifty-three hybrid seedlings were obtained, and two are recorded as bearing fruit from the end of 1903 onwards. These two fruits were not possessed of any specially desirable qualities. In 1902 nearly 2,000 crossbred seedlings of known parentage were raised as follows:—

Ripley × Cayenne	900	seedlings
Cayenne × Ripley	800	"
Queen × Cayenne	100	"
Queen × Ripley	25	"
Ripley × Queen	120	"
	1,945	"

During 1903 a further batch of 500 seedlings was also raised.

Mr. Fawcett, in his report for 1902–3, remarks :—" Mr. Harris deserves credit for having raised the seedlings. If only one improved fruit be obtained from the whole number of seedlings, it will be well worth all the time and trouble spent over it; but probably it is too much to expect to get even one improved variety out of this number."

The progress of the experiment will be watched with interest.

Mangos.—A large number of varieties of the Mango, good, bad, and indifferent, occur in the West Indies, and, unfortunately, in many instances but little care is taken to propagate the better ones. For several years

FIG. 197.—PAPAW.

grafted Mangos of good varieties have been distributed from the botanic stations, and recently an impetus has been given to the work of improving the local production of Mangos by the discovery of a reliable method of budding. (See W. Harris, "Bulletin, Department of Agriculture, Jamaica," vol. i., 1903, p. 253.)

By the adoption of this method it is possible to convert old, almost worthless, trees into valuable plants, without the long waiting period necessary when young grafted plants are used.

Avocado Pears.—Budding experiments are also in progress in Jamaica on the Avocado Pear. A large variety of forms occur in the islands, and it is very desirable that only the best—some are of an extremely high order of excellence—should be propagated, to the exclusion of the poorer varieties.

As the result of the experiments made it has been ascertained that budding the Avocado Pear is a simple matter, and accordingly for the future there should be no obstacle in the way of propagating exclusively the best varieties, whether for local consumption or for export. "The fruit in which the seed occupies the whole of the cavity is the best for shipping, as there is no bruising by the movement of the seed inside"

Fig. 198.—Guava.

(Fawcett, "Annual Report," 1901–2). This note suggests one line along which attempts might be made to select and perpetuate varieties of this fruit likely to reach distant markets in the best condition, and make this excellent fruit better known in temperate countries.

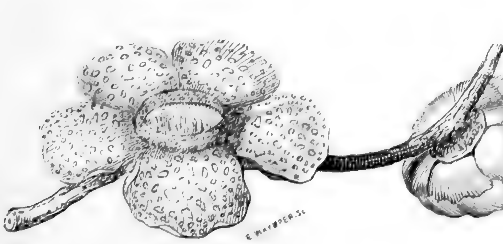
Conclusion.

It would be impossible to attempt to review in the space of this paper all the efforts which are being made to foster the fruit industry. The pages of the "West Indian Bulletin" and "Agricultural

News," and other publications issued by the Imperial Department of Agriculture, the Bulletins of the Botanical Departments of Jamaica and Trinidad, the "Journal of the Jamaica Agricultural Society," and the "Dominica Agriculturist," bear conclusive testimony to the practical nature of these efforts. The cultivation and manuring of fruit plants, treatment of pests, picking, grading, and packing of fruit, questions of storage and transport, are all adequately dealt with. Travelling instructors give practical advice to growers in the country districts, and the botanic stations and agricultural schools carry on experimental work accessible to the observation of all interested.

The agricultural shows which are held in the greater number of the islands also offer opportunities of giving practical hints on fruit cultivation, and of pointing out to the actual growers the bad results of defective methods of picking, grading, and handling their produce.

Progress in some of the directions indicated cannot be very rapid, but nevertheless a tangible measure of success has undoubtedly been obtained, and in the comparatively near future we may hope that throughout the West Indies, as is already the case in some parts, the best varieties of plants will be cultivated, the fruit will be picked, graded, and packed in a manner to allow of its reaching the distant market in the best possible state, provided it be transported under the best conditions. Here we are brought face to face with one of the radical difficulties, the conditions of transport. The shipping companies in co-operation with the exporters are giving this matter their consideration, and it is to be hoped that all the difficulties will soon be solved. Already great advances have been made in the conditions under which Bananas are transported from Barbados, and the high percentage of losses experienced in the first shipments has been reduced to a low figure. This result has been attained partly as the result of experience in time of picking and mode of packing, but mainly by improvements in storage accommodation on board ship. A successful fruit industry depends on the loyal co-operation of cultivator and transporter. Each alone can do nothing. The transporter cannot place fruit on the market to the best advantage unless it be intrinsically good, properly picked, graded and packed. Equally, all the efforts of the cultivator are rendered of no value if his carefully selected, well-grown, and properly packed fruit be transported under conditions which are far from ideal.



REPORT ON THE METEOROLOGICAL OBSERVATIONS MADE IN THE SOCIETY'S GARDENS AT WISLEY IN 1904.

By R. H. Curtis, F.R.Met.Soc.

At the close of the year 1903 the meteorological instruments which had been for some years in use at the Society's Gardens at Chiswick were removed to the new Gardens at Wisley, where they were re-erected upon

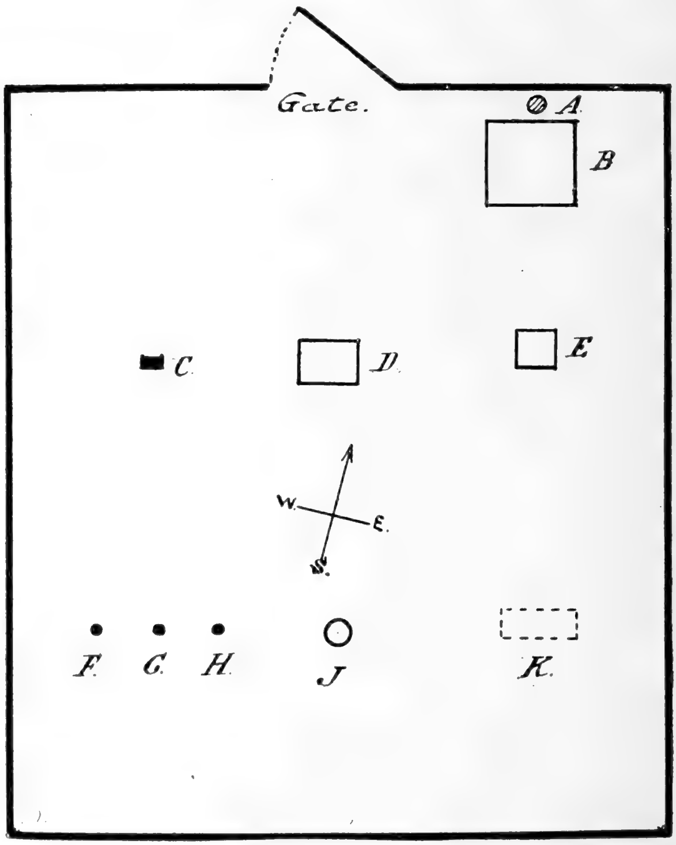


Fig. 199.—Plan of the Meteorological Station.

A. Vane for wind direction. B. Anemometer. C. Combined maximum and minimum thermometer on a post. D. Stevenson thermometer screen. E. Sunshine recorder. F, G, H. Earth thermometers, 1 foot, 2 feet, and 4 feet deep. J. Rain-gauge. K. Grass thermometers.

a site which had been selected for them by Mr. Edward Mawley, Past President of the Royal Meteorological Society and myself. To the equipment of instruments which had hitherto been in use were added a Campbell-Stokes sunshine recorder, a self-registering anemometer, and a vane for indicating the direction of the wind.

The Meteorological Station occupies a prominent and very satisfactory position in the highest and most open part of the Gardens, where all the instruments are given a perfectly free exposure, and where their indications are not likely to be affected in the future by buildings or other undesirable

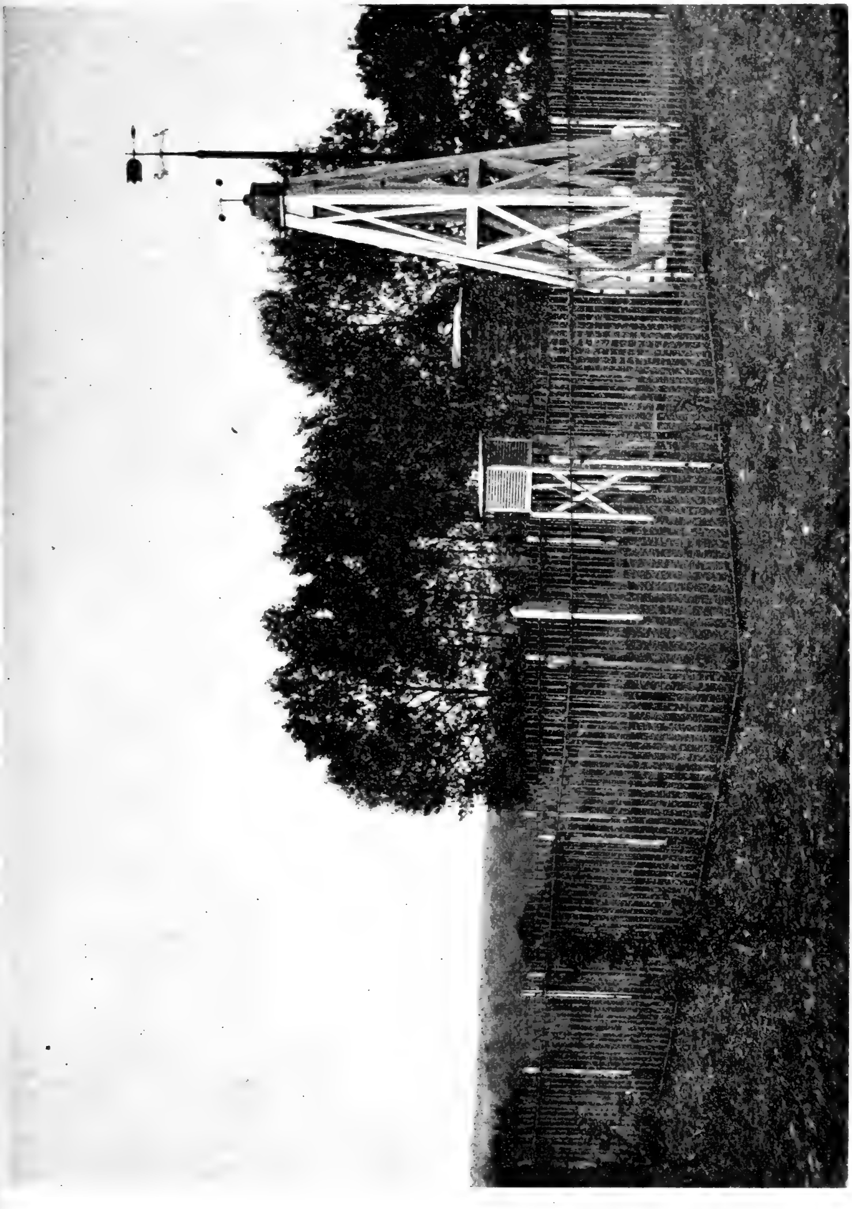


Fig. 200.—View of the Meteorological Station.

surroundings. It consists of a railed rectangular enclosure 26 feet by 23 feet, within which the instruments are arranged as shown in the accompanying plan and view.

Although the instruments were got into their new positions with as little delay as possible, a short time had necessarily to elapse before their arrangement was complete, and a further short interval before the new Observer had become familiar with the routine of his duties. There are in consequence no detailed observations available for the month of January, and the observations of wind velocity did not commence until the close of February. The thermometers were compared with standard instruments by Mr. Mawley and myself before the observations were begun.

The observations have been regularly made at 9 A.M. each day by Mr. Thomas Frazer, and an examination of the entries in the Register shows them to have been made and recorded in a very satisfactory manner. Copies have been forwarded each week to the Meteorological Office for inclusion in their official publications, and also to the Agricultural and Gardening papers.

The following summary of the weather of each month is based on the observations:

January.—The weather was unsettled and unseasonable. The winds were chiefly from between south and west, the temperature was above the average, and the rainfall was heavy, especially towards the close of the month; the amount of bright sunshine was below the average for January.

Note.—As the arrangement of the station was not complete till near the close of the month, no average values are available for January.

February.—Throughout the month, but more especially during the first half of it, the weather was unsettled, dull, and wet, with strong winds chiefly from between south and west. Temperature did not differ much from the average, but both the days and nights were slightly warmer than is usual: on the coldest night the thermometer on the grass showed only 8 degrees of frost. The rainfall was large, and rain fell on nearly every day during the first three weeks. The amount of bright sunshine was deficient.

Mean temperature of the air in shade	39°.4
Highest " " "	52°.1 on the 20th
Lowest " " "	27°.0 " 29th
Lowest " on the grass	24°.0 on the 24th and 29th

	At 1 ft. deep	At 2 ft. deep.	At 4 ft deep.
Mean temperature of the soil at 9 a.m.	39°.0	40°.7	42°.5
Highest " " "	43°.0	42°.0	43°.0
Lowest " " "	36°.0	39°.0	41°.5

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100)	87
Rain fell on 21 days to the total depth of	3·88 ins.
(Equivalent to about 18 gallons of water per square yard.)	
Heaviest fall on any day	0·50 in. on the 9th

March.—A quiet, cool, and fairly dry month, with a good deal of northerly and easterly wind, some heavy fogs, and occasional thunderstorms with snow and hail. Temperature was about 2 degrees below the average, both the days and nights being slightly colder than is seasonable; the lowest temperature shown by the thermometer on the grass was 10 degrees of frost. There was an average rainfall.

Mean temperature of the air in shade	40°.5		
Highest „ „ „	59°.3 on the 8th		
Lowest „ „ „	25°.0 „ 12th		
Lowest „ on the grass	21°.5 „ 17th		

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	39°.6	41°.0	41°.9
Highest „ „ „	45°.2	43°.9	43°.2
Lowest „ „ „	34°.8	37°.4	40°.5

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 86

Rain fell on 17 days to the total depth of ... ... 1·54 ins.

(Equivalent to about 7 gallons of water per square yard.)

Heaviest fall on any day ... ... 0·30 in. on the 31st

The prevailing winds were northerly.

The average velocity of the wind was 7 miles per hour.

There were 82 hours of bright sunshine, equal to 22 per cent. of the total possible amount.

April.—A mild month with a predominance of westerly winds, a moderate rainfall, and a fair amount of sunshine.

Mean temperature of the air in shade	49°.2
Highest „ „ „	66°.4
Lowest „ „ „	32°.2
Lowest „ on the grass	24°.9

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	47°.1	47°.2	45°.9
Highest „ „ „	51°.0	49°.3	47°.9
Lowest „ „ „	41°.8	43°.3	43°.3

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 79

Rain fell on 14 days to the total depth of ... ... 1·20 in.

(Equivalent to about $5\frac{1}{2}$ gallons of water per square yard.)

Heaviest fall on any day ... ... 0·28 in. on the 22nd

The prevailing winds were from south-west to north-west.

The average velocity of the wind was 9 miles per hour.

There were 156 hours of bright sunshine, equal to 38 per cent of the total possible amount.

There was only one day on which no sunshine was recorded.

May.—A somewhat dull month with more than the average rainfall, less sunshine than is usual in May, which is generally the brightest month of the year, variable winds, and on the whole temperature rather above the average, although with one or two somewhat cold spells.

Mean temperature of the air in shade	53°.6
Highest „ „ „	73°.5 on the 16th
Lowest „ „ „	34°.2 „ 9th
Lowest „ on the grass	26°.2 „ 9th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	53°.5	53°.0	50°.4
Highest „ „ „	59°.7	60°.0	53°.5
Lowest „ „ „	47°.9	49°.4	48°.1

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 77

Rain fell on 16 days to the total depth of ... ... 2·43 ins.

(Equivalent to about $11\frac{1}{2}$ gallons of water per square yard.)

Heaviest fall on any day ... ... 0·71 in. on the 20th

The prevailing winds were from the westward.
The average velocity of the wind was 6 miles per hour.
There were 147 hours of bright sunshine, equal to 31 per cent. of the total possible amount.
There were 6 days on which no sunshine was recorded.

June.—A fine, bright, and dry month, but somewhat cooler than is usual, and with no very warm days.

Mean temperature of the air in shade	57°.4	
Highest „ „ „	77°.2	on the 30th
Lowest „ „ „	42°.2	„ 28th
Lowest „ on the grass	33°.0	„ 4th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	59°.0	58°.4	55°.3
Highest „ „ „	63°.0	61°.6	57°.2
Lowest „ „ „	56°.3	56°.3	53°.8

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 71
Rain fell on 8 days to the total depth of ... ... 0.64 in.
(Equivalent to about 3 gallons of water per square yard.)
Heaviest fall on any day ... ... 0·20 in. on the 14th
The winds were variable in direction.
The average velocity of the wind was 6 miles per hour.
There were 208 hours of bright sunshine, equal to 42 per cent. of the total possible amount.
There was only one entirely sunless day.

July.—A warm, dry, bright month, the rainfall being less and the amount of sunshine more than the average. On the whole the days were about 2½ degrees and the nights 1½ degree warmer than is usual. The winds were generally light in force.

Mean temperature of the air in shade	64°.6	
Highest „ „ „	85°.2	on the 17th
Lowest „ „ „	49°.2	„ 4th
Lowest „ on the grass	43°.1	„ 21st

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	66°.0	64°.7	60°.3
Highest „ „ „	69°.9	67°.1	62°.2
Lowest „ „ „	60°.3	60°.8	57°.5

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 71
Rain fell on 11 days to the total depth of ... ... 1·48 in.
(Equivalent to about 7 gallons of water per square yard.)
Heaviest fall on any day ... ... 0·31 in. on the 30th
The prevailing winds were southerly.
The average velocity of the wind was 5½ miles per hour.
There were 260 hours of bright sunshine, equal to 53 per cent. of the total possible amount.
There was not one day on which some sunshine was not recorded.

August.—The weather was somewhat variable. At the commencement and again towards the close of the month it was warm and fine, but during a considerable period it was cool and unseasonable, and on two or three occasions the grass thermometer fell to within 3 degrees of the freezing point. Rainfall was slight, and there was an average amount of sunshine, only one day being entirely sunless.

Mean temperature of the air in shade	61°.0		
Highest „ „ „	87°.3 on the 4th		
Lowest „ „ „	40°.0 „ 25th		
Lowest „ on the grass	34°.4 „ 25th		

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	63°.2	63°.7	61°.5
Highest „ „ „	68°.7	66°.8	62°.6
Lowest „ „ „	58°.1	60°.5	60°.0

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 71

Rain fell on 10 days to a total depth of ... ... 1·61 in.

(Equivalent to about 7½ gallons of water per square yard.)

Heaviest fall on any day ... ... 0·68 in. on the 31st

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

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

There were 237 hours of bright sunshine, equal to 53 per cent. of the total possible amount.

There was only one day on which no sunshine was recorded.

September.—A more than usually cool month, with deficient rainfall and more than the average amount of sunshine. There were some dense fogs during the closing days of the month.

Mean temperature of the air in shade	54°.6		
Highest „ „ „	71°.0 on the 5th		
Lowest „ „ „	32°.4 „ 21st		
Lowest „ on the grass	28°.3 „ 20th		

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	56°.6	58°.4	58°.5
Highest „ „ „	61°.5	62°.4	60°.5
Lowest „ „ „	52°.9	55°.5	56°.2

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 79

Rain fell on 12 days to a total depth of ... ... 1·54 in.

(Equivalent to about 7¼ gallons of water per square yard.)

Heaviest fall on any day ... ... 0·24 in. on the 14th

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

The average velocity of the wind was 4½ miles per hour.

There were 160 hours of bright sunshine, equal to 43 per cent. of the total possible amount.

There were 4 days on which no sunshine was recorded.

October.—A quiet, dull month, with slight rainfall and only a moderate amount of sunshine. Fogs occurred during the latter half of the month. On the coldest night the thermometer on the grass showed 7 degrees of frost.

Mean temperature of the air in shade	49°.7		
Highest „ „ „	66°.3 on the 18th		
Lowest „ „ „	26°.5 „ 15th		
Lowest „ on the grass	25°.1 „ 15th		

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	51°.7	53°.4	54°.4
Highest „ „ „	55°.3	55°.7	56°.1
Lowest „ „ „	46°.7	50°.6	53°.1

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 92

Rain fell on 18 days to a total depth of ... ... 1·88 in.
(Equivalent to about $8\frac{3}{4}$ gallons of water per square yard.)
Heaviest fall on any day ... ... 0·55 in. on the 6th
The prevailing winds were from south-west and west.
The average velocity of the wind was 4 miles per hour.
There were $75\frac{1}{2}$ hours of bright sunshine, equal to 23 per cent. of the total possible amount.
There were 10 days on which no sunshine was recorded.

November.—A month of variable weather. Temperature was rather below the average, and whilst the opening days of the month were warm there was a spell of wintry weather towards the close, the thermometer on the grass showing $17\frac{1}{2}$ degrees of frost. There were a good deal of fog, a deficiency of rain, and rather more than the usual amount of sunshine.

Mean temperature of the air in shade	41°.5
Highest " " "	58°. 4 on the 11th
Lowest " " "	20°.7 " 26th
Lowest " on the grass	14°.5 " 26th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	44°.4	47°.2	50°.4
Highest " " "	49°.9	50°.9	53°.0
Lowest " " "	36°.1	40°.3	46°.0

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 93
Rain fell on 13 days to a total depth of ... ... 1·41 in.
(Equivalent to about $6\frac{1}{2}$ gallons of water per square yard.)
Heaviest fall on any day ... ... 0·43 in. on the 10th
The prevailing winds were from south-west.
The average velocity of the wind was $4\frac{1}{2}$ miles per hour.
There were 60 hours of bright sunshine, equal to 23 per cent. of the total possible amount.
There were 9 days on which no sunshine was recorded.

December.—Temperature was seasonable, and rainfall slightly above the average, but the amount of sunshine was small and for several days dense fogs were prevalent. The lowest temperature on the grass was 13 degrees below freezing.

Mean temperature of the air in shade	40°.5
Highest " " "	55°.7 on the 16th
Lowest " " "	22°.1 " 22nd
Lowest " on the grass	18°.8 " 21st

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	41°.0	42°.8	45°.3
Highest " " "	45°.8	45°.1	46°.5
Lowest " " "	37°.5	40°.9	44°.0

Mean relative humidity of the air at 9 a.m. (complete saturation being expressed by 100) 95
Rain fell on 22 days to the total depth of ... ... 2·33 ins.
(Equivalent to about 11 gallons of water per square yard.)
Heaviest fall on any day ... ... 1·03 in. on the 6th
The prevailing winds were from the south-west.
The average velocity of the wind was 5 miles per hour.
There were 29 hours of bright sunshine, equal to 12 per cent. of the total possible amount.
There were 17 days on which no sunshine was recorded.

Owing to the removal of the instruments to Wisley, the average values of temperature and rainfall based on the long series of observations made at Chiswick are no longer available for comparison with the monthly means derived from the observations from the new station. Fortunately,

DIAGRAM 1.—*Variation from the Average of the Mean Temperature and Mean Rainfall for each Month of the Year* 1904.

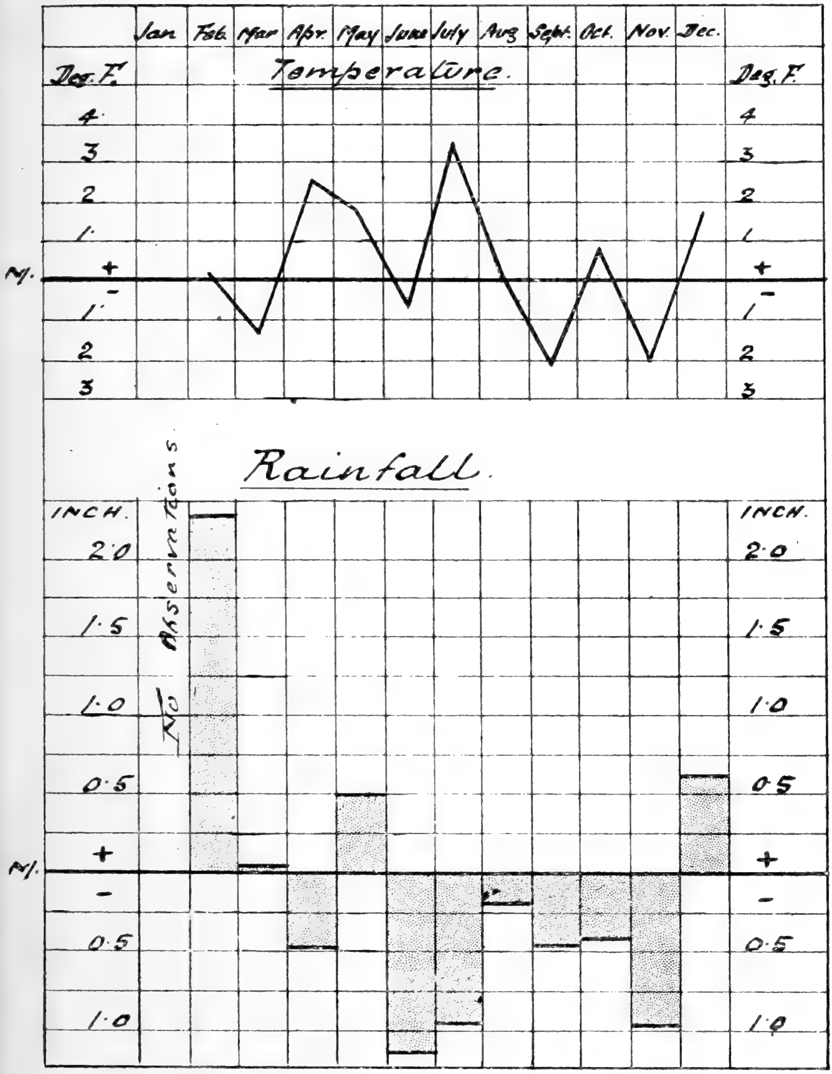


FIG. 201.

however, there exist series of observations made at places sufficiently near to Wisley to allow of their use for the determination of averages which no doubt approximate very closely to the average values for Wisley itself; and I have used these provisionally, until it becomes possible to calculate others directly from the Wisley observations. In the following diagrams these average values are indicated by dotted lines.

Diagram 1 shows the general character of the weather of the year as regards temperature and rainfall. The departures in excess from the

DIAGRAM 2.—*Variations from the Average of the Mean Maxima and the Mean Minima Temperatures of the Air for each Month of the Year* 1904.

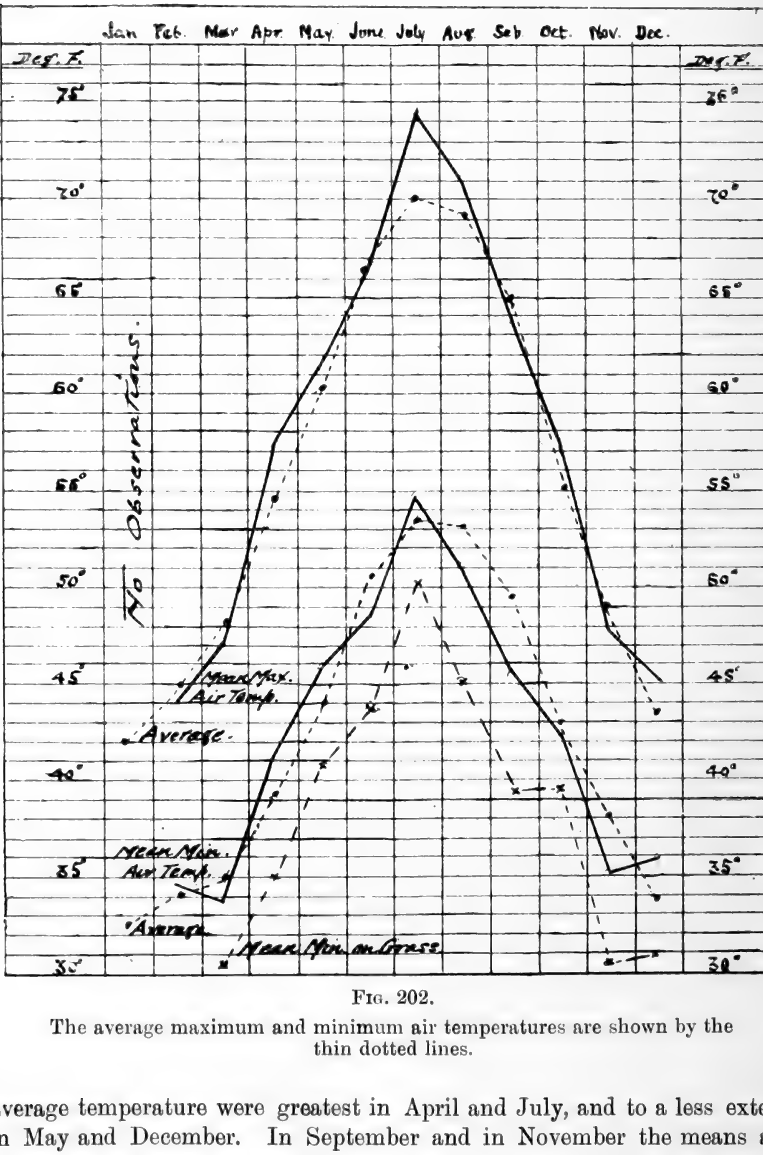


FIG. 202.

The average maximum and minimum air temperatures are shown by the thin dotted lines.

average temperature were greatest in April and July, and to a less extent in May and December. In September and in November the means are shown to be below the average. June was again slightly cooler than is usual, but not to nearly the same extent as was the case in June of the preceding year.

As regards rainfall, the large fall in February and the succession of dry months from June to November inclusive are the most noticeable features.

Diagram 3.—*Mean Temperature of the Air at Wisley compared with the Mean Temperature of the Soil at 9 a.m., at depths of 1 ft., 2 ft., and 4 ft. below the surface, for each Month of the Year.*

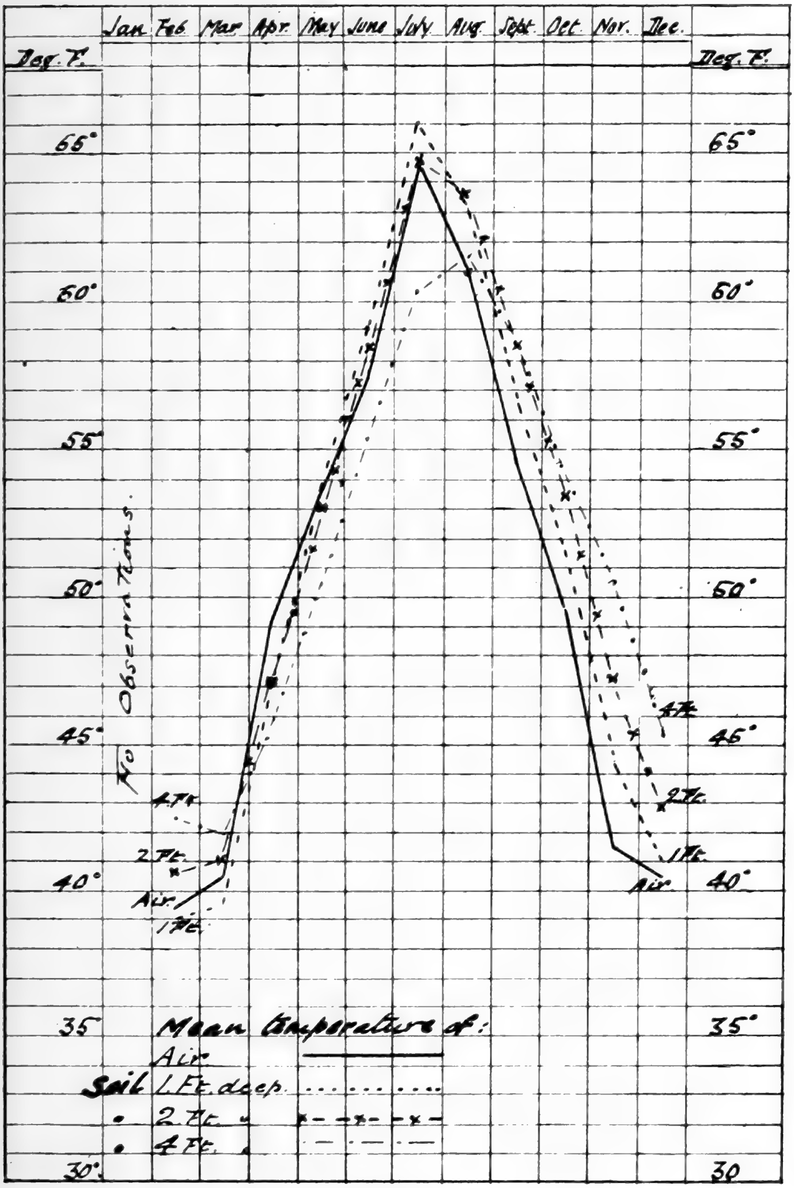


Fig. 203.

Diagram 2.—The warm weather of July is again shown here by the excess of the mean of the highest (day) temperatures over the average, whilst the unseasonably cool nights of August and September are also indicated in the curve of mean minimum (night) temperature. The absence of low temperatures on the grass in October is shown by the change in direction of the lowest curve in that month.

Diagram 3.—During the early months of the year a fairly close agreement is shown between the mean temperature of the air and that of the soil at depths of one foot and two feet below the surface. Until May the soil temperature lags somewhat behind that of the air, but from June to the close of the year it is higher, and the less rapid loss of heat by the soil during the autumn is well shown by the diagram. The *range* of temperature in the soil diminishes with the depth, and in December the sandy soil at Wisley was on the whole 2 degrees warmer at the depth of two feet than it was at the depth of one foot, and $2\frac{1}{2}$ degrees warmer at four feet than it was at two feet deep.

REPORT OF THE SOCIETY'S CONSULTING CHEMIST, DR. J. AUGUSTUS VOELCKER, M.A., F.I.C., F.L.S.

DURING the year 1904 twenty samples were submitted by Fellows to the Consulting Chemist for analysis, and, in addition, there were four applications for consultations on different matters. Eighteen Fellows in all availed themselves in this way of the special privileges granted by the Society.

The samples submitted were as follows:—

Waters	9
Soils	3
Fertilisers	6
Miscellaneous	2
Total	20

The number is small at present, but, as the privileges come to be better known, the assistance of the Chemical Department may perhaps be more widely utilised. Nor can it be said that all the samples sent had a purely "horticultural" significance, as in the case of waters, which were submitted generally as the outcome of the existence of the privileges. The samples of water sent were mainly for drinking purposes, and the desirability of inquiry into these supplies is evidenced by the fact that only two out of the nine were found to be fully satisfactory; two others were fair, one, however, containing zinc, derived from the use of galvanised iron pipes; while the other five were all more or less polluted, three of them very badly so. In one case complaint had been made of the breaking out of skin eruptions. It was found that the supply came from a well close to an old churchyard. The water showed on analysis, with 21½ grains per gallon of total solids, no less than nine grains per gallon of nitrates, and seven grains of chlorides—both excessive amounts. As regards the three samples of soil sent for examination, analysis showed in one case urgent need of lime, in a second of phosphoric acid, and in the third of potash, this latter ingredient being of special importance when fruit-growing is in contemplation. The fertilisers sent comprised (*a*) mineral superphosphate, (*b*) oyster-shell scraps, (*c*) compound manures. The superphosphate was of high quality, giving 32·59 per cent. of soluble phosphate; the shell scraps contained 87½ per cent. of carbonate of lime and would be useful for liming purposes when, as here, finely ground. A fertiliser sold as "Cucumber manure" gave the following composition:—Soluble phosphate 16·11 per cent., insoluble phosphates 9·81, potash 3·72 per cent., and ammonia 3·14 per cent., and was quite good of its class.

There was one inquiry respecting the use of a manure that was believed to have done harm to fruit trees, but the injury was not properly traceable to this cause. A second referred to harm done to Melon plants in a greenhouse. This was found to be due to the woodwork having been coated with tar, and, no doubt, volatile products given off from the tar through the influence of the heating had caused the injury. It takes long to remove this cause of trouble, and it is not safe to place plants under such conditions until every trace of smell from tar has been removed.

WANDERINGS IN CHINA.

By E. H. Wilson.

[Paper read before the Horticultural Club.]

It has been my good fortune, through the enterprise of Messrs. James Veitch & Sons, to spend some five years in China in quest of new plants for our gardens. My travels led me through Southern, Central, and Western China, and enabled me to see a good deal of one of the oldest and most interesting nations in the world. My journey in the South of China was principally to make the acquaintance of Dr. Henry. I have been most fortunate in many ways, but in none more so than in meeting this gentleman, and thus being able to profit by his sage counsel at the very commencement of my peregrinations. China, like India in particular, has its own peculiar civilisation, and the life of a European out there is very different from what it is in his own land. The sooner a new arrival realises this and adapts himself to circumstances the better for him.

Before I commence to say anything about the flora, I should like to say a few words about the Chinese. That they wear pigtails, use chopsticks in lieu of knives and forks, eat rice, bird-nests and other horrible messes, smoke opium, murder missionaries now and again; that the women bind their feet; that they are opposed to change, preferring their own form of civilisation to ours, and that every European Power is anxious to acquire a slice of their country, is a rough summary of what is generally known about the Chinese. European newspapers are always happy in showing them in their worst light, and usually succeed in so doing. Travellers have been everywhere, and the literature on China is voluminous. Yet China remains to-day one of the least known countries in the world, and her people one of the least understood. And why is this? The answer is not far to seek. Most of the books on China have been written by people who have only spent a few months in the country and obtained most of their information in the treaty ports, or through interpreters. Even those who have travelled much in the country are usually not content to state plain facts as they find them, and the result is that, with rare exceptions, books on China are grossly inaccurate.

It is not my object, neither is this the time or place, to defend the Chinese; but in common justice I must say they are much maligned. Save in moments of popular excitement, they are a peace-loving, law-abiding, and highly industrious people, and their commercial integrity is of the highest. I have been on the heels of riots, have passed through troublous districts where missionaries have been barbarously murdered only a few weeks before, and was through the Boxer trouble in 1900, yet I was never once assaulted. Further, I have never had even a piece of mud thrown at me deliberately, or been called "foreign devil" save by some irresponsible urchin. These facts speak for themselves. Could a Chinaman travel through one of our big cities, or even through our country villages, and fare as well?

Most of the murders and massacres which periodically take place in China are due to the lack of tact on the part of the individuals concerned, or the indiscretions of travellers who have previously passed through the district.

Dr. Henry spent nearly twenty years of his life in China, and most of it in remote districts; yet I am sure he can amply bear out the above statements.

It is obvious that in one paper one can only pick out fragments from here and there, and I propose to confine my remarks largely to the West of China. But before passing to the West a few remarks on the flora of Western Hupeh may be of interest.

Hupeh is one of the central provinces of China. Ichang, one of its principal cities, is distant from Shanghai, roughly, 1,000 geographical miles. It was here that Dr. Henry began to collect plants, and it is to his labours that we owe our knowledge of this remarkably rich flora.

Western Hupeh is pre-eminently rich in flowering trees and shrubs: their variety is well-nigh infinite. So extraordinarily rich is this region that it might well be considered the starting-point of many genera whose species extend all over China and reach even the distant Himalaya. *Rubus, Lonicera, Viburnum,* and *Spiræa* run riot in numbers of species; of Acer alone I collected 24 species!

Of the more remarkable trees and shrubs which occur I might mention *Davidia involucrata, Dipelta floribunda, Itea ilicifolia, Dipteronia sinensis, Eucommia ulmoides, Rhododendron auriculatum, Actinidia chinensis,* and *Cercis racemosa.* Through the courtesy of Messrs. Veitch I am able to show you specimens of these and of other plants to be mentioned later on. Ichang itself is the home of three most interesting plants, namely, *Rosa Banksiæ,* the type of the common Chrysanthemum, and the type of the common Chinese Primula. The last-named grows on the perpendicular limestone cliffs of the Ichang gorge. From January to March, when covered with its soft pink flowers, it presents a charming picture. Its flowers resemble the "stellate" type of gardens, and it would be interesting to know if this group was evolved from the type itself or is the result of selection. If it is the latter it is a most interesting case of reversion.

Three other Ichang plants should not be omitted, since they are now grown in nearly every English garden: these are *Primula obconica, Lilium Henryi,* and *Corydalis thalictrifolia.*

Another interesting fact, and one which has a peculiar relation to the flora of Western Hupeh, is the number of plants, bearing the specific name *japonica,* which are only Japanese by cultivation and are really Chinese in origin. The following well-known plants are examples: *Aucuba japonica, Anemone japonica, Iris japonica, Eriobotrya japonica, Lonicera japonica, Kerria japonica, Spiræa japonica, Senecio japonicus,* and *Styrax japonicum.* Whilst admitting that some may be common to both countries I am convinced that, when the subject is properly threshed out, it will be found that there are fewer plants common to both countries than are at present supposed to be. In addition to the many plants peculiar to Western Hupeh and those common to other parts of China, an interesting admixture of Himalayan and European plants also occurs. The former are fairly abundant up to 4,000 feet. As examples I might mention

Clematis montana, Coriaria nepalensis, Berberis Wallichiana, B. nepalensis, Benthamia fragifera, Dichroa febrifuga, and Spiræa sorbifolia. European plants are not so common, and are nearly all relegated to the higher altitudes. Amongst others we find the following:—*Viburnum Opulus, Potentilla Anserina, P. fruticosa, Agrimonia Eupatoria, Populus tremula, Pyrus Aucuparia, Polemonium cæruleum, Prunus Padus,* and *Osmunda regalis.*

To reach the glorious West we have to negotiate a river journey of eight hundred miles. Ichang is the head of steam navigation, and the journey has to be done in native boats. The river is full of rapids and the journey is fraught with danger. A passage is seldom made without accident, and I have witnessed many catastrophes. I have been singularly fortunate, but have experienced many minor accidents, and on several occasions have been within an ace of total destruction.

The first hundred miles of the journey lie through the famous Yangtsze gorges. These stupendous chasms afford some of the most marvellous, grandest, and awe-inspiring scenery in the world. The cliffs are principally of limestone, and are often 1,000 feet to 2,500 feet sheer.

At Ichang the river is 1,100 yards broad; in the Ichang gorge, five miles above the town, it is narrowed to about 400 yards. The water is in consequence very deep. In their soundings the two British gunboats, on their first ascent to Chungking, found over sixty fathoms of water at the entrance to this gorge. This in the low-water season! In summer the water in the gorge is often eighty to a hundred feet above its winter-level. At such times all traffic through the gorge is suspended.

November to April is the most favourable reason for travelling up river, and during the season the journey to Kiating occupies about two months. Chungking, the great trade *entrepôt* of Western China, is reached in a month. At Sui-Fu, another fortnight's journey, we branch off from the Yangtsze proper and enter the Min River. Another week, and Kiating is reached. Accidents and a rising river may lengthen the journey indefinitely; indeed, one never knows how long it may take to reach one's destination. A sail is requisitioned whenever the wind is favourable, but so strong is the current and so many are the rapids that the boat has to be hauled nearly the whole of the way by means of coolies attached to a bamboo hawser. The flora of the river valley between Ichang and Kiating is essentially sub-tropical, the following plants being very characteristic: *Melia Azedarach, Phyllostachys mitis, Trachycarpus excelsus, Hibiscus mutabilis, Lagerstroemia indica, Pinus Massoniana, Cupressus funebris, Ficus infectoria, Cedrela sinensis, Pistacia chinensis, Platycarya strobilacea, Gardenia florida, Melastoma candidum,* and *Gleichenia dichotoma.*

Eastern Szechuen is composed chiefly of red clayey sandstone and sandy clays of enormous stratigraphical development. As these rocks predominate largely and impart their characteristic brick-red colour to the surface where it is exposed, the term "Red Basin" has been very appropriately applied to the whole area. This area is very highly cultivated, and produces most magnificent crops when properly tilled and irrigated. Opium, in the river valleys of Szechuen, is the principal winter crop For about 300 miles of the journey between Ichang and Kiating the country, during the winter months, is nothing but one huge area covered with Poppy; and in March a more gorgeous and dazzling sight cannot be imagined.

Whilst not defending the use of the drug, I would like to say that the vice is not nearly so bad as it is represented to be. The opium craze in China to-day is not nearly as bad as the drink craze in this country.

Kiating is prettily situated at the point where the Min and Tung rivers unite. It boasts some 30,000 inhabitants, and is surrounded by low, well-wooded hills. It is the centre of a large silk industry, and the home of the white-wax industry. The latter substance is of peculiar interest. It is deposited by a species of scale insect—*Coccus Pela*—on the common Chinese Ash (*Fraxinus chinensis*). The insect is bred on *Ligustrum lucidum*, chiefly in the Chien-Chang Valley—a district 100 miles to the south-west of Kiating. The wax is used for making candles, but, owing to the increased consumption of foreign candles and kerosene oil, the demand grows less every year. Kiating is one of the best points from which to reach the mountains of the far West. These begin one day's journey west of the city, and from there until the plains of India are reached there is nothing in the nature of level ground below 8,000 or 10,000 feet. Tatien-lu, on the Tibetan borderland, is fourteen days distant over a very hard and difficult road. The whole country west of Kiating is simply one vast sea of stupendous mountains. Tatien-lu is surrounded by a snow-clad range. Some of the peaks of this range have been measured by Indian surveyors, the following being the heights of four of these giants: 20,000 feet, 21,000 feet, 24,900 feet, and 25,592 feet. When properly surveyed it is highly probable that peaks will be found equalling in height the highest peaks of the Himalaya.

The flora of this wild region is extraordinarily and peculiarly rich, and can only be compared with that of the Sikkim Himalaya. Being several degrees of latitude north, the species are more suited to our own clime. As an illustration of the peculiar richness of the flora, I might mention that, in the ascent of one mountain (Mount Omi), I gathered specimens belonging to eight new and monotypic genera—viz., *Davidia involucrata, Carrierea calycina, Tapiscia sinensis, Toricellia angulata, Tetracentron sinense, Eucommia ulmoides, Emmenopterys Henryi*, and *Camptotheca acuminata*. This same mountain is very rich in ferns; in one day I collected over seventy species.

In the mountains of Western China between 1,000 feet and 5,000 feet, the natural order *Laurineæ* forms fully 75 per cent. of the arborescent vegetation, if we omit the common lowland conifers: *Pinus Massoniana, Cupressus funebris*, and *Cunninghamia sinensis*.

The Laurinene zone is composed chiefly of evergreens, and the genera *Machilus, Lindera*, and *Litsea* run riot in species. Many of these constitute handsome and valuable timber trees. From 5,000 feet to 10,000 feet the mountains, in the more inaccessible parts of these wilds, are clad with magnificent coniferous forests. Several species of *Picea* and *Pinus*, with *Abies Fargesii, Tsuga chinensis*, and *Larix Potanini*, form the chief constituents. *Abies Fargesii* is possibly the commonest of all conifers in these regions, reaching its largest size, about 10,000 feet. It is a very handsome Silver-Fir with very dark bluish-black cones. Unfortunately its wood is soft and of comparatively little value. *Larix Potanini* has red wood and is esteemed the most valuable timber tree in Western China.

As in the Himalayas, so in Western China, Rhododendrons are a special feature. They begin about 5,000 feet, but do not get really abundant until 8,000 feet is reached, and extend up to 14,500 feet, the limit of ligneous vegetation. They vary in size from trees fifty feet to alpine plants only a few inches high, and their flowers are of all sizes and colours. Rhododendrons are gregarious plants, and nearly every species has a well-defined altitudinal limit. In June the mountains are one mass of colour, and no finer sight can be imagined than miles and miles of these mountain sides covered with Rhododendrons in flower. There is no Heather in China, its place being taken by dwarf tiny-leafed species of Rhododendron. At 12,000 feet and upward we get amongst alpine meadows with their wealth of herbs. *Meconopsis integrifolia* occurs in countless numbers, and, with its large clear yellow flowers, presents a sight not easily forgotten. *Meconopsis punicea*, with large dark scarlet flowers, and *M. Henrici*, with dark purple flowers, are equally beautiful and abundant. *Cypripedium tibeticum*, with large dark crimson flowers; *Incarvillea Principis*, with bright red flowers; and *Rheum nobile*, with its pyramidal towers of pale yellow bracts, form another gorgeous trio. Of Primulas I have collected over forty species in these regions. *Primula sikkimensis* is one of the commonest, and covers these meadows and marshes like the common Cowslip of our own land. Any attempt to portray this botanical paradise must necessarily fail, but it would be unjust to omit mention of the large areas covered with Senecios, Saussureas, Gentians, Pedicularis, and dwarf Aconites: 16,500 feet is practically the limit of vegetation. A few cushion plants belonging to *Cruciferæ*, *Caryophyllaceæ*, and *Compositæ*, with tiny Primulas, Saxifragas, and *Meconopsis racemosa* var. *sinuata*, being the last plants to give out. Above this altitude are vast moraines, glaciers, and perpetual snow: 17,500 feet is approximately the snow-line around Tatien-lu. In the grasslands west of here grasses, sedges, and tiny alpines extend above 17,000 feet, and the limit of perpetual snow is not less than 18,000 feet.

The river valleys of these regions enjoy a much warmer climate than their altitude warrants, and a very anomalous condition of things obtains. In the valley of the Tung River, between 4,000 feet and 5,000 feet, *Opuntia Dillenii* has become naturalised, and miles and miles of the river-banks are covered with this plant. Associated with the *Opuntia* is a *Mimosa*-like Legume simulating the condition of things which obtains in Texas and New Mexico. Indeed, so much does the presence of these plants approximate to what obtains in the above States that if the traveller could be suddenly dropped there he would be unable to tell, from the nature of the flora around him, whether he was in China or in dry arid parts of the Southern United States! The flora of these river valleys is essentially xerophytic in character. The leaves of the shrubs are either minute or covered with a dense white indumentum. The herbs have tuberous rootstocks or fleshy leaves and stems. Plants like *Bæa hygrometrica* and species of *Selaginella* which will stand desiccation are very abundant on rocks. *Artemisia* is richest in species, whilst the Henbane and Thorn-apple are the commonest roadside weeds. *Ceratostigma plumbaginioides* and *Caryopteris Mastacanthus* are very common sub-shrubs, whilst *Buddleia variabilis, Clematis tangutica*, and *Lilium leucanthum* present pictures not easily forgotten. In the shingly bed of shallow streams, the Sea Buckthorn (*Hippophaë rhamnoides*), *Myricaria germanica*, and *Berberis asiatica* are particularly abundant. Between 8,000 feet and 11,000 feet, the common Gooseberry is largely used as a hedge plant.

The fauna of these regions is as rich as the flora, but save for the collections of Père David in Mupin and Berezovski around Sungpan, it remains absolutely unknown. Pratt collected butterflies around Tatien-lu in 1889 and 1890, and Père Dejean has been doing the same in the same regions ever since.

Ethnologically this wild region is intensely interesting, and those interested could not do better than turn their attention to this rich field. I have only time to-night to say a few words about the Tibetans, and a distinct tribe which I became acquainted with, and about which little or nothing is known. Of late so much has been written about Tibet and its people that it is scarcely necessary for me to say anything on the subject, and I will content myself with a few remarks on the Lamas, and on the morals of the people as I saw them. The Lamas, or priests, are the curse of Tibet. They throng the streets of Tatien-lu—huge, swarthy, hulking fellows, if possible dirtier and more malodorous than the ordinary Tibetan. They shave their heads, but seldom wash themselves, being content to smear butter over the exposed parts of their bodies. Their clothing consists of a coarse claret-coloured oblong piece of serge thrown over one shoulder, the other being usually bare. Another length of cloth is wound two or three times round the waist, and reaching down to the ankle forms a kind of skirt. They are usually barefooted, but in winter wear top-boots made of untanned leather. Each carries in his hand a small prayer-cylinder and rosary, and constantly mutters the mystic "Om mani padmi hum." They swagger through the streets with an insolent mien, and lack the good manners which are the delightful characteristic of the unsophisticated Tibetan. The lamaseries in which they live are usually very richly endowed. These lamaseries are often of immense size and accommodate several thousand of Lamas, acolytes, and attendants. The latter are recruited from the dregs of society, and comprise half-castes of Chinese soldiers, loafers, debtors, and criminals.

The morals of the Tibetans around Tatien-lu—if, indeed, they have any—are of a peculiar kind. Polygamy, polyandry, and even sexual intercourse occur with a promiscuousness that defies all imagination as to relationships. Monogamy also obtains, and legal marriages can be arranged for any fixed period, varying from three days and upwards.

The distinct tribe I referred to inhabit the valley of the Upper Tung River, in long. 102° E. and lat. 31° N. roughly. They form two separate principalities known as Badi and Bawang, but are at present dominated by one ruler, a woman. In Badi the people speak a primitive Tibetan dialect, but in Bawang the language is akin to that of the Lolos. The virgins and barren women wear only a fringe of cords about a foot square in front and a similar fringe behind, but in winter the rest of the body is more or less covered by a loose robe of serge. In Badi the same custom obtains, though the fringe is rather longer. The custom is so systematically and intentionally indecent that it must have a religious significance. Possibly it is associated with phallic worship. In Badi and Bawang the marriage customs are very curious, and free love is more or less the rule. A girl finds herself with child, and she decides upon the father. The man of her decision may be as innocent as Adonis, but he has to accept and marry her all the same. Maternity is always the ratification of marriage. A ceremony is gone through and, in Badi, the girl goes to her mother's home the next day, and in Bawang after a month has elapsed. She returns and takes the man's name when a child is born. If there is no child the matter is at an end. All the married women—that is, the mothers—discard the fringe after the first child is born in favour of the ordinary Tibetan clothing. These people are essentially agriculturists, and are also good builders in brick and stone. They live in well-built houses, and every village boasts one or more square or octagonal towers of many stories—harbours of refuge and watch-towers in times of trouble. The temples are well built, and chiefly remarkable for the disgustingly indecent figures they contain.

FORSYTHIA EUROPÆA, DEGEN AND BALDACCI: NEW SPECIES.

By Otto Froebel, F.R.H.S. (Zürich).

It may be regarded as a most interesting phenomenon that in our own days an entirely new shrub should have been found in Europe, the existence of which no one had any idea of, and the family of which had hitherto only been known in Japan and China.

This was only rendered possible through this European species having its home in a part of the Balkan Peninsula in Albania, which has hitherto been comparatively unexplored on account of the danger and difficulty of the journey and the absence of any accommodation. I was indebted to the kindness of Dr. A. von Degen in Budapest for a small packet of the seed collected by him in October 1899, from which I was able to raise a few plants. Thanks to careful attention the seedlings throve well, and by the autumn of 1902 they had grown to be fine, strong bushes 3 feet and more high ; and to my surprise, and contrary to all expectation, one single plant, in 1904, produced a small number of blooms scattered over two-year-old wood, but unfortunately it was not observed until too late. I sent the already half-bloomed spray to Herr Beissner, in Bonn, but he could not use the material for further investigation.

The appearance of a *Forsythia* in Europe, whilst the other species are natives of Japan and China, and no other has been elsewhere discovered, is very remarkable, and reminds me of analogous interesting cases of plant-geography in plants which have been grown for many years in our gardens. I might first mention the genus *Ramondia*, of which *R. pyrenaica* is found exclusively in the Pyrenees. From thence Ramondias are not found until you come to Servia, where *R. serbica* Panč. and *R. Nathaliæ* Panč. are native, then *R.* (*Jankæa* Boiss.) *Heldreichii* on the Thessalonian Olympus. Then one does not find any more of this *Cyrtandreæ* until Japan is reached, where it is represented by *Conandron ramondioides* Sieb. and Zucc.

A similar case is found in *Picea Omorika* Mast. from the Servian mountains, the nearest ally of which is the *P. ajanensis* in Japan, and throughout the whole of this enormous distance a corresponding medial variety is wanting. The nearest representative of this section is found in *Picea sitchensis* from the Pacific coast of North America.

Forsythia europæa differs from *F. suspensa* by its thick, subcoriaceous, entire leaves, which are narrower, long drawn out, smaller in the stem, short-jointed, and in its longer pointed capsule; from *F. viridissima* Lindl. by its about half-sized entire, thick, subcoriaceous leaves, and by the capsule; by the same points from *F. intermedia* Zabel (*suspensa* × *viridissima*) also, and likewise from *F. Fortuni* Lindl. and *F. Sieboldi* hort. The species is especially distinguished by the form and consistence of the foliage, and exhibits no near relationship with the others. Habitat in Albania, where it forms extensive bushes in the district of Orosi, near Simoni and Kalyvarin.

The discovery in Europe of a wild-growing species of the genus *Forsythia* hitherto only known in E. Asia (China) raises the question as to whether it has only become wild in Albania. In reply to which there

Fig. 204.—Forsythia europæa.

are the three following grounds for its being native or else very long established there:

1. Its specific variation from all other known forms.
2. Its considerable presence in a large part of the Mirdizia.
3. The fact that this shrub is so well known to the inhabitants of the country that it has an Albanian name.

Moreover, the highly cultivated extra-European Forsythias seldom bear fruit, most probably on account of their organs not being of suitable form for our blossom-visiting insects. The circumstance that the Albanian species ripens quantities of the fruit, and therefore is provided with all biological properties in order to be able to propagate its species, would have considerable weight in support of a judgment being given in favour of its being indigenous.

Whilst the other species of the genus are only distinguishable by such slight differences that the two principal forms, *F. suspensa* and *F. viridissima,* were recently regarded as heterostyle forms of one and the same species, the European species is very distinct, so that I must describe its discovery as the most important and valuable find which Dr. Baldacci has hitherto made.

CYCAS REVOLUTA IN FRUIT.

A melancholy interest attaches to Figs. 205 and 206, as they are from photographs taken by the late Mr. James Epps, Junior, of Beulah Hill,

Fig. 205.—Cycas revoluta, with a dense mass of buff-yellow feather-like Fronds in the Centre.

and sent to us only a few days before he left England on his journey to Jamaica, from which, alas! he was destined never to return. Mr. Epps was an ardent gardener, especially devoting his attention to plants of economic value, specimens of which from time to time he sent up to our meetings.

Fig. 206.—Cycas revoluta. Separate buff-yellow feather-like Fronds bearing Orange Fruits.

Most people know the appearance of *Cycas revoluta*, as it is commonly grown in our glass-houses—like a Palm with a very short thick stem and somewhat stiff leaves, the pinnæ crowded together and of a very dark green. Few, however, have seen the plant in fruit, and most curious it is. From the centre of the circle of dark-green leaves there arises a feathery mass of bright buff-yellow filaments, as if they had been cut out of thick flannel or even felt. This central mass is found to be composed of a multitude of frond-like growths, and if one or two be broken off the pinkish-orange fruits or nuts are found adhering to the stems below the flannelly filaments.

The plant is a native of Southern Japan, where the fruits are eaten. They are slightly sweet, but very mealy, dry, and insipid. A very fine kind of sago is, however, made from the plant's stem, which is said to be exceedingly nutritious.

THE 'BLACK MONUKKA' GRAPE.

VERY few people seem to be acquainted with the merits of this Grape; had it not indeed been preserved in the Society's Garden, in all likelihood it would have disappeared from the face of the earth, for, though originally from India, people in India have recently been unable to find it there and have been supplied with it by the Society, aptly illustrating the old Book's saying, "Cast thy bread upon the waters, and thou shalt find it after many days," which, translated into gardening language, is, "Give away liberally anything you have, and when your own stock fails your neighbours will be able to set you up again."

The late Dr. Hogg describes it thus:—"Bunches very large, shouldered, and thickly set. Berries singularly shaped, being like monster barberries, obovate-oblong. Skin of a deep dull chestnut colour, very thin, adhering closely to the flesh, which is firm, crisp, and very juicy, with a sweet and very rich flavour, more so than 'Black Hamburgh.' This is a remarkable-looking Grape, and may be eaten with pleasure, being entirely without seeds. The vine is a vigorous grower and a great bearer, and is highly deserving of cultivation."

To this description of our great pomologist (who still, we regret to say, finds no successor) we need only add that the individual berries are small compared with 'Black Hamburgh,' and although ninety-nine out of every hundred are seedless you do occasionally come across a seed; but, speaking generally, you can pull the berries off the stalks and press them into your mouth and enjoy the refreshing juice and luscious flavour without any inconvenience from skin or pips.

Fig. 207 shows six bunches of 'Black Monukka' grown by A. F. Hartshorn, Esq., in Shropshire from eyes given him by the Society five years ago. He says:—"They were grown in a lean-to greenhouse with a southern aspect, which ripened thoroughly without the aid of artificial heat. The vine border was made three feet deep and six feet wide. At the bottom was put a layer of broken bricks and stones for drainage; over that was placed a layer of turf (turned grass downwards); it was then filled in with a compost consisting of burnt grass, weeds, fresh bones, fibrous loam, and manure from a slaughterhouse. The vines were planted outside the greenhouse, and passed through the wall and trained on the one-rod system, and were pruned back to one eye in December. To ventilate the greenhouse it was found better to open the top lights only, until the berries were set and the season well advanced; afterwards the front lights were opened as well as the top, according to the weather. The vines were not syringed, but the method was adopted of well watering the floor after sunset, which answered capitally. By this process the foliage was kept moist and healthy, without the great risk of scalding the leaves. When the vines commenced to blossom all moisture was avoided until the berries were formed: as soon as this had taken place watering of the floor was recommenced until they were nearly coloured. During the ripening process the atmosphere of the greenhouse was kept dry by supplying

FIG. 207.—'BLACK MONUKKA' GRAPE.

plenty of ventilation during the day, so as to prevent mould forming on the bunches. When nearly or quite ripe the top lights were left open a little during the night."

ON THE CULTIVATION OF GRAPES IN DAULATABAD.

By Syed Siraj-ul-Hasan.

The villages of the Aurangabad district, situated between 19° 54′ N. lat., 75° 0′ 22″ E. long., and 20° 32′ 3″ N. lat., 75° 0′ 48″ E. long., with an altitude of 2,000 feet to 2,500 feet above the sea-level and with an average rainfall of 30″ and a comparatively mild climate, have long been famous for the cultivation of a great variety of fruit. Fruit, especially that which belongs to a more temperate climate, such as the Fig, the Mulberry, and the Grape, attains a perfection within this area seldom acquired in other parts of India under similar conditions.

Of these places Daulatabad has long been famous for the cultivation of several varieties of Grape-vine, first introduced in the reign of Mohammad Tughlaq in 1338, when that monarch conceived the project of making Daulatabad his capital, and forced the inhabitants of Delhi, on pain of death, to migrate to Daulatabad with all their effects, even the trees that grew in Delhi. The immigrants from Delhi included great numbers of men from Central Asia and Kabul. Of these many understood Grape cultivation, and the congenial climate of Daulatabad soon gave returns in the shape of excellent crops, which had at the best been indifferent in Delhi. A colony of gardeners from Northern India was soon established, and it still exists under the name of Maliwara, a mile south of Daulatabad. The great feature of the new capital of India was its vast gardens, and there was hardly a mosque, a public inn, or a respectable private residence which did not possess a vineyard.

Another great stimulus to Grape cultivation was given by the Portuguese Christian missions located at Aurangabad, which were liberally endowed by the early Bijapur or Ahmadnagar kings in 1550. Their monasteries grew both purple and white Grapes. Ibn Batutah, the Moorish traveller who visited Daulatabad in 1430, and the French traveller Thévenot, who made an extended tour in 1667, were much struck with the gardens that met their eyes throughout the Sarkar of Daulatabad. Thévenot especially notices the vineyards about Aurangabad and Daulatabad.

In the middle of the seventeenth century, when Aurangzeb made Aurangabad (formerly known as Kharki), eight miles east of Daulatabad, his capital, the industry was so extensive that miles of land were under Grape cultivation. This was no doubt due to the great demand for fruit created by the presence of a vast Moghul army and the Imperial Court. It was about this time that the black variety known as "Habshi" was introduced by a Mohammedan doctor of theology, named Baba Shah Musafir, from Persia. This variety was first cultivated in his garden, known to this day as "Pandiri." This Grape soon acquired a world-wide reputation for its excellence, and was in great demand all over India. The Habshi Grape was produced in great abundance in the same garden (which is still the property of the Shah Musafir family) until 1883, when a quarrel over an increase of rent forced the tenants to give up the vineyard. No one came forward to work it under the new conditions imposed by the landlord, and the valuable vines were completely ruined by neglect. The Habshi also grew in the Government Fort Gardens at Daulatabad; but as all the plants from time to time were taken away as specimens to Hyderabad and other places, it soon became extinct. When I visited Daulatabad last year to make a selection of plants for the gardens of the Agri-horticultural School, I found only one single Habshi vine, in a deplorable condition, in a private garden. However, I got a few cuttings off this plant, and succeeded in getting some more from the garden of Rajah Rai Rayan at Pakli, some ten miles north-east of Daulatabad. Although there are no fruit-bearing vines of this variety anywhere in Daulatabad or Aurangabad, yet some fifty young and healthy plants of it are now to be found in the gardens worked by the Agri-horticultural School of Aurangabad. The Pakli gardens, however, contain a few fruit-bearing Habshi vines, and arrangements have been made to secure cuttings for the Royal Horticultural Society as soon as the wood attains proper maturity.

The following is a description of the principal varieties of the Grape-vine grown in and about Daulatabad.

Habshi.—Fruit deep bluish-black, very sweet, long olive shape; will keep longer than any other variety. Very scarce now. Skin thick. The berries very like 'Muskat Grapes,' but the colour a little deeper than 'Black Hamburgh.'

Fakhri.—Greenish-white, round, bunches medium, very sweet, flavour good; will not keep long.

Sahebi.—Resembles 'Buckland Sweet Water,' but fruit larger; will keep longer; flavour good.

Abi or *Bhogri.*—Pale green, round, something like 'White Muscadine,' but even at its best of inferior quality.

The following is the method of cultivation followed by the Grape growers of Daulatabad and the Deccan generally.

The vine is grown only from cuttings; no other method of propagation is appreciated by the native gardeners. In August or September the vine grower gets cuttings from the previous year's hard-wooded shoots, each with four or five eyes, and puts them into a well-prepared bed under some kind of shed. Each cutting is buried to a depth of two or three inches, and the top of the cutting is sometimes sealed with a mixture of clay and cow-dung to prevent the sap from being dried out. These cuttings are carefully kept in a moist condition, and are watered frequently till they begin to shoot, which happens in about ten days' time. The ground selected by the Daulatabad gardeners for the plantation invariably contains a large proportion of calcareous and argillaceous matter with pulverised basalt.

It is worth noticing that where the soil is different the Grape never attains perfection, and hence there is a belief prevalent at Daulatabad that good Grapes can only be grown within the walls of the Fort. The ground is ploughed several times till it is free from clods and weeds, and then it is considered ready for the reception of the plants. At intervals of six to ten feet pits are dug a foot and a half square and as deep, and filled with good soil and manure (generally farmyard manure), in equal quantities. The sprouting cuttings, sometimes in duplicates, are planted in these pits, firmly set into their places with plain earth, and watered every alternate day for a couple of months, after which time the waterings are reduced to once every six days. As the shoots grow, four small stakes are placed round each cutting and the shoots are trained from one to the other, tying them in their places but keeping each vine separate. In five months they grow to the height of a man, when thick stakes of the coral tree, *Erythrina indica* (locally known as "Pangara"), are planted near them as permanent supports, the top shoots of the vines are nipped off, and they are trained on the coral trees. The coral tree is often a growing stump about five feet high and pollarded. For twelve months other garden produce such as the Egg-plant, the Onion, and the Pumpkin are raised in the vineyard, care being taken to water the vines once a week unless the rainfall is heavy. In the following October all the branches are pruned to three eyes from the stem, the prunings being available as cuttings, and the flower soon appears. It seems that the gardeners do not consider it worth their while to thin out the berries or to pick out the diseased parts of the vines.

A vineyard is calculated to yield a quarter-crop at the end of the second year, a half-crop at the end of the third year, and a full crop at the end of the fourth year, and with a moderate amount of care lasts for about twenty years, giving a full crop each year. The vine is also sometimes trained on a strong open trellis, which is set over the vineyard about six feet from the ground. The pollarded plant is said to give the best yield, but the rich prefer the trellis training both on account of its appearance and its shade; it is also said to keep the vine in strength to a greater age. The vines yield a crop of sweet Grapes in February and March and a crop of sour Grapes in August. The sour crop is large, but the gardeners do not encourage it, as it is of little value. The sweet crop receives all their attention and care. After each crop the vines are pruned, and after the sour crop they are manured with poudrette and farmyard manure. The various forms of phosphatic and nitrogenous manures are highly valued and well understood by the Daulatabad gardeners, but with the scanty means at their disposal they find it impossible to procure them for their vines. Once every five or six days the earth is loosened round the roots and the vines are flooded. When the buds appear the vine is often attacked by a blight which proves very injurious to the vineyard, entailing a heavy loss to the grower. Unfortunately the gardeners are not aware of any remedy with which to combat the several diseases, such as mildew and anthracnose, and other parasites. The Agri-horticultural School has adopted the American system of preventing some of the more formidable kinds of vine diseases, but the experiment has not yet had sufficient time to show any results.

It is within the memory of the present generation that the vine crop used to be so abundant that the local bazaars could supply any quantity of this delicious fruit at such a low price as three pies to one anna per seer. The fruit was moreover largely exported to distant places; in fact it was often found in the fruit markets of Gujarat and Hindustan, and fetched a good price in foreign markets. An idea of the production in former days can be formed from the number of the vineyards. Daulatabad contained no fewer than 200 vineyards, excluding private gardens. The country between Aurangabad and Chikalthana (sixteen miles east of Daulatabad) contained another hundred vineyards. From Kannar, thirty-five miles north of Daulatabad, to Jalna, forty miles east, fruit gardening was a common occupation. But it is an incontestable fact that at home the "Jawari" has taken the place of the fruit-tree, although the cuttings of Daulatabad have given birth to extensive vineyards at Nasik, Poona, and Bangalore, where they occupy miles of land and give enormous returns. There are now only two gardens, owned by Jiwa and Chimman, left in Daulatabad which produce Grapes. Even these two are about to be sold because of the poverty of the owners. It is entirely due to the generosity of Nawab Basheer Nawaz Jung Bahadur that these two men can go on with their work. The famous "Habshi" is extinct there now, and the other varieties are about to become extinct.

REPORT ON TOMATOS AT WISLEY, 1905.

Seventy-one stocks of Tomatos were received for trial: two plants of each were grown in a span-roofed house, admirably suited for trial purposes, and two were grown outside to test their value for open-air cultivation. The season being hot and dry, all the outside plants produced good crops, no one variety bearing an appreciably heavier crop than another. Many of the varieties are so much alike that only a slight difference in foliage, growth, shape, or colour distinguishes one from another. Again, Tomatos have reached such perfection that it is now very difficult to raise a variety superior to those already in commerce. In this trial only one stood out as being of quite exceptio al value, viz. 'Sunrise.' Members of the Fruit and Vegetable Committee examined the collection on August 8.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

1. A 1 (Sutton).—Large, round, smooth, scarlet; averaging five fruits in a cluster; short-jointed, rather large foliage. Moderate crop.

2. Best of All (Sutton).—Very large, handsome, deep round, smooth, bright scarlet; averaging five fruits in a cluster; short-jointed, large foliage. Heavy crop, and very even in size.

3. Bitton Champion (Davis).—Medium size, flat round, corrugated, scarlet; averaging five fruits in a cluster; short-jointed; small foliage. Good crop.

4. Blakedown Seedling (Wilson).—Same as No. 2.

5. Cannell's Express (Cannell, Norwich).—Same as No. 2.

6. Chemin Rouge (J. Veitch).—Medium size, deep round, smooth, scarlet; averaging nine fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

7. Cherry Red (J. Veitch).—Small, round, smooth, dark red; averaging fifteen fruits in a cluster; an excellent dessert variety; short-jointed; large foliage. Very heavy crop.

8. Cherry Yellow, **A.M.** August 15, 1905 (J. Veitch).—Similar in every point to No. 7, except in colour. The Committee considered this variety to be of exceptionally good flavour, and one of the best for dessert.

9, 10. Chiswick Peach, **F.C.C.** August 15, 1899 (J. Veitch, Barr).—Medium size, deep round, smooth; the skin thickly covered with down like a Peach; very pale yellow, a delicious dessert variety; short-jointed; with moderate foliage of a decided glaucous colour. Heavy crop. Not suited for outside culture.

11, 12. Conference, **F.C.C.** August 13, 1889 (J. Veitch, Barr).—Medium size, round, smooth, deep red; averaging ten fruits in a cluster; short-jointed; small foliage. Very heavy crop.

13. Dobbie's Cherry Ripe, **A.M.** July 25, 1899 (Dobbie).—Medium

size, round, smooth, scarlet; averaging six fruits in a cluster; short-jointed; moderate foliage. Very heavy crop. Distinct from No. 7.

14. Earliana (Landreth).—Very large and coarse. Deep round, smooth; averaging four fruits in a cluster; short-jointed; moderate foliage. Fair crop.

15. Earliest of All (Sutton).—Large, corrugated, flat round, scarlet; averaging five fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

16. Early Market (Sutton).—Uneven in size, deep round, smooth, scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Good crop.

17. Early Prolific (Barr).—Medium size, deep round to plum shape, smooth, bright red; averaging six fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

18, 19. Early Ruby (J. Veitch, Barr).—Large, uneven in size, corrugated, flat round, scarlet; averaging four fruits in a cluster; short-jointed; moderate foliage. Good crop.

20. Eclipse (Sutton).—Medium to large, flattish round, smooth, deep scarlet; averaging six fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

21. Favourite (Gibson).—Medium size, round, smooth, bright yellow; averaging five fruits in a cluster; short-jointed; moderate foliage. Fair crop.

22. Fillbasket, **A.M.** August 15, 1905 (Laxton).—Medium size, handsome, deep round, smooth, scarlet; averaging seven fruits in a cluster; short-jointed. Heavy crop of even size.

23. Frogmore Selected, **F.C.C.** April 24, 1894 (J. Veitch).—Large, round, smooth, scarlet; averaging five fruits in a cluster; short-jointed; moderate foliage. Good crop.

24. Futurity (Holmes).—The stock of this is not yet fixed. Some plants were of the average type, while one had an enormous truss of rather small fruits. There were over fifty fruits in the cluster.

25. Golden Jubilee (Barr).—This variety received a **F.C.C.** May 26, 1897 under the name of 'Royal Jubilee.' Fruit very large, flattish round, smooth, bright yellow, handsome; averaging five fruits in a cluster; short-jointed; big foliage. Heavy crop.

26, 27. Golden Nugget, **F.C.C.** August 14, 1894 (Sutton, Barr).—Small, egg-shaped, smooth, bright yellow, averaging nine fruits in a cluster; short-jointed; moderate foliage. Heavy crop. An excellent dessert variety.

28, 29. Ham Green Favourite, **F.C.C.** September 21, 1887 (J. Veitch, Barr).—Large, round, smooth, deep red; averaging five fruits in a cluster; short-jointed; moderate foliage. Good crop.

30. Harrowgate Beauty (Hurst).—Very similar to No. 35.

31. Hazell's Perfect (Sharpe).—Very large and coarse, flat round, smooth, deep scarlet; averaging five fruits in a cluster; short-jointed; large foliage. Fair crop.

32. Hazell's Wonderful (Sharpe).—Medium size, flattish round, smooth, deep scarlet; averaging five fruits in a cluster, short-jointed; moderate foliage. Heavy crop.

33. Hillside Comet, **A.M.** July 25, 1899 (Barr).—Medium size, deep round, smooth scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Very heavy crop.

34. Hipper's No. 1. (Hurst).—Large, uneven in size, round, smooth, scarlet; averaging six fruits in a cluster; short-jointed; rather large foliage. Heavy crop.

35, 36. Holmes Supreme, **A.M.** August 15, 1905 (Hurst, Barr).—Medium size, deep round, smooth, scarlet; averaging nine fruits in a cluster; short-jointed; small foliage. Very heavy crop.

37. Invergill Scarlet (Barr).—Large, handsome, round, smooth; averaging five fruits in a cluster; short-jointed; large foliage. Moderate crop.

38. Invergill Pink (Barr).—Very similar to No. 37. The colour is not pink, but a dark scarlet.

39. Landreth's Earliest (Landreth).—Medium size, flat, round, corrugated, dark red; averaging five fruits in a cluster; short-jointed; large foliage. Moderate crop.

40. Large Red Italian (Barr).—Same as No. 18.

41. Laxton's Record (Laxton). Medium size, flat round, smooth, bright scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

42. Long Keeper (Barr).—Same as No. 14.

43. Lord Roberts (Capp).—Large, round, smooth, handsome, scarlet; averaging six fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

44. Magnum Bonum (Sutton).—Large, round, smooth, very even in size, scarlet; averaging five fruits in a cluster; short-jointed; broad foliage. Heavy crop.

45. New Dwarf Red, **A.M.** August 15, 1905 (J. Veitch).—Large, deep round, smooth, dark scarlet; averaging five fruits in a cluster of even size; short-jointed; large and very distinct foliage. Very heavy crop.

46. New Superlative (Gibson).—Large, flat round, smooth, deep scarlet; averaging six fruits in a cluster; short-jointed; large foliage. Heavy crop.

47. Nield's Seedling, **A.M.** July 31, 1896 (Barr).—Medium size, deep round, smooth, handsome, scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

48. Norfolk Hero, **A.M.** August 15, 1905 (Miller).—Medium to large, deep round, smooth, handsome, scarlet; averaging seven fruits in a cluster; short-jointed; big foliage. Very heavy crop.

49. Open Air (Barr).—Same as No. 18.

50. Peach Blow (Sutton).—Large, deep round, smooth, crimson-scarlet; averaging six fruits in a cluster; short-jointed; large foliage. Heavy crop.

51. Perfection (Barr).—A very good selection of the well-known Reading Perfection, which received a **F.C.C.** August 19, 1884. Heavy crop.

52. Princess of Wales, **A.M.** August 15, 1905 (Sutton).—Large, deep round, smooth, handsome, even in size, bright scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Very heavy crop.

53. Queen Alexandra (Hurst).—Medium size, deep round, rather uneven in size, smooth, scarlet; averaging six fruits in a cluster; short-jointed; large foliage. Fair crop.

54. Red Peach (Barr).—Medium size, deep round, smooth, covered with down, reddish crimson; averaging six fruits in a cluster; short-jointed; distinct foliage. Heavy crop.

55. Satisfaction **A.M.** August 15, 1905 (Sutton).—Large, round, smooth, handsome, scarlet; averaging five very even fruits in a cluster; short-jointed; moderate foliage. Very heavy crop.

56. Select Comet (Hurst).—See No. 33.

57. Sharpe's Reliance (Sharpe).—Medium size, deep round, smooth, bright scarlet; averaging five fruits in a cluster; short-jointed; small foliage. Heavy crop.

58. Stirling Castle, **A.M.** September 6, 1898 (Barr).—Medium size, deep round, smooth, scarlet; averaging seven even fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

59. Sunbeam (Sutton).—Medium size, egg-shaped, bright yellow; averaging six fruits in a cluster; short-jointed; large foliage. Heavy crop.

60. Sunrise, **F.C.C.** July 14, 1905 (Carter).—Medium size, dark red, round, smooth, handsome; averaging eleven fruits in a cluster, very even in size; short-jointed; moderate foliage. Extraordinarily heavy crop.

61. Surpasse (Divers).—Medium size, deep round, smooth, scarlet; averaging six fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

62. Swanley Superlative (Hurst).—Medium size, deep round, smooth, scarlet; averaging six fruits in a cluster; short-jointed; big foliage. Fair crop. Distinct from No. 46.

63. Tamworth Castle (Sydenham).—Medium size, plum-shaped, smooth, scarlet; averaging seven fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

64. Terra Cotta (Barr).—Medium in size, uneven, smooth, crimson-red; averaging five fruits in a cluster; short-jointed; large foliage. Heavy crop.

65. Thick-fleshed (Barr).—Medium to large, very uneven in size, smooth, scarlet; averaging four fruits in a cluster; short-jointed; large foliage. Fair crop.

66. Trent Beauty (Parr).—Very large, flat round, smooth, scarlet; averaging five fruits in a cluster; short-jointed; large foliage. Good crop.

67. Tuckswood Favourite (Holmes).—Medium size, round, smooth, scarlet; averaging six fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

68. Up-to-Date (Barr).—A good form of 'Chemin Rouge.'

69, 70. Winter Beauty, **A.M.** April 18, 1899 (Barr, Sutton).—Large, flat round, smooth, scarlet; averaging six even fruits in a cluster; short-jointed; moderate foliage. Heavy crop.

71. Drumlanrig (H. J. Veitch).—Very large and coarse, flat round, smooth, bright scarlet; averaging four fruits in a cluster; short-jointed; moderate foliage. Good crop. This variety was received late.

REPORT ON PEAS, 1905.

A VERY extensive trial of Peas was made in the Society's gardens at Wisley, 149 stocks being sent in, but owing to the combination of (1) the soil still being poor, (2) a very severe frost on the morning of May 23, (3) a long period of drought, and (4) an attack of wire-worm, the trial was not a very successful one. The Peas were all sown on March 22, and the germination was good in almost every instance. The soil had been deeply worked, and the Peas sown in trenches, made as if for Celery.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

1. Acme, **A.M.** July 5, 1898 (J. Veitch).—Height about 3 feet; haulm and pods dark green, pods in pairs; averaging seven very sweet Peas in a pod. Good crop; ready for use June 21. Raised from Veitch's Early × Stratagem; seeds wrinkled.

2. Advancer (Sutton).—Height about 3 feet; haulm very strong, with dark green pods in pairs; averaging eight large fine-flavoured Peas in a pod. Heavy crop; ready for use July 3. A very fine variety; seeds wrinkled.

3. Alderman, **F.C.C.** July 10, 1900 (Sutton).—Height 5 feet; haulm and pods deep green; pods in pairs; averaging nine large sweet Peas in long handsome pods. Heavy crop; ready for use June 26. A splendid variety; seeds wrinkled.

4. Ameer, **F.C.C.** July 2, 1885 (Sutton).—Height about 4½ feet; haulm strong, pale green; pods in pairs; averaging six large sweet Peas of a pale colour in the pod. Heavy crop; ready for use June 24; seeds wrinkled.

5. American Wonder (Sutton).—A very good stock of this well-known variety, but superseded by 'Little Marvel,' a much finer Pea in every respect.

6. Aristocrat, **A.M.** July 14, 1903 (Barr).—Height 4½ feet; haulm and pods very dark green; pods in pairs; handsome; averaging nine large rich green Peas in a pod. Ready for use July 12; seeds wrinkled.

7, 8. Autocrat, **F.C.C.** July 10, 1885 (J. Veitch, Sutton).—Height 4 feet; haulm and pods dark green; pods in pairs; averaging seven large deep green and fine flavoured Peas in a pod. Ready for use July 12; seeds wrinkled. One of the finest late Peas in cultivation, with a splendid robust prolific habit.

9. Belvoir Castle (Divers).—Height 4 feet; pods in pairs; averaging seven large sweet Peas in a pod; haulm and pods dark green. Heavy crop; ready for use June 21; seeds wrinkled.

10. Best of All (Sutton).—Height 3 feet; haulm and pods very dark green; pods in pairs; averaging eight large deep green Peas in a pod; fine flavour. Heavy crop; ready for use July 8; seeds wrinkled.

11. Boston Unrivalled, **A.M.** July 14, 1896 (Barr).—Height 4 feet;

haulm and pods pale green; pods in pairs; averaging six sweet Peas in each. Good crop; ready for use July 10; seeds wrinkled.

12. Bountiful (Sutton).—Height $3\frac{1}{2}$ feet; haulm and pods grass-green; pods usually in pairs; averaging six well-flavoured Peas in each. Heavy crop; ready for use June 25; seeds blue, round.

13. British Empire (Barr).—Height 2 feet; haulm and pods a deep grass-green; pods in pairs; averaging six large sweet Peas in each; Light crop; ready for use July 12; seeds wrinkled.

14. British Queen (Sutton).—Height 6 feet; haulm and pods very dark green; pods in pairs; averaging seven large good-flavoured Peas in each. Good crop; ready for use July 12; seeds wrinkled.

15. Brookland Gem (Deal).—Height 18 inches; haulm and pods grass-green; pods usually in pairs. The seeds of this variety germinated badly, and the crop was very light.

16, 17. Buttercup (Carter).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging eight medium-sized nice-flavoured Peas in each. Fair crop; ready for use June 30; seeds semi-round, blue. A variety of the 'Daisy' type.

18. Centenary, **A.M.** July 5, 1901 (Sutton).—Height $5\frac{1}{2}$ feet; haulm and pods very dark green; pods in pairs; averaging nine exceptionally large sweet Peas in each. Heavy crop; ready for use June 27; seeds wrinkled. A very fine variety.

19. Chelsea Gem, **F.C.C.** July 1, 1887 (Sutton).—Height 1 foot; haulm and pods deep green; pods in pairs; averaging six sweet Peas in each. Heavy crop; ready for use June 19; seeds wrinkled.

20. Chelsonian (Sutton).—Height about 6 feet. This is an early selected form of the well-known 'Ne Plus Ultra,' with all the good qualities of that superb variety. Heavy crop; ready for use July 12; seeds wrinkled.

21. Chester Hero (Dickson).—Height 4 feet; haulm and pods deep green; pods in pairs; averaging eight large excellent Peas in each. Good crop; ready for use July 6; seeds wrinkled.

22. Conquest (Dickson).—Seeds destroyed by wire-worm.

23. Continuity, **A.M.** July 9, 1898 (Sutton).—Height 4 feet; haulm and pods dark green; pods in pairs; averaging nine very large fine-flavoured Peas in each. Heavy crop; ready for use July 12; seeds wrinkled.

24. Daffodil (Carter).—Height 2 feet; haulm and pods grass-green; pods in pairs; averaging seven medium-sized well-flavoured Peas in each. Good crop; ready for use June 21; seeds wrinkled.

25. Daybreak (A. Dickson).—Height 3 feet; haulm and pods pale green; pods in pairs; averaging six large very sweet Peas in each. Heavy crop; ready for use June 20; seeds wrinkled.

26. D. P. Laird (Stanard).—Height 4 feet; haulm and pods deep green; pods in pairs; averaging six Peas in a pod. Light crop; seeds wrinkled.

27. Duchess of York, **A.M.** June 20, 1901 (Sutton).—Height 3 feet; haulm and pods grass-green, pods long, handsome, containing on the average seven large fine-flavoured Peas in each. Heavy crop; ready for use June 23; seeds wrinkled.

28, 29. Duke of Albany, **A.M.** July 5, 1901 (Sutton, Veitch).—Height 5 feet; haulm and pods deep green; pods in pairs; long, handsome; averaging eight rich-flavoured Peas in a pod. Good crop; ready for use June 30; seeds wrinkled.

30. Duke of York, **A.M.** June 6, 1893 (Sutton).—Height 5 feet; haulm and pods dark green; pods usually single; averaging eight large sweet Peas in a pod. Heavy crop; ready for use June 26; seeds wrinkled.

31. Dwarf Defiance, **A.M.** July 5, 1901 (Sutton).—Height 2 feet; haulm and pods very dark green; pods in pairs, handsome; averaging eight large deliciously flavoured Peas in a pod. Heavy crop; ready for use July 6; seeds wrinkled.

32. Dwarf Gradus (Laxton).—The Committee considered this very similar to the ordinary type of 'Gradus.' Ready for use June 28.

33. Dwarf Monarch (Carter).—Height 3 feet; haulm and pods dark green; pods in pairs; averaging nine superior-flavoured Peas in a pod. Good crop; ready for use July 10; seeds wrinkled.

34. Early Edible Debarbieux (Barr).—A very fine variety of the edible-podded Peas, of excellent flavour if the pods are cooked whole when the peas are only half grown; if left later they are not so good. Height 3 feet.

35. Early Giant, **A.M.** July 11, 1902 (Sutton).—Height 3 feet; haulm and pods dark green; pods usually single, handsome; averaging nine large deep green excellently flavoured Peas in a pod. Fair crop; ready for use June 21; seeds wrinkled.

36. Early Marrow (Crook).—This proved to be 'Gradus.'

37. Early Marrowfat (Sutton).—Height 5 feet; haulm and pods deep green; pods in pairs; averaging seven large pale green Peas in each. Good crop; ready for use June 20; seeds wrinkled.

38. Early Morn, **A.M.** April 18, 1899, as a forcing variety (Sutton). Height 2 feet; haulm and pods deep green; pods in pairs; averaging six large sweet Peas in a pod. Fair crop; ready for use June 20; seeds wrinkled.

39. Early Sunrise (Sutton).—Height 2 feet; haulm and pods pale green; bad foliage; pods in pairs; averaging four pale green Peas in each. Poor crop; ready for use July 1; seeds wrinkled.

40. Eclipse (Sutton).—Height 3 feet; haulm and pods grass-green; pods in pairs; averaging five rather small, pale, fairly sweet Peas in a pod. Light crop; ready for use June 14; seeds wrinkled.

41. Edward VII., **A.M.** June 20, 1901 (Carter).—Height 3 feet; haulm and pods dark green; pods in pairs; averaging seven large remarkably sweet Peas in straight thick pods. Good crop; ready for use July 3; seeds wrinkled.

42, 43. Edwin Beckett, **F.C.C.** July 3, 1900 (Barr, Sutton).—Height 5½ feet; haulm and pods deep green; pods in pairs, handsome; averaging nine large very sweet Peas in a pod. Heavy crop; ready for use June 26; seeds wrinkled.

44. English Wonder (Sutton).—Haulms 18 inches high, sturdy, dark green, also pods; averaging six medium-sized sweet Peas in each. Heavy crop; ready for use June 23; seeds wrinkled.

45. Ensign (Dickson).—This variety suffered from wire-worm and was not a success.

46. Essex Rival (Hobday).—Height 4 feet; haulm and pods dark green; pods in pairs; averaging nine large fine-flavoured Peas in each. Good crop; ready for use June 27; seeds wrinkled.

47. Essex Star (A. Dickson).—Height 5 feet; haulm and pods dark green; pods in pairs, handsome; averaging nine deep green very sweet Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

43. Essex Wonder, **A.M.** July 4, 1905 (Hobday).—Height 5 feet; haulms and pods dark green; pods in pairs; averaging nine large fine-flavoured Peas in each. Heavy crop; ready for use June 27; seeds wrinkled.

49. Eureka (Sutton).—Height 3 feet; haulm and pods dark green; pods in pairs; averaging eight large delicious Peas in each. Good crop; ready for use July 10; seeds wrinkled.

50. Excelsior, **A.M.** July 4, 1905 (Sutton).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging eight large very sweet Peas in each. Very heavy crop; ready for use June 20; seeds wrinkled.

51. Exhibition (Carter).—Height 4½ feet; haulm and pods deep green; pods in pairs; averaging eight large fine-flavoured Peas in each. A darker and improved form of 'Telephone.' Good crop; ready for use June 26; seeds wrinkled.

52. Exhibition Marrow (J. Veitch).—Height 3 feet; haulm and pods very dark green; pods in pairs; averaging eight large sweet Peas in a pod. Light crop; ready for use July 12; seeds wrinkled. This is quite distinct from No. 51.

53. Exhibition Marrowfat (Sutton).—Height 4 feet; haulm and pods dark green; pods in pairs, long and handsome; averaging nine large sweet Peas in each. Good crop; ready for use July 10. Distinct from Nos. 51 and 52.

54. Exonian, **F.C.C.** July 1, 1887 (Sutton).—Height 2½ feet; haulm and pods pale green; pods in pairs; averaging six sweet Peas in each. Light crop; ready for use June 18; seeds wrinkled.

55. Extra Early Daisy (Carter).—An earlier and dwarfer form of the well-known 'Daisy.' Ready for use June 30.

56. Feltham Gem, **A.M.** July 14, 1903 (J. Veitch).—Height 2 feet; pods in pairs, handsome; averaging six large delicious Peas in each. Heavy crop; ready for use July 5; seeds wrinkled.

57. Fillbasket, **F.C.C.** 1872 (Sutton).—Height 3 feet; haulm and pods deep green; pods in pairs; averaging seven Peas of fair flavour in each. Good crop; ready for use June 27; seeds slightly wrinkled.

58. Fortyfold (Sutton).—Height 5½ feet; haulm and pods dark green; pods in pairs; averaging seven large sweet Peas in each. Heavy crop; ready for use July 15. A fine stock of this popular old late Pea; seeds wrinkled.

59. Gleaner, **A.M.** July 3, 1903 (J. Veitch).—Height 3½ feet; haulm and pods very dark green; pods in pairs; averaging eight large very sweet Peas in each. Heavy crop; ready for use June 26; seeds wrinkled.

60, 61, 62. Glory of Devon, **A.M.** July 11, 1899 (Sutton, Sharpe, Barr).—Height 4 feet; haulm and pods dark green; pods in pairs;

averaging eight very large fine-flavoured Peas in each; handsome. Good crop; ready for use July 10; seeds wrinkled.

63. Gradus, **F.C.C.** July 1, 1887 (Sutton).—Height 2 feet; haulm and pods deep green; pods single; averaging eight large and very sweet Peas in each. Good crop; ready for use June 23; seeds wrinkled.

64. Green Gem, **A.M.** July 4, 1905 (Sutton).—Height 18 inches; haulm and pods very dark green; pods in pairs; averaging nine large delicious Peas in each. Heavy crop; ready for use June 23; seeds wrinkled.

65. Hamble (Stanard).—Height 4 feet; haulm and pods dark green; pods in pairs; averaging seven sweet Peas in each. Good crop; ready for use July 15; seeds wrinkled.

66. Harbinger, **A.M.** June 20, 1901 (Sutton).—Height 1 foot; haulm and pods deep green; pods in pairs; averaging six very sweet Peas in each. Good crop; ready for use June 16; seeds wrinkled.

67. Harrison's Glory (Sutton).—Height 4 feet; haulm and pods deep green; pods in pairs, small; averaging five moderately sweet Peas in each. Good crop; ready for use July 11; seeds slightly wrinkled.

68. Hercules (A. Dickson).—Height 4½ feet; haulm and pods dark green; pods in pairs, handsome; averaging nine sweet Peas in each. Heavy crop; ready for use June 27; seeds wrinkled.

69. Home Rule (Cannell).—Height 2½ feet; haulm and pods deep green; pods in pairs; averaging six large Peas in each. Fair crop; ready for use June 26; seeds wrinkled. This variety suffered from wire-worm.

70. Ideal, **F.C.C.** July 3, 1903 (Sutton).—Height 2 feet; haulm and pods very dark; pods in pairs; averaging six large fine-flavoured Peas in each. Good crop; ready for use June 23; seeds wrinkled.

71. Improved William I. (Sutton).—A good stock of this well-known old Pea, but superseded now by earlier and finer-flavoured varieties, such as 'Little Marvel.' Ready for use June 18.

72. James Grieve (Stanard).—Height 3½ feet; haulm and pods dark green; pods in pairs; averaging eight large good-flavoured Peas in each. Moderate crop; ready for use June 21; seeds wrinkled.

73. James Stanard (Stanard).—Height 3½ feet; haulm and pods pale green; pods in pairs; averaging eight large whitish but very sweet Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

74. King of the Dwarfs (Sutton).—Not a success.

75. Late Queen, **A.M.** July 10, 1900 (Sutton).—Height 3½ feet; haulm and pods very dark green; pods in pairs; averaging eight large fine-flavoured Peas in each. Heavy crop; ready for use July 15; seeds wrinkled. A splendid late variety.

76. Laxton's Standard (Divers).—Height 3 feet; haulm and pods pale green; pods single; averaging five Peas in a pod. Good crop; ready for use July 5; seeds wrinkled. This is distinct from 'Standard' which received an **A.M.** July 10, 1900.

77, 78, 79. Little Marvel, **A.M.** July 11, 1902 (Sutton, Barr, Carter).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging eight medium-sized and remarkably sweet Peas in each. Great crop; ready for use June 18; seeds wrinkled. This proved the best early variety.

80. Lord Roberts, **A.M.** July 18, 1902 (Sutton).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging seven large sweet Peas in each. Light crop; ready for use July 6; seeds wrinkled.

81. Lord Rosebery, **A.M.** July 8, 1902 (J. Veitch).—Height 3 feet; haulm and pods very dark green; pods in pairs, handsome; averaging eight large fine-flavoured Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

82. Magnificent, **F.C.C.** July 15, 1884 (Barr).—Height 2 feet; haulm deep green; pods a darker colour, in pairs; averaging six exceptionally large Peas in a pod. Good crop; ready for use July 10; seeds wrinkled.

83. Magnum Bonum Marrowfat (Sutton).—Height 4 feet; haulm and pods dark green; pods single; averaging eight large delicious Peas in each. Light crop; ready for use July 12; seeds wrinkled.

84. Market Favourite (Sutton).—Height 4 feet; haulm and pods deep green; pods in pairs; averaging six Peas in a pod. Heavy crop; ready for use June 26; seeds wrinkled.

85, 86. Masterpiece (Sutton, J. Veitch).—Height 3 feet; haulm and pods very dark green; pods in pairs; averaging eight large very green sweet Peas in each. Heavy crop; ready for use July 8; seeds wrinkled.

87, 88. Matchless Marrowfat (Sutton, Daniels).—Height 4 feet; haulm and pods pale green; pods in pairs; averaging nine very large deliciously flavoured Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

89. Mayflower (Carter).—Height 2 feet; haulm and pods deep green; pods in pairs, of medium size; averaging six good-flavoured Peas in each. Good crop; ready for use June 24; seeds wrinkled.

90. May Queen (Sutton).—Height 2 feet; haulm and pods pale green; pods single; averaging eight large Peas of fair flavour in each. Light crop; ready for use June 16; seeds wrinkled.

91. Mercury (Stanard).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging eight large fine-flavoured Peas in each. Moderate crop; ready for use July 10; seeds wrinkled.

92. Michaelmas (Carter).—Height 3 feet; haulm and pods dark green; pods in pairs, of medium size, packed with eight large sweet Peas in each. Heavy crop; ready for use July 15; seeds wrinkled. A fine late variety.

93. Monarch **A.M.** June 28, 1900 (Sharpe).—Height 3½ feet; haulm and pods deep green; pods in pairs; averaging seven large Peas in each. Moderate crop; ready for use June 26; seeds wrinkled.

94. Ne Plus Ultra (Sutton).—A splendid stock of this grand old variety, which still heads the list for flavour, and is so well known as to need no description. Ready for use July 10.

95. Nonpareil (Sutton).—Not a success.

96. Norfolk Hero (Cannell).—Height 3 feet; haulm and pods very dark green; pods in pairs; averaging six large fine-flavoured Peas in each. Good crop; ready for use July 8; seeds wrinkled.

97. Peerless Marrowfat, **F.C.C.** July 14, 1903 (Sutton).—Height 2½ feet; haulm and pods very dark green; pods in pairs, very handsome; averaging eight large delicious Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

98. Perfect Gem, **A.M.** July 5, 1901 (Sutton).—Height 2 feet; haulm and pods deep green; pods in pairs; averaging six large very sweet Peas in each. Heavy crop; ready for use June 26; seeds wrinkled.

99. Perfection Marrowfat (Cannell).—Height 3 feet; haulm and pods deep green; pods in pairs; averaging eight Peas of good flavour in each. Light crop; ready for use July 15; seeds wrinkled.

100. Perpetual (Sutton).—Height 3 feet; haulm and pods deep green; pods in pairs; averaging eight large fine-flavoured Peas in each. Good crop; ready for use July 12; seeds wrinkled. A good late variety.

101. Prestige, **A.M.** July 5, 1901, under the name of 'Prolific Late Marrow' (J. Veitch).—Height $3\frac{1}{2}$ feet; haulm and pods very dark green; pods in pairs; averaging nine large green and very sweet Peas in each. Heavy crop; ready for use July 3; seeds wrinkled.

102. Pride of the Market, **F.C.C.** July 22, 1881 (Sutton).—Not a success; severely attacked by wire-worm.

103. Prince of Peas (Sutton).—Height 5 feet; haulm and pods dark green; pods in pairs; averaging nine large sweet Peas in each. Good crop; ready for use June 26; seeds wrinkled.

104. Prince of Wales (Sutton).—Height $2\frac{1}{2}$ feet; haulm and pods pale green; pods single, small; averaging four inferior Peas in each. Light crop; ready for use June 26; seeds slightly wrinkled.

105. Prize-winner, **F.C.C.** July 5, 1901 (Sutton).—Height 3 feet; haulm and pods dark green; pods in pairs; averaging eight fine sweet Peas in each. Good crop; ready for use July 5; seeds wrinkled.

106. Record (A. Dickson).—Height 3 feet; haulm and pods dark green; growth weak, and not a success.

107. Rex Improved (A. Dickson).—Height $3\frac{1}{2}$ feet; haulm and pods very dark green; pods in pairs; averaging six large sweet Peas in each. Moderate crop; ready for use June 27; seeds wrinkled.

108. Royal Salute (A. Dickson).—Height $3\frac{1}{2}$ feet; haulm and pods very dark green; pods in pairs, handsome; averaging eight very large sweet Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

109. Royal Standard (Smith).—Height $5\frac{1}{2}$ feet; haulms and pods very dark green; pods in pairs; averaging eight large fine-flavoured Peas in each. Heavy crop; ready for use July 10; seeds wrinkled. A strong and good late variety.

110. Royal Warrant (Dickson).—This did not germinate well.

111. Sangster's No. 1 (Sutton).—This favourite of 25 years ago is now quite out of date, and superseded by earlier, better croppers, and finer-flavoured varieties; at the same time it shows how great the advance has been in early Peas.

112. Seedling Marrowfat (Sutton).—Height 1 foot; haulm and pods deep green; pods in pairs, very large; averaging eight very sweet Peas in each. Good crop; ready for use June 22; seeds wrinkled.

113. Selected Gladstone, **F.C.C.** July 18, 1902 (Sutton).—Height 4 feet; haulm and pods very dark green; pods in pairs, handsome; averaging eight large deep green fine-flavoured Peas in each. Heavy crop; ready for use July 15; seeds wrinkled.

114. Sensation (Barr).—Height $1\frac{1}{2}$ foot; haulms and pods deep

green; pods in pairs; averaging seven large sweet Peas in each. Good crop; ready for use July 1; seeds wrinkled.

115. Shamrock (A. Dickson).—Height 4½ feet; haulms and pods pale green; pods single; averaging six sweet Peas in each. Light crop; ready for use June 26; seeds wrinkled.

116. Sharpe's Queen, **A.M.** July 5, 1901 (Sharpe).—Height 4 feet; haulm and pods very dark green; pods in pairs; averaging six large delicious Peas in each. Good crop; ready for use July 10; seeds wrinkled.

117, 118. Standard, **A.M.** July 10, 1900 (Sharpe, Barr).—Height 4 feet; haulm and pods deep green; usually in pairs; averaging six sweet Peas in each. Good crop; ready for use July 5; seeds wrinkled.

119. Stourbridge Marrow (Sutton).—Height 5 feet; haulm and pods dark green; pods in pairs; averaging eight large delicious Peas in each. Heavy crop; ready for use July 10; seeds wrinkled.

120, 121. Stratagem, **F.C.C.** July 7, 1882 (Sharpe, Sutton).—Height 2½ feet; haulm and pods dark green; pods in pairs; averaging eight large very sweet Peas in each. Heavy crop; ready for use July 10; seeds wrinkled. This old variety is still excellent.

122. Sturdy (J. Veitch).—Not a success.

123. Sutton's Maincrop (Sutton).—Not a success.

124. Tall edible-podded (Barr).—Height 5½ feet. A robust and prolific variety of this type of Peas. Ready for use July 13.

125, 126. Telegraph (Sutton, Sharpe).—Height 5 feet; haulm and pods deep green; pods in pairs; averaging nine large sugary Peas in each. Heavy crop; ready for use July 6; seeds wrinkled.

127. Telephone, **F.C.C.** June 27, 1878 (Sutton).—Height 5 feet; haulm and pods dark green; pods in pairs; averaging eight large sweet Peas in each. Heavy crop; ready for use June 26; seeds wrinkled.

128. The Bell (Bell & Bieberstedt).—Height 3 feet; haulm and pods deep green; pods in pairs; averaging eight sweet Peas in each. Moderate crop; ready for use July 15; seeds wrinkled.

129. The Daisy, **F.C.C.** July 11, 1902 (Sutton).—So well known that any description is needless. Ready for use July 1.

130. The Hemsley (Cheal).—Height 6 feet; haulm and pods dark green; pods in pairs; averaging six sweet Peas in a pod. Light crop; ready for use July 10; seeds wrinkled.

131. The Herald (Barr).—Height 18 inches; haulm and pods dark green; pods in pairs; averaging seven large good-flavoured Peas in each. Light crop; ready for use June 26; seeds wrinkled.

132. The Logan (Eyre).—Height 4 feet; haulms and pods pale green; pods single, very large; averaging eight fine delicious Peas in each. Good crop; ready for use July 6; seeds wrinkled.

133. The Pilot (Sutton).—Height 3½ feet; haulm and pods deep green; pods usually single; averaging six very sweet Peas in each. Heavy crop; ready for use June 21; seeds wrinkled.

134. The Scotchman (Bell & Bieberstedt).—Height 3½ feet; haulm and pods dark green; pods in pairs; averaging seven large Peas in each. Light crop; ready for use July 12; seeds wrinkled.

135. The Sherwood, **A.M.** July 5, 1901 (Sutton).—Height 1 foot;

haulm and pods deep green; pods in pairs; averaging six sweet Peas in each. Heavy crop; ready for use June 21; seeds wrinkled.

136, 137. Thomas Laxton, **A.M.** July 5, 1898 (Laxton, Sutton).—Height 2 feet; haulm and pods dark green; pods in pairs; averaging eight fine-flavoured Peas in each. Good crop; ready for use June 24; seeds wrinkled.

138. Twentieth Century (Francklin).—Height 2 feet; haulm and pods deep green; pods in pairs; averaging seven large sweet Peas in each. Heavy crop; ready for use July 11; seeds wrinkled.

139. Improved Stratagem (J. Veitch).—See Nos. 120, 121.

140. Veitch's Maincrop, **F.C.C.** July 24, 1894 (Sutton).—Height 3 feet; haulm and pods dark green; pods in pairs; averaging seven very large sugary Peas in each. Heavy crop; ready for use July 1; seeds wrinkled. This is distinct from 'Sutton's Maincrop,' and a fortnight earlier in coming into use.

141. Veitch's Perfection (Sutton).—Height 4 feet; haulm and pods dark green; pods in pairs; averaging seven very sweet Peas in each. Heavy crop; ready for use July 15; seeds wrinkled.

142. Victor Marrowfat (Carter).—Height 18 inches; haulm and pods dark green; pods in pairs; averaging seven large delicious Peas in each. Good crop; ready for use June 26; seeds wrinkled.

143. Victoria (Sutton).—Height 5 feet; haulm and pods deep green; pods in pairs; averaging eight large Peas in each. Heavy crop; ready for use July 10; seeds slightly wrinkled.

144. Walker's Perpetual Bearer, **F.C.C.** August 9, 1881.—Height $3\frac{1}{2}$ feet; haulm and pods very dark green; pods in pairs; averaging six delicious Peas in each. Heavy crop; ready for use July 15; seeds wrinkled.

145. Western Express, **A.M.** July 11, 1902 (Barr).—Height 3 feet; haulm and pods deep green; pods in pairs; averaging six sweet Peas in each. Moderate crop; ready for use June 23; seeds wrinkled.

146. William Hurst (Sutton).—Not a success.

147. William I., **F.C.C.** 1872 (J. Veitch).—See No. 71.

148. Wordsley Wonder (Sutton).—Not a success.

149. Yorkshire Hero (Sutton).—Height 3 feet; haulm and pods very dark green; pods in pairs; averaging six sweet Peas in each. Moderate crop; ready for use July 6; seeds wrinkled.

EXAMINATION IN HORTICULTURE, 1905.

The Annual Examination in the Principles and Practice of Horticulture was held on April 12, 1905, when 160 papers were sent in.

Three hundred marks were allotted as a maximum, all candidates who obtained 250 marks and upwards being placed in the First Class. The total number of these was 20, or 12·5 per cent. of the whole.

Those who secured 200 marks, and less than 250, were placed in the Second Class. The number was 67, or nearly 42 per cent.

Those who obtained 100 marks and upwards were placed in the Third Class, the number being 71, or nearly 44·4 per cent. Three only were not placed.

There has been a continuous decrease in the number of candidates since the Council adopted a more advanced syllabus, as there were 229 in 1902; 198 in 1903; 190 in 1904; and 160 in 1905.

Comparing the percentages of the number in each class with those of 1904, they were: last year, First Class, about 18·3; Second Class, about 49·2; Third Class, about 32·4; so that the greatest reduction is in the First Class, or about one-third.

With regard to the *Elementary Principles*, the syllabus now requires a higher standard of knowledge; but many of the papers of the First Class were quite equal to it, especially perhaps in matters which are presumably learnt from books. Comparatively few of the 160 attempted to give the morphological characters of the two natural orders required. One infers that this elementary branch of Botany does not meet with the encouragement it deserves.

In *Practical Horticulture* the candidates confined their answers more strictly to the letter of the questions than they have done on previous occasions, and the knowledge imparted by the various lecturers throughout the country has evidently not been in vain. Two of the questions (Nos. 2 and 5) were almost entirely neglected. Only four candidates answered question 8. Nine gave answers to No. 6. Thirty-six answered question No. 3. Eighty-three answered No. 1. Eighty-six answered No. 7. One hundred and thirty-five answered No. 4. One hundred and thirty-nine answered No. 5. And one hundred and forty-one answered No. 2.

GEORGE HENSLOW, M.A., V.M.H., } *Examiners.*
JAMES DOUGLAS, V.M.H.,

First Class.

	No. of Marks gained.
1. Tate, A. I., Lady Warwick College, Studley Castle, Studley .	290
2. Murrell, P., University College, Reading	280
3. Villiers-Stuart, G. E., A.R.H.S., Horticultural College, Swanley	275

		No. of Marks gained.
4.	Foster, M. G., Lady Warwick College, Studley Castle, Studley	270
	Schlaepfer, L., Lady Warwick College, Studley Castle, Studley	270
	Truman, J. M., Lady Warwick College, Studley Castle, Studley	270
7.	Cooke, H. J., University College, Reading	265
	Waterhouse, T.C., Lady Warwick College, Studley Castle, Studley	265
9.	Horwood, H. G., University College, Reading	260
10.	Caton, H. O., Horticultural College, Swanley	255
	Robinson, H. S., Horticultural College, Swanley	255
	Simms, F. A. M., Horticultural College, Swanley	255
13.	Allen, W. M., Lady Warwick College, Studley Castle, Studley	250
	Attneave, L. E., A.R.H.S., Horticultural College, Swanley	250
	Bath, G., Horticultural College, Swanley	250
	Longman, S., University College, Reading	250
	Lucas, N., Horticultural College, Swanley	250
	Richardson, C., Edinburgh School of Gardening, Corstorphine	250
	Stephenson-Peach, D., Horticultural College, Swanley	250
	Williams, P., Glynde School for Lady Gardeners	250

Second Class.

21.	Eley, A., Horticultural College, Swanley	245
	French, L., Horticultural College, Swanley	245
	Hoyle, A. J., The Cemetery, Bacup, Lancs.	245
	Patteson, K., Horticultural College, Swanley	245
	Pellew, C., University College, Reading	245
26.	Cadman, D. A., Newton House, Ascham Road, Bournemouth	240
	Dedman, J. M., Spondon Hall Gardens, near Derby	240
	Greaves, D., Horticultural College, Swanley	240
	Herrington, W., Church House, Cuckfield	240
	Philp, R. W., Rotherfield, Tunbridge Wells	240
	Sadler, W. H., Yew Tree Cottages, Potton, Beds	240
	Young, B. M., University College, Reading	240
33.	Barcham, E. M. G., Essex County School of Horticulture, Chelmsford	235
	Coleman, P. A., Upland Road, Selly Park, Birmingham	235
	Green, J. J., Higher King Street, Hurst, Ashton-under-Lyne	235
	Holt, J., Litlington, Royston, Herts	235
	Isted, F., The Gardens, Overstrand, Cromer	235
	Joseph, B. G., Horticultural College, Swanley	235
	Walker, B., Bigods Hall, Dunmow	235
40.	Avery, Edw., Gunnersbury House Gardens, Acton	230
	Comrie, L. J., 8 Lauriston Park, Edinburgh	230
	Damsell, G. S., University College, Reading	230
	Horwood, J. A., University College, Reading	230
	James, Rees, Alexander Park, Penarth	230
	Landenberg, L. W., Lady Warwick College, Studley Castle, Studley	230
	Mitchell, L. A., University College, Reading	230
	Pragnell, C., The Gardens, High Cannons, Shenley	230

		No. of Marks gained.
48.	Bell, M., University College, Reading	225
	Hallowes, G.M., Lady Warwick College, Studley Castle, Studley	225
	Lawrance, S., University College, Reading	225
	Partington, E., Lady Warwick College, Studley Castle, Studley	225
	Pryce, W., Barkway Schools, Royston, Herts	225
	Robson, M. M., Edinburgh School of Gardening, Corstorphine	225
54.	Bennett, E., A.R.H.S., Horticultural College, Swanley	220
	Kalisky, G., A.R.H.S., Horticultural College, Swanley	220
	Leaver, H. F., Letheringsett, Holt, Norfolk	220
	McKerrow, E. M., Horticultural College, Swanley	220
	Murphy, K., Horticultural College, Swanley	220
59.	Dodd, W. G., 98 Gordon Road, Harborne, Birmingham	215
	Fitzwater, W. J., 5 Harvey Road, Walton-on-Thames	215
	Tait, D. R., Royal Botanic Gardens, Edinburgh	215
	Wilson, J. M., Horticultural College, Swanley	215
63.	Down, W. J., 298 Kew Road, Kew	210
	Foulkes, W. T., Mostyn Schools, Holywell, North Wales	210
	Glover, J. C., School House, Warborough, Wallingford	210
	Hull, R. C., Horticultural College, Swanley	210
	Penny, M., Lady Warwick College, Studley Castle, Studley	210
	Robinson, F., Bigods Hall, Dunmow	210
	Rogers, M. R., Horticultural College, Swanley	210
	Sweeney, J. E., University College, Reading	210
	Townley, F., Clappersgate, Ambleside, Westmorland	210
	Valery, M., Rosebank, Buxted, Sussex	210
73.	Bale, M., Horticultural College, Swanley	205
	Bevington, K., Horticultural College, Swanley	205
	Holmes, C., Horticultural College, Swanley	205
	Moore, H. J., 18 Victoria Cottages, Sandycombe Road, Kew	205
	Ransley, A. W. C., Essex County School of Horticulture, Chelmsford	205
78.	Aquatias, P. A., 10 Addison Road, Wanstead	200
	Clayton, J. E., Lady Warwick College, Studley Castle, Studley	200
	Hall, T., The Lodge, Morley Manor, Derby	200
	Hart, A. L., Lady Warwick College, Studley Castle, Studley	200
	Hawthorn, W. H., Frensham Hill Gardens, Farnham	200
	Heard, A., Essex County School of Horticulture, Chelmsford	200
	Jackson, T., 21 High Street, near Bury, Lancs.	200
	Jeffery, E., Haigh Hall Gardens, Wigan	200
	Lewis, N. W., Essex County School of Horticulture, Chelmsford	200
	Sinclair, A., Edinburgh School of Horticulture, Corstorphine	200

Third Class.

88.	Borlase, W., Springfield, Tregolls Road, Truro	195
	Miller, J., Norwood Gardens, Alloa	195
	Mowbray, G., Lower Hare Park Gardens, near Newmarket	195

		No. of Marks gained.
	Smith, V. A., Bigods Hall, Dunmow	195
88.	Summerfield, T. A., 15 Bridge Road West, Battersea, S.W.	195
	Watney, O. G., Lady Warwick College, Studley Castle, Studley	195
	Baldock, C. H., University College, Reading	190
	Brown, E. K., Copthall, Uckfield, Sussex	190
	Eason, F., Essex County School of Horticulture, Chelmsford	190
94.	Fuller, W. M., The Gardens, Farming Woods, near Thrapston, North Hants	190
	Oliver, W., Kirkby Fleetham, Bedale	190
	Palmar, W. S., University College, Reading	190
	Quarry, R. S., Royal Botanic Gardens, Edinburgh	190
	Syme, G. M., Edinburgh School of Horticulture, Corstorphine	190
	Crisp, W. C., Upperbobster, Coleford, near Bath	185
	Garbutt, T., Sea View Gardens, Ryhope Road, Sunderland	185
	Keller, D. H., Cricklewood, East Sheen, Surrey	185
102.	Newton, W. E., Essex County School of Horticulture, Chelmsford	185
	Noble, H., 49 East Street, Lindley, Huddersfield	185
	Roberts, J. C., University College, Reading	185
	Traill, A., Horticultural College, Swanley	185
	Cattell, W. J., 111 Vine Street, Coventry	180
109.	Simpson, A., 23 Sandfield, Gateacre, Liverpool	180
	Talbot, W. H., Essex County School of Horticulture, Chelmsford	180
	Anderson, J. W., Teaninich, Craigmillar	175
	Fuller, F., 3 Egerton Terrace, Latchford, Warrington	175
	Grindrod, J., Audley End Gardens, Saffron Walden	175
112.	Ogdon, H. U., Allestree Hall Gardens, near Derby	175
	Ritchie, W., Bigods Hall, Dunmow	175
	Smith, F. E., University College, Reading	175
	Bromilow, W., Chapel Farm, Chapel Green, Hindley	170
	Buddles, J., Bigods Hall, Dunmow	170
	Paddock, W. P., Eaton Bray School House, Dunstable	170
118.	Redding, W., School House, Wormley, Broxbourne	170
	Russell, P. H., Essex County School of Horticulture, Chelmsford	170
	Smart, J. K., The Castle Gardens, Ballindalloch, Banffshire	170
	Billing, E. J., 31 New Buildings, Hampstead, N.W.	165
124.	Shaw, J. G., The Gardens, Lissadell, Sligo, Ireland	165
	Thompson, E., Bigods Hall, Dunmow	165
	Bainbridge, E. H., Dale Bank, Ashover, Chesterfield	160
	Davies, S., Caxton Cottage, Lechdale, Glos.	160
127.	Harris, J., Luffness Gardens, Aberlady, N.B.	160
	Spark, F. W., The Gardens, Williamstrep Park, near Fairford	160
	Williams, G. C., Brynderwen Gardens, near Abergavenny, Mon.	160
	Bologna, M., A.R.H.S., Battersea Polytechnic, S.W.	155
132.	Francis, R., Croom Court, Severn Stoke, Worcester	155
	Smith, E. C., Essex County School of Horticulture, Chelmsford	155
135.	Worley, A. G., Hambleden, Oatlands Avenue, Weybridge	150

		No. of Marks gained.
136.	Higgins, A., Hornchurch Homes, Romford, Essex	145
	Samuels, A., School House, Linton, Cambs.	145
	Sharland, F. T., Rockhurst, W. Hoathly, Sussex	145
	Tizzard, W. H., Bletchingley House Gardens, Bletchingley	145
140.	Bartlett, E. T., Horticultural College, Swanley	140
	Cruickshank, G. B., Kirktown House, Botriphnie, Keith, N.B.	140
	Moore, J., The Rocklands, Thornton Hough, Cheshire	140
	Polkinghorne, F. J., Polgwin, Bodmin	140
144.	Goodall, A. T., Reading Room, Streatley, near Reading	135
	Hill, W., 8 Canehill Cottages, Coulsdon	135
	Hockley, R., Essex County School of Horticulture, Chelmsford	135
	Marsh, A., The Barrows Gardens, Charles Hill, Farnham	135
	Marsh, E., Horticultural College, Swanley	135
149.	Buckell, E., Lew Cottage, Goring, Oxon	125
	Pearson, A. F., Essex County School of Horticulture, Chelmsford	125
	Salmon, K. J., University College, Reading	125
152.	Hammond, F., Rose Cottage, Goring-on-Thames	120
	Pilkington, J., 6 Banner Street, Wavertree, Liverpool	120
154.	Harris, C. P., Essex County School of Horticulture, Chelmsford	115
	Wilson, F. G., Station Road, Barton-under-Needwood	115
156.	Hawtin, T. H., High Street, Goring, Oxon	110
157.	Therkildsen, K., 16 Derby Street, Ormskirk	100
	West, H. W., Springhill Road, Goring-on-Thames	100

EXAMINATION IN COTTAGE AND ALLOTMENT GARDENING, 1905.

After a careful perusal of the 139 papers returned from the various centres, the Examiners have much pleasure in reporting a distinct advance in the answers pertaining to the practical treatment of Cottage and Allotment Gardens in general as compared with those of the previous Examination in 1904. It is worthy of note that the Candidate who this year comes out head of the First Class was last year only able to obtain a Second Class.

A goodly number of those in the First Class, notably such as form the upper half of it, have evidently gained considerable experience in the working of such gardens themselves, whilst some of the answers given have afforded peculiar pleasure to the Examiners.

The greater average of excellence shown this year has made it advisable to raise the standard in each class; this has been done by making a total of 150 marks necessary for obtaining a First Class, 120 marks for a Second Class, and 90 for a Third Class. The failures are 15 under this arrangement.

The answers given to Question 1 showed in several instances that the method of trenching was clearly understood.

Several Candidates greatly confused the terms "pyramids," "bushes," "cordons," and "espaliers" as applied to fruit trees. The term "herbaceous" as applied to flowering plants also showed a deficient knowledge, whilst, singular to say, only quite a minority included Roses amongst woody plants for cutting and bunching for sale or otherwise. "Annuals," "biennials," and "perennials" were also much confused with each other.

In the making up of hot-beds the replies were frequently vague and lacking in detail. Guesswork characterised some replies—notably in advising that "early Peas should be raised from roots saved over from the previous year," that "Raspberries should be propagated from cuttings," and that "Apples in some cases should be raised from seed."

Some replies showed clearly that knowledge gained from text-books had been turned to good account.

The results of these Examinations on the whole show that it is quite possible for the children in elementary schools to be well instructed in Cottage and Allotment Gardening, and the knowledge thereby imparted will, without doubt, bear good fruit in years to come.

N.B.—Candidates should bear in mind that answers ought to be written only on one side of the paper. Some did not note this essential point.

ALEXANDER DEAN, V.M.H.,
JAMES HUDSON, V.M.H., } *Examiners.*

First Class.

		No. of Marks gained.
1.	Hardy, J. W., Grundisburgh School, Woodbridge	198
2.	Taylor, G. A., Lovejoy, St. Peter's, Kent	196
3.	Bartram, A. W., School House, Totternhoe, Dunstable	195
4.	Atkinson, E., School House, Swaffham Prior, Cambridge	190
5.	Gunnell, E. M., St. Petrox School, Paignton, S. Devon	189
6.	Jeffries, H., Essex County School of Horticulture, Chelmsford	188
7.	Daniel, H., School House, Cromford, Matlock	186
8.	Hallam, C., Stetchworth School, Newmarket	184
9.	Holt, J., School House, Litlington, Royston, Herts	183
10.	Hosmer, W. A., School House, Bourton, S.O., Dorset	181
11.	Vince, R. W., School House, Dullingham, Newmarket	179
12.	Swift, R. G., Cholmondeley School, Whitchurch, Salop	175
13.	Ashley, E. W., Ivy House, Quainton, Aylesbury	173
14.	Avery, F., Middlesex County School of Gardening	172
	Moore, H., School House, Wheelock, Sandbach	172
16.	Close, H. E., Northiam, E. Sussex	171
17.	Fendick, T. F., Middlesex County School of Gardening	170
	Rowe, F. C., Bourn P. School, Cambridgeshire	170
	Willoughby, E. R., Middlesex County School of Gardening	170
20.	Crane, F. W., School House, Fen Ditton, Cambridge	169
21.	Sheppard, E., Burghfield School, Reading	168
22.	Moffatt, A., County Technical School, Stafford	166
	Stapleton, A., Essex County School of Horticulture, Chelmsford	166
	Turner, F., National School, Bolsterstone, Sheffield	166
	Whatmore, J., Middlesex County School of Gardening	166
26.	Miller, A., School House, Arpafulie, Tors, Ross-shire	165
27.	Apse, J., County Technical School, Stafford	164
28.	Mills, G. W. B., Council School, Nayland, Colchester	163
	Storm, R. E., Kessingland Upper School, Lowestoft	163
30.	Burgess, A., Burrough Green School, Newmarket	162
	Mills, E. A., Hopton Parochial School, Thetford	162
32.	Bunston, A., Allington, near Salisbury	160
	Kerridge, A. A., 51 St. Mary Street, Chippenham, Wilts	160
34.	Anderson, A., Eldergarth, Baildon, Yorkshire	159
35.	Allen, R. V., Guilden Morden, Royston, Herts	158
	Broad, C., School House, Steeple Morden, Royston, Herts	158
	Evason, J. A., National School, Comberton, Cambridge	158
	Roberts, W. C., Middlesex County School of Gardening	158
39.	Law, C. J., County Technical School, Stafford	157
	Wasdell, S., County Technical School, Stafford	157
41.	Roberts, W. M., School House, Haynford, Norwich	156
42.	Brown, E. K., Copthall, Uckfield, Sussex	154
	Peacocke, B., Essex County School of Horticulture, Chelmsford	154
44.	Anderson, A. H., Baildon, Shipley, Yorkshire	153
	Westwood, J., County Technical School, Stafford	153
46.	Williams, G. L., Middlesex County School of Gardening	152

		No. of Marks gained.
47.	Powell, G. W., Middlesex County School of Gardening	151
	Rogers, A. T., County Technical School, Stafford	151
	Sadler, W. H., 4 Yew Tree Cottages, Potton, Bedfordshire	151
50.	Archer, M. V., The Clive, Grinshill, Shrewsbury	150
	Graver, R. G., Market Bosworth, Nuneaton	150
	Hall, J. H., County Technical School, Stafford	150
	Paulson, W., F.R.H.S., N. Cockerington School, Louth	150
	Sarjeant, R. A., Middlesex County School of Gardening	150
	Stringer, W., Middlesex County School of Gardening	150
	Woolley, F. A., Kirby Hill School, Boroughbridge, Yorkshire	150

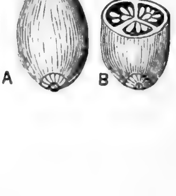
Second Class.

57.	Rose, T., Essex County School of Horticulture, Chelmsford	146
58.	Field, A. C., Boys' Council School, Fenny Stratford, Bletchley, Bucks	145
59.	Cowen, W. J., Throckley Schools, Newburn R.S.O., Newcastle-on-Tyne	144
60.	Williams, C. E., Middlesex County School of Gardening	142
61.	Foster, L., Pickhill National School, Thirsk, Yorks	141
	Green, C. H., County Technical School, Stafford	141
63.	Ash, E., Tarrant Keyneston School, Blandford	140
	Lord, E. S., Longsdon, Stoke-on-Trent	140
	Westwood, E., County Technical School, Stafford	140
66.	Siddall, F., Middlesex County School of Gardening	139
67.	Day, T., Middlesex County School of Gardening	137
	Oliver, W., Kirkby Fleetham, Bedale	137
	Trethewey, J. T., School House, Eynsham, Oxford	137
70.	Harvey, J. H., County Technical School, Stafford	136
	McMeekin, M. E., Middlesex County School of Gardening	136
72.	Blackman, W. H., F.R.H.S., Great Hale School, Heckington S.O., Lincs	135
	Davies, S., Caxton Cottage, Lechlade, Glos.	135
	Foulkes, W. T., Mostyn Schools, Holywell, N. Wales	135
75.	Baker, H., Boys' School, Charlwood, Surrey	134
	Foley, I., County Technical School, Stafford	134
	Last, F., County Technical School, Stafford	134
78.	Lyster, H. H., County Technical School, Stafford	133
79.	Glover, J. C., School House, Warborough, Wallingford	128
	Smith, W. J., The Nook, St. Peter's, Kent	128
81.	Bates, J. M., Slade Green School, Erith, Kent	127
	Leggott, C., Middlesex County School of Gardening	127
83.	Sterne, L., Felsham, Bury St. Edmunds	126
84.	Tomlinson, C., County Technical School, Stafford	125
85.	Ellis, S. J., Wolvercote Council School, Oxford	124
	Wayles, J., Princess St., Chase Terrace, Walsall	124
87.	Aldridge, F. J., School House, Croydon, near Royston	123
	Stubbings, H. C., County Technical School, Stafford	123

		No. of Marks gained.
89.	Aldersey, B. M., Essex County School of Horticulture, Chelmsford	121
	Knott, L. C., 6 Allerton Terrace, Meldreth, Royston	121
	Pasfield, H., County Technical School, Stafford	121
	Webb, G., East Orchard School, Shaftesbury, Dorset	121

Third Class.

93.	Bailey, R. J., County Technical School, Stafford	118
	Garratt, H., Watford Council School, Rugby	118
	Neal, A. B., Middlesex County School of Gardening	118
	Weatherley, F. H., Middlesex County School of Gardening	118
97.	Thorne, W., Babraham School, Cambridge	117
98.	Cross, A., Cove Cottage, South Marston, Wiltshire	116
	Fellows, G. H., County Technical School, Stafford	116
	Lewis, W., School House, Toot Baldon, Oxford	116
101.	Kilby, L. T., Chesterton School, Bicester, Oxon	114
	Redding, W., Wormley School, Broxbourne, Herts	114
	Simpson, H. G., County Technical School, Stafford	114
104.	Baker, J., County Technical School, Stafford	113
105.	Simcox, A. W., County Technical School, Stafford	111
106.	Sharley, W. H., County Technical School, Stafford	110
107.	Jones, J. R., Dean, Cockermouth	109
108.	Parker, T. E. H., School House, Crabb's Cross, Redditch	107
	Smale, H., Essex County School of Horticulture, Chelmsford	107
110.	Knight, R. A., School House, Hoo, Rochester	106
	Smith, E., 81 Divinity Road, Oxford	106
112.	FitzGeorge, W., County Technical School, Stafford	103
	Wass, W., Hope National School, Caergwrle, Wrexham	103
114.	Scott, E. A., Station Road, Quainton, Aylesbury	101
115.	Bologna, M., A.R.H.S., Battersea Polytechnic, S.W.	100
116.	Davies, T., County Technical School, Stafford	98
	Sutton, E. T., Great Alne School, Alcester	98
118.	Pym, T. P., Middlesex County School of Gardening	95
119.	Slack, R. W., County Technical School, Stafford	94
120.	Brown, A. L., Middlesex County School of Gardening	93
	Lombard, K., Talacre School, Gwespyr, Holywell	93
122.	Greatorex, R. L., Middlesex County School of Gardening	91
123.	Birdsall, W., Rufforth School, York	90
	Essex, E., School House, Wildbourclough, Macclesfield	90



COMMONPLACE NOTES.

By the Secretary and Superintendent.

Gifts.

The Society is constantly being indebted to kind and generous friends. In the last Journal we mentioned that we were in need of a good microscope for the use of the Scientific Committee.

Curiously enough, on the same day we received two offers to supply the want—one from Mrs. H. H. France-Hayhurst, who sent a magnificent instrument, fitted with a great number of appliances; the second from Sir H. Yorke, who sent a sum of money to purchase a microscope, and who, on being informed of Mrs. France-Hayhurst's gift, most readily consented to allow his instrument to be a students' microscope for use at Wisley. And subsequently Sir Trevor Lawrence, Bart., President of the Society, enabled us to purchase two additional high-power object lenses for each of the microscopes, so as to enable the working and development of the smallest insects and minutest fungi to be observed.

At the same time Lady Macleay offered to give, in memory of her husband, the late Sir George Macleay, of Pendell Court, a much wanted clock for the Council Room in our new building in Vincent Square. The offer, we need hardly say, was gladly accepted, and a very fine clock with bracket to stand upon is being made under the superintendence of Messrs. Cowtan, of Oxford Street, who provided all the furniture and fittings for the Council Room and Library.

A great many things have also been given us for the Wisley Gardens, some of which were mentioned in our last issue and some must be reserved for the next; but we cannot help mentioning the very valuable collections of ornamental trees and shrubs presented by the Royal Gardens, Kew, and by Messrs. G. Bunyard & Co., Maidstone; Clibrans, Altrincham; T. Cripps & Son, Tunbridge Wells; G. Jackman & Son, Woking; R. Notcutt, Woodbridge, Suffolk; R. Smith & Co., Worcester; James Veitch & Sons, Ltd., Chelsea; A. Waterer, Knapp Hill, Woking; J. Waterer & Sons, Bagshot.

A most complete collection of Fruit Trees and Bushes has also been presented by Messrs. G. Bunyard & Co., Maidstone; Dicksons, Chester; J. Fraser, South Woodford; H. Lane & Son, Berkhamsted, Herts; Hugh Lowe & Co., Bush Hill Park; Paul & Sons, Cheshunt, Herts; J. R. Pearson & Sons, Lowdham, Notts; Thos. Rivers & Son, Sawbridgeworth, Herts; S. Spooner & Sons, Hounslow, Middlesex; James Veitch & Sons, Ltd., Chelsea.

And, further, Mr. John Pinches, of Crown Street, Camberwell, has presented upwards of 4,000 specially made labels, to be hung with aluminium wire, for the naming of the collections of Fruit Trees &c.

A Society which has such real friends as these indeed shows evidence of vigorous life.

Plants Distributed.

Notwithstanding the very definite warning repeated year by year on the Society's distribution of plants form :—"Only surplus plants raised from seeds or cuttings are available for distribution. The great majority of the plants offered are therefore of necessity *very small*, and may require careful treatment for a time"—notwithstanding this, and the fact that the words "*very small*" are emphasised by being put in italics, a year seldom passes without some few Fellows grumbling because the plants when they get them are most of them small. Over and over again we have pointed out that small things grow into big if they are taken care of, and we have suggested how greatly it adds to a true plant-lover's interest to watch the plant growing from month to month and year to year. That they will so grow and amply repay a little kindly care let the following letter from a Fellow prove: "Among the small plants I received from the Society in February last was a *Lupinus arboreus*. I put it in a corner of my garden and it grew well and flowered a little, bearing white flowers. I think it may interest you to hear that it now measures round 21 ft.; that is, 7 ft. in diameter across the plant; and the circumference of the stem about an inch or so from the ground is five inches. Altogether it is a very fine specimen of a year's growth, I think." A very fine specimen indeed, and an excellent reproof to all who despise the day of small things.

Manuring Strawberries.

"What is the best artificial manure for Strawberries, and what quantity should be given?" Some few years ago we tried chemical manures on Strawberries, and after careful comparison we found the best results accrued from 1 oz. of nitrate of soda and 2 oz. of superphosphate to every square yard, applied just as the flower trusses begin to show themselves, care being taken that it did not fall upon the foliage. Then immediately the fruit was set we applied 1 oz. of muriate of potash a square yard, again carefully keeping it off the foliage—that is absolutely necessary. And we may mention in passing that another advantage was secured, namely, that these dressings of chemical manures almost entirely removed the nuisance which slugs so universally are, particularly in gardens.

Acanthus latifolius.

How often, in searching after rarities, we lose sight of easily obtainable beauties! The rarities are often undeniably beautiful when they grow and blossom freely. But how frequently they will not do so, notwithstanding all our care and toil! They live, and that is all. Often they look miserable and make a true lover of plants feel miserable to see them—so unkindly do they respond to our loving care—so unable are they to adapt themselves to their uncongenial surroundings of soil and climate. A tenth part of the trouble and expense bestowed upon really hardy and free-growing plants would repay us a thousandfold. Look at fig. 208. Is it not a stately plant? Has it not a beauty peculiarly its own—beauty of leaf, beauty of blossom, grace of habit—and all combined with absolute hardiness and ease of growth? Anyone can grow it if he will. And yet how seldom does one see it! The plant photographed grew in the garden of the Rev. W. J. Packe at Feering, in Essex, a devoted lover of hardy flowers.

And as it is with *Acanthus latifolius*, so it might be, so it would be, with a hundred and one other similarly beautiful and hardy plants if

FIG. 208.—ACANTHUS LATIFOLIUS AT FEERING VICARAGE, KELVEDON.

people would but abandon once and for all their ambition to grow "rarities" simply as rarities, without reference to their real beauty, as compared with commoner and less difficult subjects.

Statistics of Interest to British Horticulturists.

In continuation of the statistics given in the last volume of the Journal (Vol. XXVIII., pages 597–600) the following tables of Imports and Exports have been compiled from the Trade and Navigation Returns for 1904, printed in February 1905 :—

TABLE I.—SHOWING THE IMPORTS OF FRUIT AND VEGETABLES DURING 1902-1904.

—	Quantities			Values		
	1902	1903	1904	1902	1903	1904
Fruit :				£	£	£
Apples, raw . . . (cwts.)	2,843,517	4,569,546	3,771,781	1,923,474	2,781,643	2,118,374
Apricots and Peaches, raw ,,	16,112	9,578	13,465	33,391	21,584	32,907
Bananas, raw . . (bunches)	2,804,700	3,087,516	3,910,511	1,060,263	1,196,889	1,382,572
Cherries, raw . . . (cwts.)	166,359	110,192	260,830	216,421	167,142	319,969
Currants, raw . . . . ,,	76,080	76,419	117,352	92,112	110,535	144,390
Gooseberries, raw . . ,,	27,564	34,312	36,215	16,919	28,444	21,116
Grapes, raw . . . ,,	632,932	684,084	853,572	676,992	715,057	827,634
Lemons . . . . . ,,	1,003,298	978,318	989,296	417,152	406,728	408,500
Nuts : Almonds . . . ,,	149,574	157,156	153,015	554,460	544,934	515,005
,, other nuts, used as fruit ,,	783,788	791,281	706,065	641,394	667,902	590,336
Oranges . . . . . ,,	6,518,107	6,176,752	5,853,253	2,358,708	2,275,400	2,193,144
Pears, raw . . . . . ,,	491,906	271,518	542,624	439,536	326,463	510,691
Plums, raw . . . . . ,,	541,136	594,626	493,984	515,059	622,268	537,485
Strawberries, raw . . ,,	40,211	32,614	34,524	58,080	49,362	49,536
Unenumerated, raw . . ,,	500,679	688,873	654,765	308,998	449,413	372,575
Fruit, Dried :						
Currants . . . . . ,,	1,295,994	1,159,400	986,724	1,192,816	966,176	842,724
Raisins . . . . . ,,	662,459	758,191	670,220	1,201,378	1,150,541	1,006,959
Vegetables, Raw :						
Onions . . . . (bushels)	7,605,489	8,619,919	8,291,814	999,942	1,003,016	1,076,413
Potatos — From Germany . (cwts.)	258,692	2,228,695	1,661,632	44,994	422,569	334,851
Potatos — ,, France . ,,	2,248,443	2,796,483	4,157,698	626,271	839,791	987,243
Potatos — ,, Channel Islands . ,,	1,268,098	1,103,215	1,249,043	481,134	649,496	431,447
Potatos — ,, Other countries ,,	1,923,857	3,021,809	2,934,894	437,033	691,382	686,460
Total	5,699,090	9,150,202	10,003,267	1,589,432	2,603,238	2,440,001
Tomatos . . . . (cwts.)	783,894	1,071,927	1,134,697	700,126	953,192	1,007,278
Unenumerated	—	—	—	468,411	396,784	457,491
Flowers, Fresh :	—	—	—	267,281	248,689	242,454

From the above table it will be seen that, while the imports of Bananas, Cherries, Currants, Gooseberries, Grapes, Potatos, and Tomatos show a steady upward tendency, the quantities of Oranges and of dried Currants imported exhibit an equally steady decline. Many of the fluctuations in the other kinds of fruit are, in a measure, due to the abnormally bad crops of home-grown fruit in 1903, which necessitated a great rise in the imports that year.

But, viewing the immense imports of fruit in connection with our increase in the acreage under small fruits and orchards, it would seem that the consumption of fruit and vegetables per head of population is rapidly increasing, especially among the so-called "lower" classes.

The steady decline in the imports of flowers is a matter for congratulation, and may in a large measure be accounted for by the great quantities of early spring flowers—such as Daffodils, Snowdrops, &c.—which are grown in the Channel Islands, in the Scilly Islands, in Cornwall, Lincoln, Cambridge, and Norfolk.

When, however, it is remembered that the above table is constituted largely of such fruits as could be grown in this country, it affords us considerable matter for reflection, especially when we compare its figures with those in

TABLE II.—SHOWING THE EXPORTS OF FRUIT &c., 1902–1904.

—	Quantities			Values		
	1902	1903	1904	1902	1903	1904
FRUIT:				£	£	£
Lemons . . . . (cwts.)	24,260	26,816	22,203	12,071	13,684	9,286
Oranges . . . . . "	383,923	340,600	248,527	145,412	136,582	103,965
FRUIT, DRIED:						
Currants . . . . . "	23,674	23,944	23.281	22,785	20,429	19,939
Raisins . . . . . "	25,259	18,248	20,194	44,185	32,300	29,58
Pickles, vinegar, sauces, and condiments (including chutney) value £	—	—	—	670,742	577,178	630,464
Provisions, unenumerated . .	—	—	—	1,389,302	1,044,599	934,144
Confectionery, jams, and preserved fruits . . . . (cwts.)	333,763	319,736	314,780	846,609	801,067	811,877

IMPORTS AND EXPORTS OF WOOD AND TIMBER.

The two following tables show the imports and exports respectively of wood and timber during the same period—1902-1904—and it will be fairly admitted that they afford even more food for reflection than the Tables I. and II. which refer to fruit and vegetables. Against imports to the value of nearly twenty-five and three-quarter million pounds, we have exports to the value of only a little over the three-quarters of a million, thus leaving us twenty-five million excess of imports over exports, and, rather than this being an abnormal quantity, it will be seen that the imports during 1904 were lower than those in either of the two preceding years.

TABLE III.—SHOWING THE IMPORTS OF WOOD AND TIMBER DURING 1902–1904.

—	Quantities			Value		
	1902	1903	1904	1902	1903	1904
WOOD AND TIMBER:				£	£	£
Hewn: Fir, oak, teak, &c. (other than pit props or pit wood) . (loads)	832,239	916,070	775,361	3,340,298	3,844,589	3,074,410
Hewn: Pit props or pit wood "	1,978,485	2,321,348	2,332,577	2,094,906	2,535,365	2,485,113
Total of wood hewn . "	2,810,724	3,237,418	3,107,938	5,435,204	6,379,954	5,559,523
Sawn or split, planed or dressed "	6,676,726	6,742,233	6,066,162	17,171,422	18,192,519	15,505,625
Staves of all dimensions . "	119,992	129,773	132,178	668,630	570,859	527,696
Furniture woods, hardwoods, and veneers:						
Mahogany . . (tons)	61,896	88,942	103,770	532,438	797,125	892,728
Other sorts . . . . "	227,350	175,724	197,937	1,379,025	1,182,499	1,152,500
Total of wood and timber £	—	—	—	25,186,719	27,122,956	23,638,072
MANUFACTURES OF WOOD AND TIMBER:						
Furniture and cabinet ware . .	—	—	—	1,145,154	707,414	588,219
House frames, fittings, and joiners' work	—	—	—		469,227	332,627
Other sorts (including wood ware and wood turnery) . . .	—	—	—	1,320,520	1,168,621	1,162,475
Total of manufactures of wood and timber (including furniture) . . . . . . £	—	—	—	2,465,674	2,345,262	2,083,321

TABLE IV.—SHOWING THE EXPORTS OF WOOD AND TIMBER DURING 1902-1904.

—	Quantities 1902	Quantities 1903	Quantities 1904	Values 1902	Values 1903	Values 1904
WOOD AND TIMBER:				£	£	£
Hewn . . . . . (loads)	11,237	8,856	10,048	134,535	103,926	108,021
Sawn or split, planed or dressed „	25,660	25,301	23,071	137,015	130,220	142,801
Staves of all dimensions . „	5,576	7,596	6,563	55,492	60,154	38,183
Furniture woods, hardwood, and veneers:						
Mahogany . . (tons)	23,804	29,782	29,095	240,241	293,014	258,474
Other sorts . . „	7,736	9,400	10,612	79,720	95,274	93,611
Total of wood and timber £	—	—	—	647,003	682,588	641,090
MANUFACTURES OF WOOD AND TIMBER:						
Furniture and cabinet ware . .	—	—	—	—	33,601	35,725
House frames, fittings, and joiners' work	—	—	—	48,887	10,706	4,841
Other sorts (including wood ware and wood turnery) . . .	—	—	—	138,868	135,595	129,692
Total of manufactures of wood and timber . . . . . £	—	—	—	187,755	179,902	170,258

ACREAGE RETURNS.

In issuing the Acreage Returns, taken on June 4, 1904, the Board of Agriculture points out that—

> Potatos occupy an area of 570,209 acres in Great Britain, or 5,923 more than in 1903. This increase has taken place almost entirely in Scotland, where there are 6,371 acres (of which 1,089 are in Perth) more than last year, while in Wales there is a decline of 483 acres. The majority of English counties show a decline in area (amounting to as much as 1,488 acres in Cambridgeshire) balanced by gains of 4,674 acres in Lincoln, the most considerable potato-growing county, 1,122 acres in Stafford, 867 acres in Lancashire, and smaller increases in a few other counties. The substantial increase in Lincolnshire is partly attributed by the collectors to the encouragement afforded by the success of certain new varieties.

It must, however, be remembered that this acreage is less than that recorded in 1901, when it was 577,260, and in 1902, when 573,880 acres were returned; and, considering there were 579,222 acres under Potatos in 1889, this increase is more apparent than real; and, notwithstanding the great increase in our population and the improvement in their diet, the Potato acreage has not materially increased, although the imports of Potatos exhibit a steady upward tendency.

The increase under small fruits is, however, definite and assuring. These crops were first returned separately in 1888, when 36,724 acres were found to be under small-fruit cultivation, and since then the figures have steadily grown, until 1904 again makes a record return. The Board comment on this as follows:—

> The acreage under small fruit has shown a continual tendency to increase, and a further gain of 1,795 acres, or 2·4 per cent., is recorded this year, making the total of 77,947 acres, the largest ever returned. Most counties show an increase, more particularly Middlesex, Norfolk, Worcester, Cambridge, and Perth. Orchards also show an increase of 3,525 acres, or 1·5 per cent., of which over 1,000 acres are reported in Kent. The other principal orchard-bearing counties—Hereford, Devon, Somerset, Worcester, and Gloucester—all return larger areas than in 1903.

As will be seen from the following table, not only the acreage under small fruits, but also that under orchards, show a most satisfactory expansion, and we trust that the Report of the Departmental Committee of the Board of Agriculture on Fruit will still further stimulate and encourage the planting of fruit-trees and bushes in this country.

TABLE V.—SHOWING THE ACREAGE UNDER SMALL FRUIT AND UNDER ORCHARD CULTIVATION, 1902-1904.

—	Small Fruits			Orchards *		
Year	1902	1903	1904	1902	1903	1904
	acres	acres	acres	acres	acres	acres
England	68,263	68,968	70,612	230,673	233,286	236,705
Wales	1,203	1,230	1,263	3,767	3,748	3,813
Scotland	5,912	5,954	6,072	2,416	2,449	2,490
Great Britain	75,378	76,152	77,947	236,856	239,483	243,008
Isle of Man and Channel Islands	698	525	521	1,697	1,997	1,691

* The acreage under orchards is that of arable or grass land used for fruit trees of any kind.

American Blight.

Numberless correspondents complain of woolly aphis, and many and various are the remedies recommended—and of these it must depend on the time of year as to which we should choose. In the winter, the best mode of dealing with woolly aphis is to obtain a good powerful garden-engine-pump and spray all the trees from top to toe with a wash made of one pound of caustic soda and one pound of crude potash dissolved in ten gallons of hot water. A still day should be chosen for the work, and the operator should always wear stout leather gloves and his oldest clothes, as the mixture burns both the skin and the clothes. It is well also to wear good big spectacles of plain glass, and to spray as far as possible in the same direction as the wind (if there is any) blows. This wash will not in the least injure the trees *whilst they are dormant*, but it will kill all the woolly aphis it comes in contact with, and will also cleanse the trees from all lichen and mossy growths.

In the growing season of the trees, an emulsion of paraffin and soft soap applied by hand with a brush is an excellent remedy, though of course it is both difficult and slow in applying it to large and old trees; and when we say it is difficult and slow, that is tantamount to saying it is a somewhat expensive method. The expense, however, can be reduced to a minimum by employing a boy, who will rather enjoy the work, and providing him with a light ladder, a high pair of steps, a pailful of emulsion, a small paint-pot to hold a little of it at a time, and an old scrubbing-brush or stiff paint-brush, and set him to scrub the tree all over wherever he sees the white woolly patches. It is important to have a big stick in the pail and keep it well stirred up every time before the little paint-pot is filled.

Lawns.

A Fellow inquires how to rid a lawn of coarse weeds. If the lawn is very bad the best plan is to dig it all up and re-sow early in April with good seed procured from a really reliable source. The old plan of sweeping out the floor of a hayloft and sowing the produce, is the very best way to sow and obtain, a magnificent crop of weeds of all sorts. If the lawn is not so bad as to necessitate absolute re-formation, we should advise sowing the lawn with one ounce of sulphate of ammonia to the square yard, first in April, again in May, again in June, and fourthly in July, taking care to distribute it evenly and *in dry weather*. This will kill all the broad and flat leaved weeds and encourage the grass, and then if mowing is done *every* week regularly, the coarse grasses will be kept under and the finer grasses will be able to make headway, and so the lawn will gradually improve; but it must always be borne in mind that a fine English lawn cannot be made in a day or a year, or hardly in one generation. Not more than one ounce to the square yard should be given, or the grass will be burnt in places; it must also be evenly distributed.

Manures and Wireworm.

A Fellow writes: "Our kitchen garden suffers from a plague of wireworm and snake millipede. We have used no chemical manures for some years. Would it disperse and kill the grub and sweeten the soil to use such manures as superphosphate of lime, basic slag, or nitrate of soda? The soil is gravelly, and farmyard and stable manure has always been used and often fresher than it should have been." We recommend, on rich soils and under such conditions, to apply kainit at the rate of 4 cwt. an acre early in March, keeping it off the foliage; and later in the year when the crops are growing freely, apply nitrate of soda at the rate of $1\frac{1}{2}$ cwt. an acre. This will do the land a great deal of good, and will materially assist in keeping wireworm and millipede in check.

Nettles.

A Fellow asks us how to get rid of "a plague of Nettles" growing in a wood, and invading the adjacent lawns and garden, the extent of ground being too large for digging them up, as that would be too expensive a process.

There is an old West-country doggerel on Nettles—

> Cut 'em in May
> They'll grow again next day.
> Cut 'em in June
> They'll grow again soon.
> Cut 'em in July
> And they'll surely die.
> Cut 'em in August
> And die they must—

in which there is a vast deal of truth. If you cannot dig up Nettles, which are deep-rooting plants, there is nothing like persistent cutting them down. We have ourselves absolutely destroyed them in this way, but not in one year nor in two. Cut them down close to the ground as soon as they are six inches high, and never all through the year let them exceed six inches in height, but continually and persistently cut them and cut them, and the plants will become weaker and weaker until at last they will die.

The one point is to keep always cutting, and never allow them to exceed six inches in height, or to ripen any seed.

Poisoning from Daffodils.

In February last we received the following letter :—

"We force large quantities of Daffodils for cut flowers. The men working in this crop very frequently get their hands poisoned by the juice which flows from the base of the flowerstalk when broken or cut. To aid us in arriving at a suitable remedy for this, we should like to know what poison it is which is present in the plants."

On our inquiring in what way the men were poisoned, we were told "the men and lads are at work picking the blossoms all day long and from one day to another. After they have been at the work a little time, first one and then another will be obliged to stop working on account of gatherings underneath the finger-nails, and at various places on the hands and arms, and sometimes on other parts of the body. It seems as if the juice which flows from the stem, where broken off, has something in it which sets up an irritation in the blood or something of that sort, which has to find vent somewhere. If there is any little scratch or wound on the hand it seems almost certain to be affected, by this poison (or whatever it is) being thus given a chance to get into the blood. We take care to have warm water and soap at hand, and the men are given time to get their hands clean before they have their meals, but—especially with certain individuals—it all seems to do no more than mitigate the evil a little. If you can do anything to help us cope with the trouble we shall be extremely obliged."

Being ourselves quite ignorant on the point, we inquired of one of our largest Daffodil-growers, who told us : "It is an old complaint, as I have observed it all the time I have grown Daffodils. Nearly all the men and women suffer more or less with bad hands at bunching time. It is caused, I think, by their having chapped hands, on which the juice of the Daffodil acts as an irritant. But if there is no broken skin, and the hands are well washed after bunching the flowers, there is little if any poisoning."

Having obtained so much information, we at once examined the matter for ourselves, and we find that the "poisoning" is purely mechanical : it is caused by small crystals of lime, technically called *raphides*, which exist in great numbers in the sap or juice of the Daffodil. It is only necessary, therefore, to keep these crystals out of the skin—to prevent them from entering, either through cuts, or the cracks caused by chapping, or under the finger-nails. We therefore recommend that all who are to any extent engaged in gathering Daffodils should, before beginning their work, rub their hands over well with oil, and rub a little soft tallow up under the finger-nails ; and if they will always do this we do not think they will suffer to any appreciable extent.

Two Ornamental Rubus.

Of all the numerous species of *Rubus* it is doubtful if any of them equal *R. odoratus* for effect and succession of blossoms. In the Society's

Gardens at Wisley it commences blooming early in June, and continues until the middle of September. The flowers are quite two inches across, of a deep purplish-rose, produced in large clusters, and standing well above the large vine-like foliage. It always attracts a good deal of admiration. However, one of the great advantages of this handsome plant is the admirable way it will grow under the shade of trees. Such plants are by no means common, and this is one of the best, if not the best of all, as it grows famously and flowers profusely under deciduous trees. A Fellow of the Society who lived many years out in Canada said that many of the forests there had a thick undergrowth of this Rubus. It is also known as the Purple-flowering Raspberry, and the fruit is very similar to a brilliant red Raspberry, but almost flavourless.

The plant being perfectly hardy, and growing freely almost anywhere, it should be given plenty of room, as it sends out suckers, like the Raspberry, and for that reason is most adapted for the wild or semi-wild garden, where it will attain a height of four to five feet.

Very similar in habit and growth is *Rubus nutkanus,* which bears pure white flowers, but not quite so freely as *R. odoratus.* In "The Dictionary of Gardening" *R. nutkanus* is said to attain a height of ten feet; at Wisley it is about four feet, and seems to thrive equally well in sun or shade. In the autumn the foliage turns a lovely shade of golden-yellow, heavily suffused with bright dark crimson, and would be most useful for dishing up fruit for the dessert table. This *Rubus* also is a native of Canada and North America.

Bamboos.

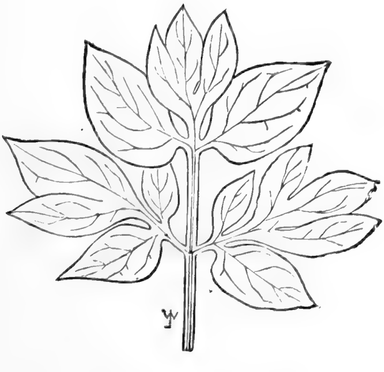
No class of plants has more rapidly come into public favour of recent years than the various Bamboos. It is only quite recently that it has been recognised that Bamboos are many of them quite hardy, though all who have eyes to see beauty of growth and foliage have for years been longing that Bamboos would grow in England. At last it has been established that many of them will grow well, at all events in the West and in the South. One point, however, in their cultivation still gives trouble and anxiety and disappointment. A plant has grown into a really fine specimen and comes into bloom. An inexperienced grower will possibly rejoice that his plants are so flourishing and healthy as to have attained to blossoming; but he will soon learn by experience to dread the blooming of his plants, for often, very often, the blossoming of Bamboos is but the immediate prelude of decay, and the winter of death succeeds to the summer of blossom. It is very seldom that a Bamboo which blooms survives; even if it does so for a time it is but a wreck and ruin of what it previously was, and it will take more years to rehabilitate itself than if an entirely new plant were planted. At present we hardly know what to advise, but if the blossoming twigs (or the whole cane) could be cut out *before the flowers expanded* one would expect to preserve the plant entirely; and if the intention of the plant to blossom should have been unnoticed until the blossoms were actually expanded, one would at least hope to save the plant's life by cutting off all the bloom *at once* before any seed is formed, though sad experience proves that even if the whole cane is cut out after the blossoming has well begun the plant cannot often be saved. And if the seed is once formed there seems little if any hope of saving the great majority of the varieties of the Bamboos.

Violets in Winter.

A Fellow asks us how to obtain a good supply of Violets in winter, and as so many fail we may endeavour to explain, although written instructions are so inferior to only a little practice. And first let us say that there is no plant grown which suffers so much from "coddling." Violets must be grown as hardily as possible, and they are best when treated as annuals, in the sense of taking fresh runners every year and never using the same for two succeeding seasons. The runners should be taken as early as possible in the season; they should be planted in the open, in good soil, and left to grow; in fact they will require no attention beyond keeping the ground clean from weeds and syringing the plants frequently in hot or dry weather, so as to keep down the attacks of red spider, to which Violets are terribly predisposed. In August or quite early in September the plants must be lifted with good balls of earth and planted in frames on raised beds made of leaves and litter, with about six inches of good loam and leaf-mould in equal proportions. The surface of the soil must be about eight inches only from the glass. All runners must of course be kept vigorously cut off, and again we say no coddling must be done. The lights must be kept off as often as possible—indeed should never be put on except at night, unless the weather is foggy, damp, frosty, or wet.

Publication of Journal.

With regard to the delay in the appearance of the present issue, the Editor requests Fellows to glance at the "Prefatory Notice" on page iii of the loose "Title-page" and "List of Contents" which will be found enclosed in the present issue.



BOOKS RECEIVED.

"The Country Day by Day." By E. Kay Robinson. 8vo., 371 pp. (W. Heinemann, London.) 6*s*.

A charming and altogether delightful book, which everybody who has a garden or is fond of the country should own. The writer is evidently a very keen observer of animal life, and has also the gift of describing what he sees in such a manner as to make others picture them too. He is also, in a quiet way, humorous withal.

Anybody who knows anything about birds will find the descriptions of them so absolutely lifelike that he will be able to recall their various performances even if he has not seen them for years, and in many cases make out unknown ones from their manners and customs.

In fact, for combined amusement and instruction, it is one of the most interesting works we have seen.

"Organography of Plants." By Dr. K. Goebel. Authorised English edition, by I. B. Balfour, F.R.S. Part I. "General Organography"; Part II. "Special Organography." Part I., royal 8vo., 270 pp., cloth, 10*s*. net; half morocco, 12*s*. net. Part II., royal 8vo., 707 pp., cloth, 21*s*. net; half morocco, 24*s*. net. (Oxford: Clarendon Press.)

Organography differs from morphology, as it includes the developmental history of organs, and the influences which cause differentiations of structure.

Part I. (published in 1900) contains five sections, dealing with (1) the general differentiation of the plant-body; (2) the relationships of symmetry; (3) the differences in the formation of organs at different developmental stages; (4) malformations and their significance in organography; (5) the influence of correlation and external formative stimuli upon the configuration of plants.

Part II. (published 1905) has two sections, the first dealing with *Bryophyta, Hepaticæ,* and *Musci,* the second with *Pteridophyta* and *Spermophyta.* After describing the vegetative and reproductive organs of the former, the author deals with *phenomena of adaptation of the vegetative organs of Hepaticæ, and of the Musci.*

Similarly of the *Pteridophyta.* First is described the structure and development of the sexual organs, that of the prothallus, and phenomena of its adaptation.

With regard to flowering plants or *Spermophyta,* the root, shoot, and leaf are described from a developmental point of view, including transformations of root into shoot; transitions between leaf and shoot; roots adapted to special functions; the construction of leaf, and the connexion between the configuration and relationships of life.

"Transformed Leaves" is the subject of one section; while the work concludes with a description of the sporophylls and flower of the

Angiospermæ, and the organs of propagation in both the *Pteridophyta* and *Spermophyta*.

"The Calendar of Garden Operations." Enlarged edition, cr. 8vo., 152 pp. (H. G. Cove, 41 Wellington Street, Strand.) 7½*d.* post free.

In the new, enlarged, and freely illustrated form presented under the above heading it is difficult to recognise a very old acquaintance, the late Sir Joseph Paxton's "Cottager's Calendar," for so many years issued by the proprietors of the "Gardeners' Chronicle." Whilst the general rule in relation to books is to issue cheaper editions as time goes on, in this instance its price is doubled, as the old friend, with its greater size and new name, is now priced 6*d.* instead of the plebeian 3*d.* Great as was Paxton as an architect in glass-houses, it is obvious, on reading the literary matter of this useful little brochure, that he was as exact and as efficient in dealing with small matters. One of the most useful features of the book for cottagers, allotment-holders, and amateurs, the classes to which it specially appeals, are the calendars of work which should have attention during each month of the year. Such reminders are of great interest and value to all who garden, but to the unprofessional element especially so. In these calendars nothing worthy of attention seems to have been overlooked. Some rather lengthy lists of vegetables, fruits, and flowers suitable for small gardens and allotments are appended, and they, too, are very useful. When such fleeting things as Potatos, Tomatos, Peas, and some other products, inclusive of flowers, are mentioned, naturally, to keep them up to date, frequent revision is essential. Some of the illustrations are instructive, some are the reverse; as, for instance, we may well wonder in what respect there is, on pages 14 and 15, to be found any difference between the two diversely named Broccolis figured. A few more really practically instructive pictures, such, for instance, as a pretty cottage front florally decorated, would have far more value for the unprofessional reader than would one presenting a greenhouse full of Sweet Peas. In so many gardening books the illustrations, comprising largely trade blocks, are their weak features. The illustrations of insect pests are of a very different nature, as these are so true to nature and so excellent as to enable the garden novice to recognise his enemies with ease, whilst the literary text enables him also to rid himself of their unwelcome presence. The little book is, notwithstanding any small defects, most worthy of the widest circulation, and is, for its price and use, probably one of the most helpful that has been published. May it in its new aspect become the pocket companion of myriads of earnest amateurs and cottage gardeners.

"The Book of the Rose." By the Rev. A. Foster-Melliar. Cr. 8vo. Third edition. 356 pp. (Macmillan & Co., London.) 6*s.*

A melancholy interest is attached to the appearance of the third edition of this standard work on Roses and Rose culture. For no sooner was the revision of the last proofs completed than the author was taken suddenly ill, and in a few days passed away, leaving a sad gap in the small band of modern writers on the Rose, of which he was its most gifted member. The whole work had been so completely overhauled when the second edition was called for three years ago that there remained comparatively little room for further revision in the present issue. The reader may, however, rest assured that whatever alterations were required in order to keep the subject-matter abreast of the times have been carried out, for Mr. Foster-Melliar was not only a fascinating writer on his favourite subject, but also a most conscientious and painstaking one. Although all phases of Rose culture are dealt with, the author's keenest sympathies centred in the production of fine blooms, rather than in the employment of the Rose as a decorative plant. His views on this point are concisely expressed in the introductory chapter, where he says: "In my estimation the value of the Rose is in the glory of its individual flowers, and in these pages at least the idea is not the Rose for the garden, but the garden for the Rose." Nearly one third of the volume is devoted to what he quaintly terms the "Manners and Customs" of a large number of the best Roses now in cultivation. The descriptions given of the different varieties show clearly what an intimate knowledge and keen perception the author had of the distinctive characteristics of each Rose which he describes. The cultural directions in preceding chapters are also in the same way the result of his own personal experience and observation. Indeed, there is no operation treated of, from hacking briar stocks out of the hedges to staging a winning stand of beautiful Tea Roses at an exhibition that he has not carried out with his own hands.

"On the Relation of Phyllotaxis to Mechanical Laws," Part III. By A. H. Church. 8vo., pp. 215–353. (Williams & Norgate, London.) 5*s.*

This third and last part deals with secondary growth-phenomena and mathematical notes on log-spiral systems and their application to phyllotaxis phenomena. The author emphasises the necessity of studying the embryonic development of phyllotaxis. Instead of referring systems to genetic spirals indicated by the usual series $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, &c., he adopts the formulæ (3 + 5), (5 + 8), &c. Some little difficulty follows, because in some cases it is not clear which should be preferred; thus (3 + 5) would do as well as (5 + 8) for the outermost spirals of *Sempervivum* (fig. 83, p. 244). The author then considers the results of contact-pressures, eccentric growths, bilaterality of appendages, &c.

The basis of the interpretations is the assumed log-spirals of the parastichies in the bud. He observes that "any attempt to indicate a *ratio* introduces a source of error." He apparently overlooks the fact that the fraction represents the number of leaves (denominator) and number of coils in a cycle (numerator); the fraction then indicates the angular divergence between any successive leaves on the spiral line, *e.g.* $\frac{2}{5} = 144°$ &c.

He adds: "Still greater is the error of the old rotation, which states that 5 and 8 parastichies imply an $\frac{8}{13}$ genetic spiral with orthostichies as straight lines." But straight or strictly vertical orthostichies only occur with $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, as the subsequent denominators are not measures of 180°. The old rotation fully recognises this fact. Alluding to the fact that the series $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, &c. represent the successive convergents of the continued fraction $\frac{1}{2} + \frac{1}{1} + \frac{1}{1}$ &c., the author observes: "Hence mathematical statements became read into the subject with which botany has nothing whatever to do." Might not something similar be said of log-spirals? Indeed he admits that the log-spiral theory is put forward solely as a mathematical conception, admittedly gratuitously introduced into plant-morphology.

"Ennemis et Amis des Arbres Fruitiers, de la Vigne et du Rosier." Par C. Duval. 8vo., 504 pp. (Baillière et Fils, Paris.) 3*s.* 9*d.*

This little book, which contains some five hundred pages, will be found by fruit-growers who are able to read French to be of considerable use, though, fortunately, many of the pests mentioned are not natives of this country. The arrangement of the matter is unusual, but in many ways it is very practical. The book is divided into three parts. The first deals with fruit trees in alphabetical order, and, under the headings of roots, stems, leaves, and flowers, gives the names of the various pests which infest those parts of the tree. After the name of each pest is given a number, under which it is described in Part II. A useful calendar is provided, showing the insects &c. which may be expected to be found in the course of each month. The second part of this work is devoted to descriptions of the different enemies of the various trees, their life-histories, and the best methods of destroying them. They are given in the following order: insects (including mites), small animals, snails, slugs, fungi, other vegetable parasites, ailments due to defects in the soil, unseasonable weather, &c. To each pest is given a different number, which corresponds with that given after each when mentioned in Part I. It would have been simpler, however, in Part I. to have referred to the pages on which the description of the insect &c. would be found. A few words on the anatomy and classification of insects are given at the commencement of Part II. Under the heading of defects in the soil, it is stated that the disease known as chlorosis is caused by excess of lime, or coldness, dampness, or poorness of the soil. Watering with sulphate of iron is recommended as a remedy; in the case of vines this treatment should be continued several years in succession. The dropping of immature fruit it said to be due to a want of lime in the soil, and that the best remedies are chemical manures, stable manure, or chalk. The cracking of fruit is caused by excessive moisture following drought; if the soil has become unusually dry, watering should be done carefully. The third and last part is given up entirely to the "friends of fruit trees, vines, and roses." One is glad to see that a list is given of about fifty different kinds of birds which are of use to the fruit-grower, though the number described is nothing like that number. It has been so much the fashion on the Continent to destroy all the small birds that it is pleasant to see that so many are recognised as friends. This book, like so many that are published in France, is issued with merely a paper cover, so that anyone who intends to use it as a book of reference will have to get it bound, or it would soon come to pieces. There are a fair number of illustrations, but many of them are very poor, however; the book is not an expensive one (3*s.* 9*d.* in English money), so that really good figures could hardly be expected.

"Vegetables for Exhibition and Home Consumption." By E. Beckett. 8vo., 216 pp. (Simpkin, Marshall & Co., London.) 3*s.* 6*d.*

Few gardeners have made so high a reputation as vegetable growers and exhibitors, none have higher qualifications for the authorship of a book on such subjects than Mr. Edwin Beckett. When a real practical gardener sets down to write a book on some gardening subject with which he is so essentially familiar, it is obvious that what he writes embodies personal experience, hence must have far higher value and reliability than can be found in books compiled by mere chamber authors, who seem to vie with each other in putting into circulation the greatest number of books they well can. If of gardening books there is no end—and it seems to be particularly true—certainly there are, of this somewhat needless outpour, good books and indifferent ones; and the book now under notice is essentially of the former class, because it embodies descriptions of the very best work by one of the most able and successful of cultivators. For that reason it becomes, on the subject with which it deals, a standard work. A pleasing feature of the text is the simple phraseology in which it is couched, and which is such that even illiterate readers can easily follow. There is no kind of garden vegetable that is not fully referred to. The various kinds are treated of alphabetically, and in each case what the author esteems to be the most desirable varieties are mentioned. In some cases, such as with Peas and Potatos, for instance, there is not that up-to-dateness which might have been looked for; but in relation to these and some other products, when varieties come and go rapidly, it is rather difficult to publish selections that may have but fleeting popularity. Mr. Beckett lays great stress on the preparation of soil for vegetable crops. It is, when well done, the very foundation of success in after cultivation. Manuring also gets early reference, and even the accumulation of all sorts of garden refuse, leaf soil, or vegetable matter, to become ultimately useful manure, has attention. The book is moderately and by no means excessively illustrated. The blocks used, the product of photographs, are at once natural and excellent, but a few illustrations of a fanciful or "faked" kind might very well have been dispensed with. It is only needful to compare the two pictures of Runner Beans to understand our meaning. One of the difficulties authors of books of this description have to face is in inviting the use from the trade of catalogue blocks for illustration, finding themselves under the necessity to some extent of mentioning the traders' products specifically, thus giving the impression that the book is written rather for advertising purposes than as a means for disseminating practical information on specific subjects. The constant repetition of the names of certain firms attached to diverse varieties is a blot on any book that is assumed to come from an absolutely independent source. Authors would do well to avoid that difficulty in the future. A very useful feature of the book is the monthly calendar of routine work in the garden, although the introduction to each month and some old weather proverbs will probably raise a smile. Few things have proved to be more fallacious. Finally come in the book some useful notes on insect pests and diseases which affect vegetables, troubles that will come even in the best regulated gardens, but of which high-class cultivation such as the book advises is, on the whole, the best preventive.

"A Handbook of Systematic Botany." By Dr. E. Warming. Translated and edited by M. C. Potter, M.A. Second edition. 8vo., 620 pp. (Swan Sonnenschein & Co., London.) 15*s.*

This was an excellent edition, when it first appeared in 1894, of an excellent work dating from 1892. It includes the Myxomycetes, classes the Schizophyta among the Algæ, and the Uredines among Protobasidiomycetes, and gives some account of fossil Pteridophytes and Gymnosperms. Its classification of Angiosperms is moreover mainly Eichler's of 1883. We cannot, however, discover that the present so-called "edition" is anything more than a reprint. *Isoetes* still appears among *Selaginelleæ* and *Ginkgo* among *Taxaceæ*; there is no mention of the Cycadofilices; and Treub's paper on chalazogamy in *Casuarina*, dating from 1891, is still spoken of as recent. This re-issue of stereotyped books as new editions is unfair alike to author, editor, and purchaser, and in many branches of science handicaps English students as compared with their Continental fellows.

"An Outline of the Theory of Organic Evolution, with a Description of some of the Phenomena which it explains." By Maynard M. Metcalf, Ph.D., Professor of Biology in the Women's College of Baltimore. 8vo., 204 pp. (Macmillan, London.) 10*s.* 6*d.* net.

This book is based on lectures at the Women's College, Baltimore. The author admits that "little claim to originality can be made for it." It contains the more striking cases of evolution in the ancient world, and is splendidly illustrated with numerous plates, plain and coloured, and figures. The explanation given of evolution is by Darwin's theory of natural selection; hence differing *in toto* from Dr. Eimer's work with the same title (1890), in which that author shows how specific structures are the outcome of direct adaptations to the conditions of life.

There are two parts, Part I. dealing with "The Theory of Organic Evolution," and treating of natural selection, heredity, variation, &c. Part II., "The Phenomena explained by the Theory," deals with comparative anatomy, classification, homology, &c. The work concludes with "Man in relation to Animals" and "General Considerations."

"The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., LL.D., F.R.S. Two vols., 8vo., 566 and 605 pp. (John Murray.) 5*s.* net.

This reprint of Darwin's well-known work will no doubt have a wide circulation among horticulturists, breeders, and others in its present cheap form. The first volume deals with the history of our domesticated animals and cultivated plants, and concludes with chapters on bud variation and inheritance. The second volume has chapters on inheritance (reversion, fixedness of character, prepotency, sexual limitation), crossing, changed condition of life, hybridism, selection by man, causes of variability, action of external conditions, laws of variation (use and disuse, correlated variability), and the provisional hypothesis of pangenesis.

"Trees: a Handbook of Forest-botany for the Woodlands and the Laboratory." By Dr. H. Marshall Ward. Vol. II. "Leaves." 8vo. 348 pp. (Cambridge University Press.) 4*s.* 6*d.* net.

"The present volume is devoted to a close study of the external features of the leaves of our woodland plants, especially from the point of view of the morphological characters which are found to be of systematic value."

Besides a classification of all the forms of leaves, the physiology of the leaf, as, for example, its transpiration, respiration, and assimilation, is discussed; leaf-movements and insectivorous habits are also treated of.

"How to use Nitrate." Fifth edition. 8vo., 79 pp. (G. Street & Co., London.)

This little book is now in its fifth edition, and still has prefixed to it the well-known and useful lecture by Dr. B. Dyer. The lecture and also the succeeding pages are well worth careful studying. Although there is naturally a bias in favour of nitrate of soda as the source of available nitrogen, the facts stated and the arguments deduced are just and very fair. There has lately been such a great deal of matter published, especially in the periodic Press and in the form of pamphlets, at the evident instigation of the syndicates and committees interested in various manures, that it has become very difficult for the cultivator to decide whether this or that article or letter has been stimulated for public or personal interests. Most cultivators will agree that the advocate for nitrate has a good case to put before them as jurors, and therefore, when properly put as in this instance, the words demand attention, and this should certainly be given. Where prices are given, 95 per cent. nitrate of soda is reckoned as obtainable for 10*s.* per cwt., whereas for a considerable time now it costs much more than this even when bought by the ton.

"The Book of the Potato." Ed. by T. W. Sanders. 8vo., 222 pp. (W. H. & L. Collingridge, London.) 2*s.* 6*d.*

Apart from its great industrial value, gardening has great merit in a literary sense, for not only does it maintain a remarkably prolific serial literature, but it is the subject of books without number. It might have been thought, so freely has the Potato been written about, that there could possibly be nothing fresh to say concerning it; but the author of this book has succeeded in compiling a very interesting treatise in which, if there be nothing new, matters are presented in a concise and useful form that may be helpful to novices in Potato culture. The book seems to have grown out of the remarkable "boom" which was so successfully organised by certain Potato dealers in their own interests and that of a few new varieties of Potatos last year; but as that boom has left behind the most depressing "slump" in Potato prices perhaps ever known, we can but hope for the publishers' sake the book may meet with better fortune than the objects of its publication have. The book is very largely illustrated, especially with pictures of diverse Potatos. They help the reader but very little, not only because less striking than are usually seen in seedsmen's catalogues, but also because most modern varieties vary so much in shape from diverse soils. The more useful pictures are those which exhibit tubers boxed in the spring for sprouting before planting, and those depicting certain insect pests of the Potato. Happily these, where cultivation is good, give little trouble. A few would-be humorous presentations of tubers might well have been omitted from a book devoted to practical work. At the end there is presented a list of no fewer than 269 named varieties, many of which are almost out of cultivation, and a few years hence the list will, at the present rate of production, be increased by a hundred new ones. It is possible with lists of the best varieties to keep pace with the times only in weekly papers. The most useful portions of the book are those which deal with soils, their natures and cultivation, with manures and their adaptabilities for Potatos, with methods of propagation, best uses of sets, watering them, planting, and general summer culture. Potato production for exhibition, necessarily a very minor matter in Potato culture, is described also. To many persons not yet Potato enthusiasts the book may come as a very useful guide, and the National Potato Society may be instrumental in creating an entirely new class of cultivators. If the book finds quite a new constituency it will not have been written in vain.

"Wild Flowers Month by Month." By Ed. Step, F.L.S. Two vols., 8vo., 400 pp. (F. Warne, London.) 12*s*.

A perfectly delightful book for anyone who loves our country fields and lanes and woods and commons. It is illustrated with more than 300 pictures, reproduced from actual photographs, so that you not only get the flower but its habit also. Even the homeliest flowers are here Dandelion, Stitchwort, Daisy, Herb Robert, Toadflax, Hawthorn, Buttercup—nothing is too common—and yet the rarities are here as well, and the photographs are altogether charming. Bird's-nests and eggs, and butterflies and caterpillars, and such like are not forgotten. The letterpress is equally attractive with the pictures—it is so simply written, drawing the reader's attention to all the points worth noting from a scientific point of view, and yet without using scientific terms, but all in thoroughly good Saxon-English which even a child of fourteen or fifteen could understand. It is really a pleasure to recommend this book most heartily as a Christmas giftbook to all and sundry who have a disposition to love God's beautiful world of plant-life in nature.

"Hints on Collecting and Preserving Plants." By S. Guiton. 8vo., 55 pp. (West, Newman & Co.) 1*s*.

The object of this brochure is to show the young collector how to form an herbarium. It is divided into five parts, viz. collecting, drying, preserving and arranging, mounting, and the herbarium. Each is treated well, with photos as illustrations.

"The Potato." By Samuel Fraser. 8vo., 185 pp. (Orange Judd Company, New York; Kegan Paul & Co., London.) 3*s*. 6*d*. net.

This excellent little book is packed full of sound, practical information. It is seldom such a thoroughly unbiassed up-to-date work appears.

Beginning with the history of the Potato, it deals with conditions influencing growth, with soils and manures, with seed, planting, management, spraying, harvesting, storing, marketing, feeding, value, and also breeding and selection. We have studied the Potato scientifically and practically for many years, have grown many acres of this useful and recently much boomed plant, but here we have a book dealing with the subject, read and re-read, which we shall require to keep always near at hand. Those who know most about the Potato will most appreciate this new addition to the library. We do not say it is absolutely perfect. A critic can find blemishes. Unfortunately the varieties are mostly not English, and those that are have not identical names.

"An Elementary Text-book of Botany," By Professor S. H. Vines, M.A., D.Sc., F.R.S. Second edition. 8vo., 611 pp. (Swan Sonnenschein & Co., London.) 9*s.*

This appears to be merely a reprint of the first edition, of October 1898. Professor Vines is to be congratulated on the way in which he has now for many years provided our more advanced students with text-books covering the whole field of pure botany and on the skill and originality with which he has in this work condensed the matter of his "Students' Text-book." For some features of the larger work—notably the balance-sheet of plant nutrition—we regret that room has not been found; but still more do we miss all mention of fossil forms, which throw such a flood of light upon the affinities of living plants. The writers of text-books, moreover, who occupy influential educational positions are precisely the men who should have the courage to lead the way in adopting more modern views on such important conclusions as those represented by our systems of classification. We regret, therefore, Professor Vines's decision to maintain the grouping of Angiosperms derived from Bentham and Hooker's "Genera Plantarum" of more than twenty years ago; and can only hope that we may soon have the enlarged edition of the "Students' Text-book" foreshadowed in the preface to the present work, which will no doubt be brought in every respect up to date.

"Garden Cities in Theory and Practice." By A. R. Sennett. 2 vols. 8vo., 1,404 pp. (Bemrose & Sons, London.) 21*s.*

Horticulture is only incidentally touched upon in this work, it being briefly discussed in the hundred or so pages dealing with garden cities in their relation to agriculture. The author is an engineer, and the most interesting parts of the book are those bearing on the laying-out of the town, the construction of buildings, locomotion, &c., with special reference to the site in progress of development near Hitchin.

The sociological aspect of the question is dealt with at great length.

"Carnations, Picotees, and the Wild and Garden Pinks." Edited by E. T. Cook. 8vo. 162 pp. ("Country Life," Covent Garden, W.C.) 3*s.* 6*d.* net.

There are several recent works on the Carnation, and this, the latest of them, is undoubtedly the best. To begin with, paper, printing, and illustrations are admirable. In the preface the editor remarks on the practice of exhibiting Carnations. "The showing of Carnations in paper collars is grotesque and without reason." Many persons fancy that this practice was handed down to us by the old florists, but it is not so. When Carnations were exhibited thirty years ago, they were all shown in paper collars; but the old florists who exhibited before 1850 knew nothing of paper collars and objected to their use. One old florist has remarked "that it was very easy to show flowers on cards, but it was very different when we had to show them with the flowers standing well out of the tubes on long stems." The National Carnation Society wisely provides many classes where the flowers are shown without cards, but at the same time they should object to wires, as a Carnation should not only have a calyx that does not split, but also a stout stem needing no artificial support when cut and placed in a vase.

There is a learned introductory chapter by the Rev. Prof. Henslow, M.A., V.M.H., in which he traces the history of the Carnation from its cultivation in England in the sixteenth century. It certainly was very widely cultivated in England at the end of that century, and in the seventeenth century, as we know from Parkinson and other writers, the varieties were numerous and of various colours, striped and edged. The first hybrid plant produced in England by cross-fertilisation was raised from a Carnation impregnated by the pollen of a Sweet William. This plant was (in 1717) cultivated in the garden of a Mr. Thomas Fairchild, and was probably raised by him.

Mr. E. H. Woodall, who dearly loves the Carnation, has a chapter on "The Carnation in the Garden." He grows a choice collection of border Carnations in his garden at Scarborough, and places it before the Lily, second to the Rose, and adds that "in gardens near to towns or in smoky districts it will thrive quite as happily as in pure air, while the Rose demands both shelter and the country." Mr. Woodall suggests that the Carnation might well be cultivated in England, as it is almost universally in Spain, in boxes or pots, placed on balconies or housetops, so that the flowers may hang down naturally, allowing the guard petals to fulfil their function, and shelter the centre of the flower from sun and rain, thereby causing it to fill up perfectly. Mr. Woodall does not advise growing many varieties. 'Trojan' is the best white; 'Mephisto,' deep crimson; 'Miss Audrey Campbell,' yellow; 'Belladonna,' rose-red; 'Midas,' orange.

Mr. W. A. Watts, of St. Asaph, also writes of the border Carnation and its propagation by "Hybridising in the Open," but he evidently means cross-fertilisation; the two processes are different. If one Carnation is pollenised by another variety, it is cross-fertilised. If a Carnation is similarly treated with the pollen of a Sweet William, or any other species of *Dianthus*, it is hybridised. Sowing the seed, layering, propagating by cuttings, staking, disbudding, &c. are well explained by Mr. Watts. The culture of the border Carnation is also fairly dealt with by Mr. James Douglas. The same cultivator has chapters on the Picotee—white and yellow ground, another chapter on the "Malmaison Carnations," and the "Tree or Perpetual-flowering Carnations." These papers extend through a considerable portion of the book, and contain useful information on the history of the Picotee, and the method of cultivating it and the Carnation under glass and in the open garden.

"Carnations for Exhibition and a Year's Work in the Garden" is treated by the late Mr. Richard Dean, and the operations for each month of the year are indicated in a concise form.

Mr. H. Thomas strongly recommends the Carnation for town gardens, and is so enthusiastic that he avers "the Carnation seems to relish the smoke of a large city." He advises planting in March, but does not add that they ought to have been established in small flowerpots before planting them out.

Mr. Herrington, of the Florham Farms, Madison, New Jersey, contributes an excellent paper on the American Carnation, and the gist of it seems to be that the American Carnations do best in America. He saw some of the best of the American Carnations exhibited in the Royal Horticultural Society's Hall in February last year. Such flowers, he adds, "would not have been accepted as a gift by even the street flower-sellers of New York." The fine flowers sold in New York and other populous centres in America, to the extent of a hundred million blooms or more annually, are grown on benches planted out in a depth of 4½ or 5 inches of soil. A point new to us in Mr. Herrington's excellent paper is the method of judging adopted by the American Carnation Society. New varieties presented for certificates must score 85 out of 100 points before they can obtain an award. The points are as follows: Colour, 25; size, 20; stem, 20; form, 15; substance, 10; calyx, 5; fragrance, 5; total, 100. If one may criticise here, a good calyx and fragrance should have more points, which should be deducted from the points given for size and stem. If colour appropriates a fourth of the points, fragrance ought to have 20 points.

There is a long chapter on diseases of the Carnation, the insect pests, &c., and the best way to treat them.

There are delightful engravings of the Pink as a rock-garden plant, the Pink for edgings to borders, and as cut flowers for vases, with full instructions to amateurs as to the treatment from seed and from cuttings or "pipings."

Mr. Henry Correvon writes very fully of the Pinks of the Alps, describing no fewer than 84 species and varieties of species. No one who takes an interest in these charming flowers can do without this book, for the instruction it gives in the culture of the plants, or as a work of reference as to the specific forms of the genus *Dianthus*.

"The Scented Garden." By F. W. Burbidge, M.A., V.M.H. 8vo., 96 pp. (John Lane, London.) 2*s.* 6*d.* net.

Certainly the best book that has yet appeared upon the subject. It consists, in a greatly expanded form, of a lecture delivered by Mr. Burbidge before the Royal Horticultural Society in 1898, and its pages are brightened up by a few excellent reproductions of beautiful flower-photographs. Not that it requires much brightening; for, as all who have read any of his works know full well, Mr. Burbidge not only knows all about flowers, but has the gift of being able to describe them all in veritable flowers of speech. Here in this little book you may find all about fragrant leaves as well as fragrant flowers; the theory and processes of scent and smell are described; several recipes are given for Pot-Pourri, Sweet Jar, and such like old-fashioned compounds; and a wonderfully complete list is given, with short descriptions, of all known scents of plant origin.

"The Amateur Gardener's Rose Book." By the late Dr. Julius Hoffmann. Translated from the German by John Weathers. 8vo. 155 pp. (Longmans, Green & Co.) 7*s.* 6*d.* net.

Many British rosarians will no doubt welcome and read with interest a work like this, which affords such a clear insight into the methods of rose culture adopted in many parts of the Continent. The instructions given by the author to the German amateur rosarian respecting the various operations of planting, manuring, propagating, &c. are presented with unusual clearness and conciseness. As might have been expected, they differ in many respects from those recommended in any English work on the same subject, and on that account are very suggestive. For instance, from the chapter on "the winter protection of Roses" it will be seen how little able the majority of our cultivated varieties are to contend against the prolonged winter frosts of Central Europe when altogether unprotected. The following are the directions given for protecting the more delicate Teas: "With such particularly tender kinds one may make doubly sure by covering the heads with dry peat-fibre, leaves, or pine needles and making a protective roof out of two pieces of board, which may also be well covered with loose soil or short litter from the stable. The stems themselves should be covered with loose earth." It is also curious to notice the great preference given to standard Roses in a climate where the winters are often so severe. But the book as a whole is more suited to German than to English gardens.

"Poisonous Plants of all Countries." By A. Bernhard Smith. Cr. 8vo. pp. 71, index. (Wright, Bristol; Simpkin, London.) 2*s.* 6*d.* net.

This is a classified list of plants, with a diagnosis of the families to which the species belong. They are arranged under headings indicating the action on the human system, viz. those "Acting on Brain," on "Spinal Cord," on "Heart," and "Vegetable Irritants." The "Poisonous Principles" are grouped as Alkaloids, Glucosides, and Organic Acids to which Neutral Principles, Resins, and Volatile Oils are added. These are supplemented by a glossary.

"The Cereals in America." By Thomas F. Hunt. 8vo., 421 pp. (Orange Judd Company, New York; Kegan Paul & Co., London.) 9*s.*

Although the cereals are farm crops, many gardeners are interested in them, and those who have a sufficient knowledge of science fully to understand the facts set forth will find much to interest and instruct them in these pages. All the important cereals are dealt with; but, as might be expected in an American work of this kind, Maize occupies a very large number of pages.

The first two chapters are of a more general character, dealing with the classification and improvement of field crops. In the latter of these the reader is informed: "A frequent change of seed is not necessarily a good thing; certainly it is not necessary to obtain seed from distant parts of the country for a region whose soil and climate are well suited to the crop. If the region is not well adapted to the crop, frequent new supplies of seed may be helpful and even essential." Obviously the principles set out in these statements are of wide application, although they can conveniently be studied best in plants so widely grown as the cereals. Hence the book may be profitably read by a much wider circle of readers than agriculturists.

"Mendelism." By R. C. Punnett. Sm. 8vo. 63 pp. (Macmillan & Bowes, Cambridge; Macmillan & Co., London.) 2*s.* net.

This useful handbook explains the Mendelian principles of heredity in a clear, concise, and altogether admirable manner. First, a brief biography of Mendel (1822–1884) is given, with a note on the unfortunate neglect of his work by his contemporaries, and the romantic re-discovery of his paper in 1900. Then follows a short account of Mendel's experiments with Peas, on which the Mendelian principles of heredity are based; the phenomena of dominance and segregation, the theory of unit-characters, gametic segregation, and gametic purity are all in their turn introduced to the reader. The results of recent work with Sweet Peas, Stocks, Maize, mice, rabbits, and poultry, all of which confirm and extend the Mendelian principles, are noted by Mr. Punnett, who, being himself in daily contact with many of the experiments, is able to give the facts at first hand. This particularly applies to the interesting stories of the 'Emily Henderson' Sweet Pea, *Primula × pyramidalis*; the Andalusian and the 'Walnut-comb' fowls; all of which illustrate the rapid strides recently made in Mendelian research. Mr. Punnett concludes with suggestive references to the profound influence which Mendelism must exercise on current biological conceptions of evolution as well as on economic breeding and social science. Altogether this little work is to be commended to all who wish to make themselves acquainted with the important discoveries of Mendel, and to keep in touch with recent research in heredity. The practical gardener, as well as the hybridist, will read with pleasure and profit the few notes at the end of the book on the up-to-date methods employed in crossing varieties of Peas and Sweet Peas so as to ensure reliable results.

"A Gardener's Year." By H. Rider Haggard. 8vo., 404 pp. (Longmans, London.) 12*s.* 6*d.* net.

We have never read a book on horticulture written in such an instructive and interesting style as this work. Mr. Rider Haggard is always fascinating in his writings, and he has carried the same delighful method into what is usually a dry subject. As a frontispiece, a plan with a key to Mr. Rider Haggard's garden is given, which might with advantage be copied by anyone intending to lay out a moderate-sized garden. The long stretch of lawn facing the house is not disfigured by a number of useless and often expensive beds, always more or less unsatisfactory. In the chapter on "The Garden, Past and Present," a very interesting description is given of how it was made, and what it is now. Following this is a charming description of the work done every month in the year, the plants in flower, often the fruit and vegetables in season, with many instructive notes on their culture, peculiarities, insect and fungoid foes, the failures and successes. Mr. Rider Haggard very truly remarks: "The individual, employer or servant, who is really master of *all* branches of English gardening has not been met by me." To this we may add, "and by no one else." But if we had more books written in Mr. Rider Haggard's happy, educational manner, our knowledge of English gardening would be greatly increased.

"The Journal of Agricultural Science." Royal 8vo., 148 pp. Vol. I. Part I. (Cambridge University Press.) 5*s*. net.

The first number of a new journal to be devoted to papers dealing with scientific research connected with agriculture. It is to consist of original papers, occasional critical articles on recent work, notes, reviews, and discussions.

The present number contains several articles of considerable interest to gardeners. One by Dr. B. Dyer on "Town Manure" is especially useful to us, and will doubtless be often referred to in future publications. The articles on poor pastures will prove useful for advanced students and for reference. A note on the new method of producing combined nitrogen, *i.e.* as calcium cyanamide, by Mr. A. D. Hall, is not only immensely interesting, but shows how thoroughly up-to-date is this new publication.

This work is to be published as material accumulates at 5*s*. net, or to subscribers at 15*s*. per volume of four parts. It is a work which will be indispensable in libraries, where there is claimed to be an up-to-date collection of works on horticulture.

"Suggestions for the Consideration of Teachers and others concerned in the work of Public Elementary Schools." 8vo., 155 pp. 1905. (Parliamentary Publication, Cd. 2638.) Price 8*d*.

This book is probably the most encouraging effort that the Board of Education has yet put forth. It is an evident attempt to encourage the children being taught on sound common-sense principles and with some reference to their future in life. The Board encourages the training of the five senses in the Infant school, so that "incidentally the scholars will acquire a useful knowledge of the surroundings in which their lives will be spent." This, it is recommended, should be followed with Observation Lessons and Nature Study, in which the teachers are reminded that "habits of observation are better cultivated by the thorough examination of a few objects rather than by a less careful examination of many," whilst, on the other hand, "the same lessons should never be given twice, because facts which have been discovered by the children are likely to be remembered, and for that reason not likely to be re-observed." The compilers very truly point out that "Natural History itself, the study of the habits of birds or insects or plants, is apt to be too unsystematic, too little under control, and soon degenerates into reading about things instead of seeing them, or, still better, doing them"; and that the teacher "should not use technical terms: he should not say 'cotyledon' when 'seed-leaf' will serve." The teachers are also told that in framing their schemes they "should bear in mind that drawing is not an isolated subject, and that it should be correlated with other subjects of the Time Table, such as nature study"; and the same tendency of harmonising the Time Table by grouping the subjects is happily noticeable under geography, where it is recommended that "expeditions should be made . . . and the vegetation and forest trees observed." Useful notes on school gardens are given on pages 82 and 83, and the classified lists of nature-study topics on pages 104 and 109 appear to be fairly complete, and also essentially practical and not too scientific.

It is probably not saying too much to state that absence of such practical teaching in the past, up to very recent times, is largely responsible for many of the national evils of the present day. The County Councils are now endeavouring to improve the position of the working classes by lectures, housing schemes, and other means; and many associations, notably the local Horticultural Societies, are also doing much towards stimulating a love of gardens and of nature. But the main issue lies with the people themselves, and we warmly welcome the Board of Education's "suggestions" as an honest attempt to train the children to become useful and intelligent men and women. Although primarily intended for teachers, the book should be read by all who are interested (and who is not?) in schools and school-life. We hope that the book will have an index on its second annual appearance. Some notice of the Certificate Examinations for Teachers should have been added, such as the R.H.S. examination in cottage and allotment gardening, which will be held for the third time in succession on Wednesday, April 11, 1906.

"Future Forest Trees." By A. Harold Unwin. 8vo., 108 pp. (T. Fisher Unwin, London.) 7*s.* 6*d.* net.

The value of this work to the forest student in this country is hardly sufficient to warrant the translation. Out of the fifty-five trees enumerated only about ten can be recommended for economic planting in this country, and possibly another dozen might be included for ornamental purposes. The Weymouth Pine (*Pinus Strobus*), the Douglas Fir (*Pseudotsuga Douglasii*), and the giant Arbor Vitæ (*Thuya gigantea*) may be used for afforesting purposes; but it would be pure folly to plant *Picea alba*, *Pinus Banksiana*, and *P. rigida* for the value of timber produced or even as shelter-givers to other species.

Nearly every tree mentioned within the pages of the book has been tried over and over again in every part of our country, and invariably found wanting, in so far at least as adaptability to our climate is concerned. For German forestry, which, however, differs widely from that practised in our own country, the information given in the pages of this handy and neatly got-up publication may be of considerable value, but to the British arboriculturist it is of little real benefit.

"Variation in Animals and Plants." By H. M. Vernon, M.D. Crown 8vo., 415 pp. (Kegan Paul, London.) 5*s.*

A slightly disappointing book, for though it is a very fair digest of much previously published work, there is little, if any, new or original research in it, at least regarding plants—indeed, all through the book plants occupy a comparatively small share of attention. Nevertheless it serves to direct the student's attention to a multitude of sources of independent and elaborate investigation. The subject is divided into three parts: I. The facts of variation; II. The causes; III. Its relation to evolution. It is perfectly wonderful how the re-publication by our Society a few years back of Mendel's long-forgotten article has stimulated inquiry into the laws of variation. In this country, on the Continent, and in the United States scientific research is being concentrated on this subject, and scientists are almost unanimous in their appreciation of Mendel's work.

"Trees: A Handbook of Forest-Botany for the Woodlands and the Laboratory." By H. Marshall Ward. Cambridge Biological Series, Vol. III. Flowers and Inflorescences. 8vo. pp. 402. (Cambridge University Press.) 4*s*. 6*d*. net.

Part I. contains 17 chapters on "General Structure," Part II. "Special." The book contains 142 illustrations, with an Appendix forming a key to about forty species of Willow, when the flowers of one sex only are available; a bibliography, glossary, and index conclude the volume.

The various kinds of inflorescence are first described; then follow details of the floral structure and functions of the organs. Floral diagrams and formulæ are explained and the various methods of pollination.

In the descriptions of the trees the Gymnosperms are taken first and fully described, each having a complete page illustration with floral details. Then follow members of the *Incompletæ*, *Thalamifloræ*, *Calycifloræ*, and lastly *Gamopetalæ*.

"Carnations, Picotees, and Pinks." By H. W. Weguelin. 8vo., 104 pp. (W. H. & L. Collingridge, London.) 2*s*. 6*d*. net.

The author in his preface states that a new book on the Carnation needs no apology, and the book in question contains some useful information.

In his chapter on the "Carnation as a Garden Flower" the author assumes "that gardeners of a former age were wrapped up in the Carnation for pots, or to give blooms to put into paper collars and pat down on a green box at the exhibition." Gardeners of a former age did nothing of the kind. The early florists, when the flakes and bizarres were more popular than they are now, knew nothing of paper collars. They were introduced in the time of florists now living; moreover, cultivation in pots was not known. Larger and finer flowers were grown in the open border, the flowers protected by a miscellaneous collection of old tins, boxes, or anything handy, or sometimes the florists had cardboard shades made. In the same chapter there are other remarks which go to prove that "a little learning is a dangerous thing."

Growing Carnations from seed is recommended. Most growers do this, and there is much interest and instruction to be derived therefrom, but the seed ought to be sown before summer. March is the best month, and the operation should not be delayed after April. It takes the whole season to produce a large handsome plant. French, German, American, Scotch, and Irish Carnations are noticed, and a number of names are given of French and German varieties, and the author "maintains that for amateurs who want good strong border plants the French varieties are of much value." Nine varieties are named to make an excellent small collection. They have been tried and found wanting. The best is "Carolus Duran," but even that has long been superseded. Growers are also informed that it is an advantage to plant the Carnation on a plot of ground entirely surrounded by tall trees, "so that the whole place was shaded at different times of the day." Very few Carnation-growers would select such a position if any other were available. Some shelter from the north and east might be desirable if the trees were not too tall and at such a distance from the ground that it was not overshaded.

There is also a chapter on "Exhibiting and Dressing." We are informed that there is much to be said both for and against dressing; but for himself he prefers to exhibit in classes where that monstrosity, the paper collar, is not permitted. The National Carnation and Picotee Society, whose shows are held under the auspices of the Royal Horticultural Society, offer valuable prizes for dressed flowers, and while these prizes are offered exhibitors will be sure to compete for them; but they also offer prizes for Carnations shown in a natural manner. Certainly the tables where the dressed flowers are exhibited have a very bald appearance, but this might easily be remedied if a row of Palms were arranged down the centre of the tables.

The illustrated chapter on "Pests and Diseases" is useful; so also are the "Monthly Operations."

Lists of the newest and best varieties are also given which might be improved, nor need two varieties have been printed twice over. We have Lady Wolverton' (Cutbush), rose pink; 'Lady Wolverton' (Cutbush), rich deep salmon. Also 'Francis Samuelson,' soft apricot; 'Francis Samuelson,' soft clear apricot; but a more grave error is in the fact that 'Grisi,' 'Chanticleer,' and 'Montjoy' are wrongly described as selfs, whereas they are fancies. Some of the best selfs are left out, and some are in that ought to be out.

There is also a chapter on Pinks, and the book contains a number of illustrations of groups of Carnations, examples of the best types of selfs and fancies, also of the American Carnation; but surely the very worst type of Malmaison has been selected; it is named 'Duchess of Norfolk.' There are many of the new Malmaisons with well-formed flowers and petals. Why select the worst? It is not quite fair to the type. The list of Malmaisons, too, is imperfect.

The above imperfections have been pointed out; but, on the other hand, there is much useful information for the aspirant who wishes to take up the culture of the Carnation. He will be informed how to propagate his plants; what kind of soil to grow them in, either in the open garden or under glass. If disease or insect pests attack them, the treatment is described. Layering is illustrated and described, but it is not recommended for Pinks—why, it is hard to say. Thousands are propagated every year, and all of them are layered. Certainly the Pink can be propagated more readily from pipings than the Carnation; but it can be propagated from layers quite as freely.

"Tree and Shrub Culture, Pictorial and Practical." By Walter P. Wright and W. Dallimore. 8vo., 152 pp. (Cassell & Co., London.) 1*s.*

True to its name, it is most practical and teaches by way of detailed pictures. An invaluable manual for all who want to propagate or plant, to prune or cultivate trees and shrubs, especially flowering shrubs. Not only are we told and shown how to do it, but in almost every case how *not* to do it also. How we wish, for instance, that everybody who possesses even a single tree which needs pruning would look at figs. 16 and 17 and learn how to cut them and how not, and the results of both treatments, for thousands of fine trees are ruined every year by ignorant cutting, and leaving "snags" to carry decay and rottenness into the tree's heart. Then follow lists of trees and shrubs of all manner of kinds for all manner of purposes and all manner of places; *e.g.* ornamental foliage, autumn tints, ornamental fruits, climbing, trailing, in shade, for hedges, weeping, &c. Nothing seems to have been unthought of, and a more useful and instructive shillingsworth it has seldom, if ever, been our lot to come across. It has a few errors doubtless, else would it be more than human, and we cannot help thinking the description of *Azara microphylla* as "flowers white, in summer," is one of these, for in our own garden in a cold south-eastern county, its flowers are yellow, scented most fragrantly like vanille, and produced in myriads in February and March.

"The Book of the Lily." By W. Goldring. 8vo., 98 pp. (John Lane, London.) 2*s.* 6*d.* net.

This excellent manual opens with an introductory chapter which far excels the general run of such prologues. It is both highly interesting and highly instructive. Then follows the main body of the book, consisting of an alphabetical list of all known garden Lilies, with a description of each and cultural notes. We should like to ask, in passing, why the author (in common, alas! with many others) always so persistently uses the word "culture" when he means "cultivation." The two words have a very distinct difference of meaning, and if writers will continue to use them as if they were synonymous and interchangeable we shall sooner or later lose the meaning of one or other of them, and the English language be by so much the poorer. But to return. The descriptive and cultural notes are excellent, and by them an amateur can easily make out a list of Lilies suitable for his own particular soil, and decide in what position to plant them. One is also told plainly of difficult subjects, and by that means we know what to avoid as well as what to attempt, and this is a great point. In the description of *Lilium Henryi* the impression is given that it should be grown "in the conservatory" or "under glass." Of course it can be so grown, but it can be equally well or even better grown out of doors wherever *L. Hansoni* will grow, as the only difficulty with either is the very early start which they make before we are safe from spring frosts. The finest specimens of *L. Henryi* we have ever seen have been out of doors. The descriptive notes are followed by a chapter on Hybrid Lilies; and that by "Lilies in the open-air garden," in which the hardy Lilies are split up into "groups that require different conditions of treatment in the matter of soil and situation," a most useful and practical method of grouping; and the utility of it is vastly enhanced by a short list of dwarf shrubs suitable for planting with each group for shelter. Other useful chapters are on the "Planting of Lilies"; on "Pot Culture" (may we not say "Cultivation in Pots"?); and on "Diseases." Concerning the disease which so often attacks the common white or Madonna Lily the author has not much advice or comfort to give us. It admittedly puzzles us all. We know what it is—a fungus called *Botrytis cinerea*; but what causes the fungus to come, or lays the Lily open to its attack? Is it wet or cold, or too high feeding? Our author says "cold and over-stimulation." It may be so, and yet many cottage gardens where it thrives most luxuriantly look very cold in the spring, and we have seen the patch "where the Lilies grow" mulched with freshly collected horse droppings, and yet never showing a sign of the fungus. That it can be cured with sulphur we have proved. Some very fine bulbs most terribly smitten with fungus were three or four years ago sent to the Scientific Committee in May, which we afterwards experimented on in this way: We put the bulbs in a large blue "sugar-bag," with about a quarter of a pound of flowers of sulphur, and every few days shook the bag up well, continuing till September, when we planted them, and they at once began to grow; and though they gave us no blossoms the first year the foliage was perfectly healthy, and the following season they had regained their vigour and beauty. So far as we understand its life-history, the fungus, having once got an entrance into the tissue or flesh of the bulb, grows up unseen with the plant's growth, penetrating the whole stem; and just when the flowers are ready to expand it comes to the surface and forces its way through the leaf-surface, killing the leaves and destroying most, if not all, of the flowers, but itself putting forth fruit in the process, which fruit, though *most minute*, falling on the damp earth germinates in the soil, grows downwards till it again reaches the bulb, finds its way into its substance, rests there during the winter, and then begins over again its growth with the Lily's stem-growth, and so continues *da capo* year after year until at last it exhausts the bulb altogether, hard fight though it makes for it. Such, in popular language and avoiding scientific terms, we believe to be the fungus's history; and if it be so, it ought to be possible to prevent the fruit or seeds from germinating when they fall on the ground by scattering kainit over the surface of the soil under the flower-stems *before any sign of the disease is apparent*; for we suspect that when it once shows—when the leaves on the stem begin to flag and look semi-transparent—we fancy the mischief is done by that time, the fruit or seed of the fungus has fallen; so that if we sprinkled kainit all over the surface of the soil before this took place, the fruit or seed of the fungus falling on it would be killed, for they cannot bear either kainit or sulphur. It must of course be borne in mind that when once the fungus has good hold of the bulb nothing can save it that year, but the kainit treatment applied on the soil this year may prevent the disease from reaching next year's Lily stems. We are afraid we have been guilty of a terrible digression, but it is an interesting subject for gardeners, suggested by a most interesting and valuable handbook.

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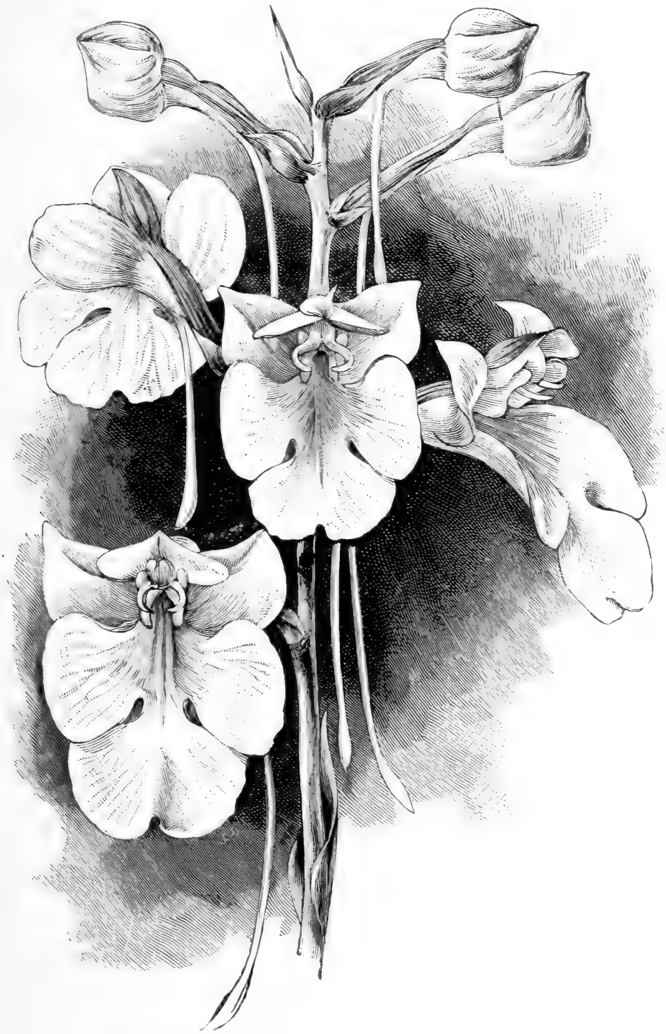

DONORS OF SEEDS, PLANTS, TREES, &c., TO THE SOCIETY'S GARDENS AT WISLEY DURING THE YEAR 1904.

AMBROSE, Messrs., Cheshunt. A vine of 'Melton Constable.' Will be planted in the collection.

BARR, Messrs., Covent Garden. Seeds of a Giant Leek. Will be tried in 1905.

BARRETT, W., Rodborough Court, Stroud. Seed Potatos. See p. 220.

BECKETT, E., Aldenham House Gardens, Elstree. 100 plants of Streptocarpus. Distributed to Fellows.

BENNETT-POË, J. T., Holmwood, Cheshunt. Plants of *Nephrolepis Duffii.* Distributed to Fellows.

BONAVIA, Dr., Westwood, Worthing. Hybrid Hippeastrums, and a hybrid Pelargonium. Growing in the Gardens.

BOVIL, A., Puerto de la Cruz, Tenerife. Seeds of *Echium simplex.* Growing in the Gardens.

BOYCE, J. W., Welney, Wisbech. Seed Potatos. See p. 219.

BROWN, Sir A., Bart., Broom Hall, Dorking. Dracæna stems for stock.

BROWN, Messrs., Peterborough. Seed Potatos. See p. 220.

BULLAR, Mrs. G. E., Southampton. Three packets of seed from Mexico. Not yet germinated.

CAREW, Lord, 28 Belgrave Square, W. Seed Potatos. See p. 218.

CARTER, Messrs., High Holborn. Vegetable and flower seeds. Will be tried, 1905.

CLEMENTI-SMITH, Rev. P., St. Andrew's Rectory, E.C. Three shrubs and flower seeds. Growing in the Gardens.

COLEMAN, W., Tunbridge Wells. Seed Potatos. See p. 219.

COOK, W. A., Shirley, Croydon. Seed of a Tomato. Will be tried, 1905.

COOPER, TABER, Messrs., Southwark Street. Seed Potatos. See p. 218.

COPP, G. H., Sherborne. Seeds of a Tomato. Will be tried, 1905.

CRAMPTON, F. C., Sissinghurst. Seed Potatos. See p. 218.

CUTBUSH, Messrs., Highgate. Hardy Cypripediums and Alpine plants. Growing in the Gardens.

CURATOR, Argotti Botanic Gardens, Malta. Seeds, all of which have been sown recently.

DANIELS, Messrs., Norwich. Seed Potatos (see p. 218) and vegetable seeds, which will be tried in 1905.

DAVIES, Messrs., Bitton. Seeds of a Tomato. Will be tried in 1905.

DEAL, W., Kelvedon. Seed Potatos. See p. 218.

DICKSONS, Messrs., Chester. Vegetable seeds which will be tried in 1905, and a valuable collection of fruit trees towards forming a collection.

DICKSON, A., Messrs., Belfast. Primula seeds. Growing in the Gardens.

DICKSON & ROBINSON, Manchester. Seeds of Lettuce 'Staghorn.'

DOBBIE, Messrs., Rothesay. Seed Potatos (see p. 218) and a collection of Violas, for trial in 1905.

DOUGLAS, J., Great Bookham. Seeds of Carnations. Growing in the Gardens.

DRUERY, C. T., Acton. A valuable collection of British Ferns. Planted in the Gardens.

EDMONDS, Miss, Wiscombe Park, Colyton. Hardy plants. Planted in the Gardens.

ELEY, T. G. H., 81 Drakefield Road, Hatcham. Seeds of herbaceous plants. Will be distributed to Fellows.

FERGUSON, G., The Hollies, Weybridge. Plants of Delphiniums and *Campanula carpatica.* Planted in the Gardens.

FORBES, J., Hawick. Seeds of Stocks, Violas, Pansies, and Delphiniums. Growing in the Gardens.

FOX, W. L., Falmouth. Seedling Dracænas. Distributed to Fellows.

FRASER, J., South Woodford. A valuable collection of fruit trees towards forming a collection.

FRÈRES DE LUZY, Lilford Road, Camberwell. A patent Incisor. Will be tested and reported upon in 1905.

GAUNTLETT, Messrs., Redruth. Choice shrubs and plants. Planted in the Gardens.

GEORGE, B. T. St., Pensax Court, Worcester. Seeds from New Zealand. Plants will be distributed to Fellows.

GLEDSTANES, F. G., Maidenhead. Croton cuttings. Plants distributed to Fellows.

GOLDSMITH, A., Woodbridge. Two seedling Black Currant bushes. Planted in the collection.

Goodyear, W., Dalkeith, Finchley. Dracæna stems for stock.
Goodwin, D. P., Oakden, Kidderminster. Two plants of *Dracæna Draco.*
Gooney, T., Daventry. Seed Potatos. See p. 218.
Green, Mrs., Curragh Camp, Ireland. Violets. Planted with the collection.
Hall, A. D., Harpenden. Seeds of Salad Potatos.
Hartland, Messrs., Cork. Bulbs for naturalising in grass.
Hawker, W., Brynmelyn, Hay. Seeds of the 'Start' Rose which failed to germinate, and Violet plants.
Head, Mrs. J., Lowndes Square. Pineapple crowns from Pernambuco. Distributed to Fellows.
Heilbut, S., Holyport, Maidenhead. Three large greenhouse plants.
Hill, D., Herga, Watford. Herbaceous and Alpine plants. Planted in the Gardens.
Hobbies, Messrs., Dereham. Dahlias. Will be included in the trial in 1905.
Holmes, R., Norwich. Tomato seeds. Will be tried in 1905.
Horne, J., Sea Braes, Jersey. Seeds of *Clianthus* and *Phormium.* Plants will be distributed to Fellows.
Hunt, G., Auckland, New Zealand. Fifteen packets of seeds. Plants will be distributed to Fellows.
Izquerdo, Señor Salvador, Santiago, Chili A valuable collection of seeds. Plants will be distributed to Fellows.
Ker, Hon. Mrs. A., Nazeing Park, Waltham Cross. Cuttings of *Podocarpus elongata.* Failed to strike.
King, G. R., East Horndon. Seed Potatos. See p. 219.
Lane, Messrs., Berkhampstead. A valuable collection of fruit trees towards forming a collection.
Lawrence, Sir T., Bart., Dorking. Eleven packets of choice seeds. Plants will be distributed to Fellows.
Levi, S. T., Basinghall Street. Two patent Manure Infusers. Will be reported upon later.
Limon, R., Wraysbury, Bucks. Seeds and plants of choice Primroses and Polyanthus. Planted in the Gardens.
Lloyd, F. G., The late, Langley House, Bucks. Choice Begonia seeds. Distributed to Fellows.
Long, J., North Brink, Wisbech. Seed Potatos. See p. 219.
Low, Messrs. Hugh, Enfield. A valuable collection of fruit trees towards forming a collection.
Lowinsky, T., Tittenhurst, Sunninghill. Violets. Planted in the collection.
Lucas, E., South Lambeth Road. Seeds of Oats forty years old. All failed to germinate.
Ludford, W. C. G., Fern Lea, Four Oaks. Two Four Oaks Undentable Syringes. These proved excellent in every respect.
Lynch, R. I., Botanic Gardens, Cambridge. A choice collection of seeds. Plants will be distributed to Fellows.
McLeod, Mrs., Coates Gardens, Edinburgh. Seeds of Auriculas. Growing in the Gardens.
McIndoe, J., Dunedin, New Zealand. Three Pelargoniums and one Begonia. Arrived dead.
Mann, P., Aylesbury. Seed Potatos. See p. 220.
Marks, J., Gracechurch Street. 5 cwt. Union Briquettes. These threw out a great heat, but were not durable in the furnaces.
Marshall, Mrs., Hillside, Byfleet. Two plants of *Clivia miniata.*
Marshall, W., Auchinraith, Bexley. One Yucca. Planted in the Gardens.
Mitchell, W., Sonning. Mitchell's seedling Blackberry. Planted in the Gardens.
Osman, C., Belmont, Sutton. Seeds of a Scarlet Runner Bean. Stock not fixed.
Parr, H., Trent Park Gardens, New Barnet. Seeds of a Tomato. Will be tried in 1905.
Paul, Messrs. G., Cheshunt. A valuable collection of fruit trees towards forming a collection, and seeds of *Cotoneaster angustifolia.*
Perry, A., Winchmore Hill. Three plants of *Isatis glauca.* Planted in the Gardens.
Peterson, F., Bassett Road. Plant of *Gentiana acaulis alba.* Planted in the collection.
Prichard, M., Christchurch. Plants of *Lobelia cardinalis.* Planted in the Gardens.
Proudlock, R. L., Ootacamund. Sixty-nine packets of seeds. Recently sown.
Reuthe, G., Keston. Seeds of *Trapa natans.* This flowered in the ponds, bearing insignificant white blossoms.
Rivers, Messrs., Sawbridgeworth. A valuable collection of fruit trees towards forming a collection.
Ross, C., Welford Park, Newbury. Seed Potatos. See p. 218.

Ross, Col. Sir J., of Bladensburg. Seeds of *Eucalyptus*, &c. Plants will be distributed to Fellows.

Rossiter, Major, High Road, Chiswick. Seeds of Statices. Plants will be distributed to Fellows.

Roupell, W., Roupell Park, S.W. Herbaceous plants. Planted in the collection.

Sandeman, Col., Whin Hurst, Hayling Island. A collection of choice seeds. Plants to be distributed to Fellows.

Shailer, Mr., New Zealand. New patent Hoes. These will be reported upon.

Shawyer, G., Cranford. Seeds of a Tomato. Will be tried in 1905.

Sim, W., Fyvie, Aberdeenshire. Seed Potatos (see p. 219) and seeds of a Pea, which will be tried in 1905.

Spooner, Messrs., Hounslow. A valuable collection of fruit trees towards forming a collection.

Stansfield, Messrs., Sale, Manchester. Nine choice hardy Blechnums. Planted in the collection.

Sutton, T., Crawford House, Surbiton. Seeds and plants of sub-aquatics. Planted in the Gardens.

Sutton, Messrs., Reading. Plants of *Solanum muricatum*, syn. *S. guatemalense* hort. Plants will be distributed to Fellows.

Sydenham, R., Birmingham. Flower seeds and bulbs (planted in the Gardens), and seeds of a Tomato. Will be tried in 1905.

Tanner, A. W., Shanklin, I.W. Seed Potatos. See p. 220.

Toogood, Messrs., Southampton. Vegetable seeds. Will be tried in 1905.

Turner, T. W., Chelsea Hospital Gardens. Stove plants for stock.

Veitch, Messrs. J., Chelsea. Seed Potatos (see p. 219) and a valuable collection of fruit trees towards forming a collection.

Veitch, Messrs., Exeter. Seed Potatos. See p. 218.

Walker, J., Thorpe. Seed Potatos (see p. 220) also a Dahlia, which will be included in the 1905 trial.

Walkley, F., Horncastle. Seed Potatos. See p. 220.

Wallace, A. R., Broadstone, Wimborne. Three plants of *Eucalyptus Gunnii.* Planted in the Gardens.

Warburton, J. W., Carpenham, Rostrevor. A very choice collection of seeds. Plants will be distributed to Fellows.

West, C. E., Higham Hill. Twelve reels of Raffia-tape. This tying material will be reported upon.

Weston, T. A., Postling, Hythe. Seed Potatos. Received December 1904. Will be tried in 1905.

Wettstein, Professor R., Universität in Wien. A collection of seeds. Plants will be distributed to Fellows.

Whitaker, J. T., High Bentham. Strawberry plants 'Archroyal.' Planted in the collection.

White, C. A., Rhodes Park, Bulawayo. Choice seeds. Plants will be distributed to Fellows.

Whitwell, G., Serpentine Cottage, Kendal. Twelve varieties of *Lastrea montana.*

Wilks, Rev. W., Shirley Vicarage, Croydon. Dahlias, bulbs, vine cuttings, and a large and valuable collection of Iris. Plants will be distributed to Fellows.

Worsley, A., Isleworth. Stove and greenhouse plants. Retained in the Garden.

Wrench, Messrs., King William Street. Vegetable seeds. Will be tried in 1905.

Wythes, G., Syon House Gardens, Isleworth. Seed Potatos. See p. 220.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE

AND

HORTICULTURAL AND BOTANICAL SCIENCE.

JUDGING by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural and Botanical periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to all who have helped in the work all the more hearty.

The Editor desires to express his most grateful thanks to all who co-operate in this work for the very large measure of success already attained, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on was 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. 614, 615.

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.S., F.R.H.S.
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Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Worsdell, W. C., 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.
Acta Horti Petropolitani	Act. Hort. Pet.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
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 Botany	Ann. Bot.
Beihefte 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.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Botanische Zeitung	Bot. Zeit.
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.
Bulletino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
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 the Botanical Laboratory, University of Pennsylvania, Philadelphia	Contr. Bot. Lab. Phil.
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.
Flora	Flora.
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. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp Dep. Agr. W.I.
Journal of Botany	Jour. Bot.
Journal of Horticulture	Jour. Hort.
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 S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
Le Jardin	Le Jard.
Lindenia	Lind.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Orchid Review	Orch. Rev.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.

Journals &c.	Abbreviated title.
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.
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.†
Wiener Illustrirte Garten-Zeitung	Wien. Ill. Gart.-Zeit.
Woburn Experiment Farm Report	Woburn.
Zeitschrift für Pflanzenkrankheiten	Zeit. f. Pflanz.

* 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.

Abies balsamea: its Fertilisation and Embryogeny. By K. Miyake (*Beih. Bot. Cent.* xiv. pp. 134–144 ; with three plates).—Dr. K. Miyake describes the cell division and embryology of this species. His conclusions are as follows : Number of archegonia varies from two to four. Neck of the mature archegonium usually consists of three or four tiers of cells, with four cells in each tier. Ventral canal cell is large and persists until the time of fertilisation. Various monstrosities were found. At fertilisation, two sperm nuclei, stalk cell, and tube nucleus are all discharged into the egg. Large sperm nucleus moves directly towards egg nucleus and attaches itself to it. Fertilised nucleus forms four free nuclei by successive division, which move down to base of egg, and there divide simultaneously. After the eight nuclei are completely formed, walls are laid down between them. The second sperm nucleus, tube nucleus, and stalk nucleus divide or attempt to do so before they disintegrate. A possible " fertilisation of one of the second segmentation nucleus (*sic*) by the second sperm nucleus was found in one preparation."—*G. F. S.-E.*

Abies, Galls on. By F. Muth (*Nat. Zeit. Land-Forst.* ii. pp. 436–439 ; 2 figs. ; 1904).—Galls on species of *Abies* are not uncommon, but the cause is as yet not clear. Gall formation has been ascribed to fungi, *Nectria cinnabarina* according to Behrens a species of *Pestallozia* according to Hennings. The author found galls of *Abies Fraseri* inhabited by a gall insect (*Phylloxera* sp.) which he figures : these were found in very young galls in which no fungus mycelium occurred. The fungi mentioned above are considered by Muth to follow at a later stage. *W. G. S.*

Abutilons. By Georges Bellair (*Rev. Hort.* pp. 436–8, Sept. 16, 1904 ; 3 woodcuts).—Description of several attractive varieties : *A. Thompsoni, A. vexillarium variegatum, A. Sellowianum marmoratum,* and *A. Darwinii tessellatum* mottled with yellow ; *A. venosum* 'Souvenir de Bonn,' margined with white ; and *A. v. Sawitzi,* more than half white. Cultural directions.—*C. T. D.*

Acacia podalyriæfolia (*Die Gart.* No. 14, p. 158, December 31, 1904 ; with figure).—One of the most elegant of the half-hardy species. The plant is shrubby and has small coriaceous silvery leaves and yellow flowers. If this species is grafted on *A. dealbata,* the more vigorous and hardiest of the genus, it grows quicker and stronger. On the Riviera it is cultivated in large quantities, planted in sheltered positions out of doors, as it flowers much earlier and longer than *A. dealbata,* and is consequently a valuable plant, as the cut flowers keep well and it sells well in Covent Garden Market.—*G. R.*

Acer platanoides (*Gartenflora,* Heft 13, July 1, 1903, p. 337).—A remarkable variety of the Norway Maple, *Acer platanoides,* is figured and described by Count Schwerin, the well-known German specialist of the genus *Acer*. The leaves are mostly three-lobed, with lacerated margins, and in colour somewhat resemble the older variety known as *digitatum aureo-marginatum*; but the most noteworthy peculiarity of the leaves is seen in outgrowths from the margin, of various forms, all more or less sharply pointed and of a brownish-green colour, offering a curious contrast to the colouring of the blade. The variety is named *Wittmackii*, in compliment to the eminent editor of the "Gartenflora."—*A. H. K.*

Acoridium, The Genus. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 219).—Interesting particulars and the enumeration of the known species are appended.—*H. J. C.*

Africa, Tropical Plants of the Northern Temperate Zone in their Transition to the High Mountains of. By A. Engler (*Ann. Bot.* xviii. Oct. 1904, pp. 523–540).—In Africa a considerable number of highland forms have been recorded whose nearest relatives are to be looked for in the northern temperate zone or other widely separated countries.

The identity or otherwise of these with the forms living in other latitudes and the origin of the African species are the main points discussed in the paper.

A number of instances are given of species, of various orders, becoming modified by advancing from the temperate zone to high altitudes in Africa. The author gives his views as to climatical adaptations.—*A. D. C.*

Agronomy, Instruction in, at some Agricultural Colleges. By A. C. True and D. J. Crosby (*U.S.A. Dep. Agr. Office Exp. Stn., Bull.* 127; 1903).—The question of agronomy or plant production as taught and practised at several of the agricultural colleges in the United States is set forth. General views of the colleges in question, with detailed plates of the laboratories and class-rooms showing apparatus used for the various experiments. A good outline of the manner in which students in the States are trained to carry out their duties in regard to profitable plant production is given. In addition to the above, detailed courses are given, which should interest all those connected with horticultural teaching in this country.—*E. F. H.*

Alder, The. By W. J. Bean (*Garden*, No. 1694, p. 319; 7/5/1904). The Alder is one of the most suitable of all trees, native or foreign, for planting in wet situations. On steep banks of streams and ponds it is particularly useful because its roots hold the soil well together. In habit the Alder varies. At Whitton Park, near Hounslow, growing on the margins of the lake are some tall specimens 90 feet or so high. The number of trees that can be grown in very moist situations is not so great but that the Alder may be welcomed among them. To the more graceful outlines of Willow or Poplar the stiffer carriage of the Alder affords a contrast that not only pleases in itself, but is valuable in that it accentuates the beauties of its associates. There are several varieties: the best known is *laciniata*, a tree wild in the north of France, and more ornamental than the type because of the deeply cut leaves. Of a similar type, but even better, is the variety *imperialis*. There is a golden-leaved variety (*aurea*), which, though not one of the best of golden-leaved trees, is useful because of the situations in which it can be grown.—*E. T. C.*

Alder Disease. By Dr. Appel (*Nat. Zeit. Land-Forst.* ii. pp. 313–320; 3 figs.; 1904).—Numerous Alders (*Alnus glutinosa*) died in groups in plantations in Pomerania. A fungus (*Valsa oxystoma*, already known to attack Alder) was found on all diseased trees. The bark becomes discoloured in strips, generally beginning near a broken branch or other wound. Infection of healthy Alders was unsuccessful. Inquiry showed prevalence of spring-frosts, and a dry period of years from 1899 to 1902, which, coupled with drainage operations, had made the soil very dry. Garden experiments confirmed that Alders grown with too little water became attacked by the same fungus. The author therefore concludes that the trees were weakened by lack of water and by spring-frosts. He points out that Alder plantations may suffer from overdraining; in dry seasons water may require to be supplied. He states that stool-shoots produce stronger trees than seedlings.—*W. G. S.*

Algæ: A new Rhododermis. By F. Heydrich (*Beih. Bot. Cent.* xiv. pp. 243–246; 1 plate).—A new species, *R. Van Heurckii*, is here described. It was discovered on the leaves of *Zostera maritima* in St. Brelade's Bay, Jersey, and forms small dark incrustations about 1 mm. thick, covering the edges of the *Zostera* leaves.—*G. F. S.-E.*

Algæ and Bacteria in Water Supply—to destroy. By Geo. F. Moore and Karl F. Kellerman (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 64, May 1904).—Assumes the importance of maintaining all public water supplies in the highest degree of purity. The disagreeable odours and tastes so often present are due almost exclusively to Algæ which are widely distributed, and many reservoirs have been rendered unfit for use in consequence. Methods already known for removing the odours and tastes caused by Algæ have proved unsatisfactory, either because of expense or failure to achieve their object. It is proposed to submit a new, cheap, harmless, and effective method for ridding public water of these pests. It has been found that copper sulphate in a dilution so great as to be colourless, tasteless, and harmless to man is sufficiently toxic to the Algæ to destroy or prevent their appearance.

At ordinary temperature one part of copper sulphate to 100,000 parts of water destroys typhoid and cholera germs in from three to four hours.

Since the selective toxicity of sulphur sulphate renders it fatal to pathogenic forms peculiar to water, while the saprophytic or beneficial bacteria are unaffected, the method is particularly well adapted for this purpose. Definite knowledge as to what organisms are present, constitution of water, temperature, and other important facts are necessary before it is possible to determine the proper amount of copper sulphate to be added.

No rule for determining the amount of copper sulphate to be added can be given. Each body of water must be treated in the light of the special conditions.—*M. C. C.*

Algæ, Blue, Cell and Nuclear Structure (*Beih. Bot. Cent.* xviii. Abt. i. pp. 1–45).—F. G. Kohl (Marburg) and Edgar W. Olive give two papers on this subject. That of the latter has two plates and a very carefully constructed bibliographical table. The work has been done independently, but the conclusions arrived at are almost identical. The cell possesses a nucleus and peripheral protoplasm with chromatophores, cyanophycin granules supposed to be reserve albumen, fatty globules, glycogen as the reserve carbohydrate (not found by Olive), and vacuoles. The nucleus shows in division the spirem, spindle, dyaster, bispirem, and other stages. The number of chromosomes varies from 4–6 (Kohl) up to 32 (Olive). The longitudinal division of the chromosomes is doubtful. A ringlike growth of the cell-wall occurs towards the end of cell division; in the heterocysts all the living part of the cell seems to disappear, though growth of the wall takes place.—*G. F. S.-E.*

Alkali Land at Fresno, California, Reclamation of. By Thomas H. Means and W. H. Keileman (*U.S.A. Dep. Agr. Bur. Soils, Circular* No. 11).—An account of an experiment carried out by the Bureau of Soils in co-operation with the owners, on a twenty-acre tract of land, impregnated with alkali to such an extent that no crops could be grown.

The plan was to irrigate the land so as to keep it under water four inches deep until, by drainage, enough alkali had been washed out of the soil to enable a crop to be grown. Four- and six-inch tile-drains were found to be the best, the 3-inch clogging too easily (and even larger, up to 24-inch, were used); but in any case a fall of 1 in 500 was sufficient to wash away the sand as fast as it entered the pipes, and in addition a $\frac{1}{4}$-inch wire rope, passed through the pipes as they were laid, enabled them to be cleared of all obstruction with a cleaning brush whenever necessary.

After four and a half months of irrigation the land was found to be sufficiently sweetened to allow Sorghum and Egyptian Clover crops to be grown.

The experiment proving successful, the paper goes on to show how the same system can be most economically applied to larger tracts in the Fresno district, where, fortunately, a natural fall obviates the expensive necessity of pumping plant.

The cost, based on an extent of 20,000 acres, should not exceed $10 per acre, and the drainage water can be successfully used for irrigation in the district west of Fresno, where it is much wanted. This water, analysis has proved, is not strongly alkaline, as might be supposed, for the sodium carbonate, or black alkali, on being washed into the soil, absorbs carbonic acid gas and becomes the much less harmful sodium bicarbonate.—*C. H. C.*

Allium albopilosum. By C. H. Wright (*Bot. Mag.* t. 7982).—Native of South Turkestan. Nat. ord. *Liliaceæ*; tribe *Allieæ*. This is the largest-flowered species of the genus. A robust herb. Leaves strap-shaped, 18 inches long, glabrous above, marked with longitudinal lines of white hairs beneath; perianth segments linear, deep lilac, with a metallic sheen, nearly 1 inch long.—*G. H.*

Aloe Baumii. By A. Berger (*Gard. Chron.* No. 902, p. 226, fig. 94, April 9, 1904).—This species was discovered by H. Baum near Chirumba on his Kumene-Sambesi expedition in 1899, about 1,200 metres above the sea-level. An account of this expedition has just been published, in which this plant is described for the first time. Mr. Baum says that "the natives call the plant 'Mantomba,' and use the flowers to make a kind of cake." Native of South-West Africa. Nat. ord. *Liliaceæ*; tribe *Aloineæ*. A dwarf Aloe. Leaves rosulate, 9 to 12 inches long, with oblong whitish spots; flowers racemose, orange-red.—*G. S. S.*

Alstrœmeria nana. By A. B. Rendle (*Journ. Bot.* 503, pp. 325–326; 11/1904).—Description of a new species collected by Mr. Hesketh Prichard on Mount Frias and the shingle of Lake Argentino, Patagonia. The species, which is one-flowered, is about the same size as the Andine *A. pygmæa*, its flowering stem being 10 cm. high. It is very near *A. patagonica.* The perianth-lobes are about 2 cm. long, yellow, slightly dotted with red on the three inner ones.—*G. S. B.*

Analysis of the Soil by Means of the Plant. By A. D. Hall (*Jour. Agr. Sc.* vol. i. part i., pp. 65–88; Jan. 1905).—An article teeming with interest to those students of agricultural science who have time thoroughly to master the facts and arguments set forth. From the "general conclusions" which Mr. Hall draws we extract the following:—

"1. The proportion of phosphoric acid and of potash in the ash of any given plant varies with the amount of these substances available in the soil, as measured by the response of the crops to phosphatic or potassic manures respectively."

"2. The extent of the variation due to this cause is limited."

"3. The fluctuations in the composition of the ash are reduced to a minimum in the case of organs of plants, which, like the grain of cereals or the tubers of Potatos, are manufactured by the plant from material previously assimilated."

"6. Pending the determination of phosphoric acid and potash 'constants' for some test plant occurring naturally on unmanured land, the interpretation of soil conditions from analysis of plant ashes is not a practicable method by which chemical analysis of the soil can be displaced."—*F. J. B.*

Anarthrophyllum Prichardi. By A. B. Rendle (*Journ. Bot.* 503, p. 331, pl. 465A, 11/1904).—Description of a new species, very near to *A. desideratum*, collected on the top of Mount Frias, Patagonia, by Mr. Hesketh Prichard. It is a tough-stemmed undershrub, with silky tripartite leaves and conspicuous orange flowers with reddish standard petals.

G. S. B.

Ancistrochilus Thompsonianus. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 297, fig.).—Interesting particulars of its history &c., and the illustration is well reproduced. The plant is better identified in gardens as *Pachystoma Thompsoniana.*—*H. J. C.*

Angiosperms, Hallier's System of. By G. Senn (*Beih. Bot. Cent.* xvii. pp. 129–156).—Gives a short discussion of Hallier's work and gives the following characters as evidence of antiquity in a natural order: (1) Pollination by insects. (2) Relatively long flower-axis. (3) Numerous parts in the flower. (4) A cyclic or spiral insertion of the flower parts. (5) Perianth parts and sporophylls free (not cohering). (6) Gradual transition from bracts to perianth leaves. (7) Perianth not differentiated into calyx and corolla. (8) Gradual change from sepals to petals. (9) Actinomorphy. (10) Stamens leaflike; pollen-sack overtopped by the end of the connective. (11) Want of a style. (12) Cohesion of many carpels or of many styles. (13) Many seeds in the carpel. (14) Large simple fleshy seeds without hairs or hooks. (15) Small embryo embedded in endosperm. (16) Two cotyledons. (17) Leaves entire at the margin. (18) Treelike growth with a few thick branches. (19) Many water forms in a family. (20) Want of vessels (in the case of land-plants which are not parasites).—*G. F. S.-E.*

Angræcum Rothschildianum. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 230).—Particulars are here afforded from a plant which has flowered at Glasnevin. The differences are distinctly given to distinguish it from the allied species *A. Galeandræ.*—*H. J. C.*

Annual Flowering Plants. By L. C. Corbett (*U.S.A. Dep. Agr. Farmers' Bull.* 195, 1904; illustrated).—A guide to the sowing and rearing of the best known annuals for the decoration of gardens where only a temporary effect is required, or until such time as more permanent plantations are in full beauty.

This paper would be especially helpful to those engaged in school-garden work. It gives clear directions for the making and use of hotbeds, pits, &c.—*C. H. C.*

Anthurium Andreanum Hybrids. By R. Jarry-Desloges and Ed. André (*Rev. Hort.* pp. 12–14, Jan. 1, 1904, and pp. 43–41, Jan. 16, 1904; coloured plates).—Description of numerous new forms and cultural directions and illustrations of *A. bicolor,* a very handsome form, spotted rose, merging into white above and white beneath. Remarks *re* failures due to excessively high temperature and deprivation of rest at proper periods.—*C. T. D.*

Antirrhinum majus, var. **Peloria** (*Gartenflora,* March 1, 1904, p. 113; coloured plate).—This is an example of a sport which occasionally occurs in other members of the family *Scrophulariaceæ,* but which has not hitherto been made constant. The corolla, instead of being two-lipped, is at the top divided into five segments which are turned back. It appears that Herr Hoflieferant Chr. Lorenz, in Erfurt, has now succeeded in raising this type of Snapdragon for several years from seed saved from plants which have exhibited this peculiarity. If this sport is to be made permanent it will doubtless prove as useful in the garden as it is interesting to the botanist.—*R. C. R. N.*

Ant-Plants. By Ernst Rettig (*Beih. Bot. Cent.* xvii. pp. 89–122).—The peculiar spongy tissue of *Myrmecodia* is partly to protect the plant from the strong insolation and loss of water during the dry season: it also acts as a water-absorbing and water-storing organ. The author criticises the work of Schimper, Wettstein, and others. There is a useful bibliography giving the more recent publications on the subject.

G. F. S.-E.

Aphis.—At the recent Congress of Economic Biologists held at Birmingham a valuable paper was read by Mr. F. V. Theobald, entitled "A Plea for the Study of British Aphides in connection with Cultivated Plants." Mr. Theobald said that in 1904 plant-lice, or aphides, had been more in evidence than in any year during the last quarter of a century. Rare species were very plentiful, and common species swarmed. Many could not be identified at all, and disappeared from the trees and plants they infested as rapidly as they apparently made their appearance. Moreover, in 1904 he observed several aphides migrating in vast swarms, aphides that in previous years had been far from common in the locality. The enormous reproductive power of these insects at certain times was well known, but we know nothing of the causes that regulate the reproductive phenomena; why an excessive reproduction takes place now and again, accompanied by a vast active migration—a so-called "blight." One instance showing the unsatisfactory state of our knowledge in regard to plant-lice and cultivated plants might be taken in the case of the Apple aphides. The majority of writings by economic entomologists on Apple aphis are, he said, valueless, because they treat two or three totally distinct species as one. In 1902 Sanderson worked at the Apple aphides in Delaware, and found that there were three common Apple aphides, viz. *Aphis pomi*, *Aphis sorbi*, and the commonest aphis, a hitherto undescribed species which Sanderson named *Aphis Fitchii*. With the object of seeing whether if this new species was our common spring and autumn aphis, Mr. Theobald made collections in various parts of the country, and found Sanderson's species to be by far the commonest. This was very important, because *Aphis Fitchii* was a well-known migrant. It fed on the Apple in spring and early summer and was the cause of damaged buds, withered blossom, and deformed fruits, but caused only very slight leaf curling. It left the Apples in early summer and did not return until the autumn, when a sexual brood was produced. He was inclined to believe that the *Aphis Fitchii* migrated to Corn and Grasses. On the other hand, *Aphis pomi* was permanent on the Apple, and was a great leaf-curler, producing a terribly crumpled-looking leaf if allowed to work on unmolested. *Aphis Fitchii* hatched much earlier than *Aphis pomi*, and commenced its attack before the blossom was open. Spraying was of use in spring for this species; it is not so, however, for *Aphis pomi*. It was, therefore, very important to know what particular Apple aphis they had to contend with. It was because they had not known what they had been giving advice upon that they got such varied results in spraying. Leaf-curling aphides were the most difficult to cope with, because the curl protected the plant-lice from any spray they chose to use. In fact, with such species as the Plum aphis and the Currant aphis it was only a waste of time and money to do so when the leaves were once deformed. A knowledge of the life-history of an animal pest is most important, for it would show us where we could attack it with some hope of success.

A great deal was known about the vagaries of the Hop aphis that might be turned to advantage by the Hop-grower. The Hop aphis came from certain Prunes in spring and many migrated back to them in autumn to deposit their ova on the Plum tree. Moreover, this ovation went on throughout the year on the Sloes and Damsons, so that there were successive winged generations flying to the Hops. Thus, to save the Hops, the farmer must wash his Damsons early in the year and use drastic measures in destroying the hedgerows of Sloe. To prevent the rapid reproduction of the aphides, farmers should avoid using nitrogenous manures in large quantities, and should use a strong dressing for spraying the egg-laying generation before they had had time to lay their eggs.

W. W.

Aponogeton fenestrale (*Ouvirandra fenestralis*). By H. Baum (*Die Gart.* No. 9, p. 97, November 26, 1904; with illustration).—Among Aquatics this species is very interesting, owing to its peculiar netted leaves. A native of Madagascar, it requires tepid water, a shady position, and absence of lime; it prefers rain water.—*G. R.*

Apple, and how to Grow it. By G. B. Brackett (*U.S.A. Dep. Agr. Farm., Bull.* 113, 1900; 10 figs.).—This bulletin is issued with the object of encouraging the growing of Apple trees in all gardens. It deals clearly with all points of Apple culture, and gives lists of varieties suited to the different parts of the States. The careful treatment of the trees in planting and afterwards, thorough and frequent stirring of the soil, are "absolutely essential to success." The farmer had "better save his money and pains" than plant trees and then sow grass and graze it with calves or other live stock.—*F. J. C.*

Apple Industry in Tasmania. By W. J. Allen (*Agr. Gaz. N.S.W.* pp. 815–819, September 1904).—An account of a visit of the delegates, who attended the Fruit-growers' Conference at Hobart, to the orchards in the vicinity of this town, where a great industry in connection with Apple culture is carried on. Everyone seems engaged in the work, either in making boxes, picking, drying, packing, carting, or shipping the fruit. During the season of 1904 it was expected that Tasmania would export to Great Britain over 600,000 cases of Apples, and more than that number to the different Australian States. In 1902 New South Wales imported from Tasmania 522,883 bushels of green fruit, 6,160 packages of evaporated fruit, 264,110 lb. of fruit pulp, 1,808,799 lb. of jam. The Apples mostly grown for export in Tasmania are the 'Sturmer Pippin,' 'Cleopatra,' 'Scarlet Nonpareil,' and 'French Crab.' A few other varieties are grown rather extensively, but the four above named are considered the best and most profitable varieties for export at present.

H. G. C.

Apple in Oregon. By E. R. Lake (*U.S.A. Agr. Exp. Stn. Oregon, Bull.* 81, July 1904).—In 1848 the Apple was introduced, and flourished remarkably; but upon price gradually decreasing with the loss of the Californian market many orchards were left to take care of themselves; now better care is being given them.

The usual standard varieties when planted in a soil of good body and suitable fertility do not begin to yield net results until about eight or ten years old. As the preparation, planting, and care of the orchard for this period involve considerable expenditure, it is of great importance to choose a suitable site for the orchard. Hence select as low-priced land as is compatible with a deep, well-drained, moderately heavy, friable, fertile soil in a locality where climatic conditions and transportation facilities are favourable to the development of the crop.

The fruit of the Apple is largest in the humid valleys, but best flavoured on the hills and dry tablelands. The excess of humidity and the need of free air induce canker and favour the aphis. The Apple is not very particular as to the nature of the soil; it neither dislikes very clayey, very limy, nor very sandy soils, but the best flavoured and longest keeping fruits come from trees grown on clay-loam.

Apples grown on sandy soil are said to weigh less per bushel than those grown on clay or clayey soils, other conditions being equal.

In planting on higher land it is necessary to avoid too shallow soil for the successful growth of long-lived and fruitful trees. While the Apple very much dislikes a wet boggy soil, it equally dislikes a site upon which cold air may stagnate. Every hollow, especially if it be one without a pronounced outlet to lower levels, fills up with cold air, and as one passes from the crest to the bottom and up the opposite side one feels the change in temperature.

Though the soils in such places may be good and deep, and water drainage of the best, yet in such hollows cold air may settle and remain with little or no motion and be death-traps, not alone for the Apple, but for fruit trees in general; it being as imperative to keep still cold air away from the tree's head as it is to keep stagnant water away from its feet.

If it is necessary to drain, the pipes should be from 4 to $5\frac{1}{2}$ feet deep, and 20 to 40 feet apart, corresponding with the distance between the trees.

The question of site and aspect is treated at some length, quoting authorities, including Professor Bailey, Downing, and others.

Selection of trees and planting, age of trees to plant.—One-year-old trees are judged old enough for Oregon. The distance between trees for planting at present is 20 to 24 feet apart, though some plant 30 to 40 feet apart. Karl Stackland, a most successful Apple-grower, says: "An area will yield about so much good fruit, and it matters little whether the trees are 20 or 40 feet apart, so far as the ultimate yield is concerned."

Trees of the same variety will often make twice the growth in some localities that they do in others, though the size and appearance of the fruit may be identical, with this difference, that the fruit on the dwarfer trees is earlier and consequently higher coloured. Other conditions being equal, dwarf-growing trees, shortage in water supply, lightness of soil, and closeness of trees tend to induce early fruitfulness and maturity.

Double planting is sometimes practised, say with standard Apples 40 feet apart, with early-bearing varieties, as Plums, Cherries, summer and autumn Apples, and early Pears, planted between. As soon as the standard trees begin to bear these "fillers" may be removed. By this mode of planting the standards are protected by the fillers. However, the general practice favours planting, say, 30 feet apart, and cultivating Tomatos, Potatos, Melons, Beets, Carrots, Strawberries between.

Plan of Planting.—The two general plans are the hexagonal and the square. The former is the more economical of space, and the trees are more evenly distributed. Then follows an account of the method of laying out land on either plan. In planting it is recommended that the trees should be so planted that when the soil about them fully settles they will still be in the ground as deeply as, or, better, 2 or 3 inches deeper than, before removal from the nursery. Then follow thirteen photographs of orchards illustrating badly and well cultivated orchards, also orchard fences.—*C. H. H.*

Apple Tree, Crown Gall. By Wm. B. Alwood (*U.S.A. Dep. Agr. Exp. Stn. Virginia, Bull.* No. 140, Sept. 1902; 11 cuts).—The organism which produces the abnormal growth known as crown gall on the Apple appears to gain entrance to the Apple seedling in the nursery. The diseased seedling can be detected by inspection, the unusual amount of fibrous roots at and below the crown being the characteristic depended upon for recognition of the trouble. Nurserymen can select the seedlings used so as largely to control this trouble. No one could expect entirely to prevent its occurrence in the nursery now that it has become so widely spread. Persons planting fruit trees should reject with the greatest care all trees which show the cancerous growth about the crown, or a sufficiently abnormal development of fibrous roots about the crown to warrant belief that the plants are diseased. Crown gall can apparently be readily inoculated from a diseased plant into healthy ones; hence diseased plants should not be allowed to remain among healthy ones in an orchard. Cultivating the orchard may serve to spread the disease by carrying diseased tissue from one tree to another, but no definite data can be cited.—*M. C. C.*

Apples as Cattle-food (*Rev. Hort.* p. 560, Dec. 1, 1904).—M. Blin, in the "Journal d'Agriculture Pratique," reports that mixtures of chopped Apples with dry forage form admirable substitutes for root foods, and points out the value of such knowledge in seasons of superabundance.
C. T. D.

Apples, Bitter Rot of. By W. B. Alwood (*U.S.A. Dep. Agr. Exp. Stn. Virginia,* Nov. 1902; four plates).—This account of the bitter rot of Apple (*Glœosporium fructigenum,* or, as they prefer to call it, *Glomorella rufo-maculans*) consists chiefly of a summary of recent researches, and mainly of Messrs. Schrenk and Spaulding's investigations and results, as given in 1902 at the Mississippi Valley Laboratory of the Bureau of Plant Industry. Further confirmation is not given of the production of limb cankers by this parasite, but, on the contrary, the conclusion from this station is: "In no instance have we been able to find the presence of the bitter rot fungus on the limbs or trunks of Apple or Pear"; and again: "Canker spots on the limbs of the older Apple trees were found in plenty"; and further: "In no case were we able by observation to trace the slightest connection between the cankered limbs and the occurrence of rotted fruit." It is added: "We have frequently found the bitter rot present where no trace of cankered limbs could be found, and the cankered limbs without the presence of bitter rot." Finally we are informed that the "question has been referred to a number of the best specialists on fruit diseases in the Atlantic Coast States, and without exception they have so far reported that they have not observed that the 'cankers' are the source of the bitter-rot infection. The mummied fruits are universally regarded as the chief source of primary infection."—*M. C. C.*

Apples, Cordon Espalier. By Owen Thomas (*Garden*, No. 1723, p. 369, 26/11/1904).—During recent years this system of training Apple trees in gardens has gained much favour. It has many points to recommend it. The most important ones are that, if the training wires are fixed to run from north to south, the trees receive the full benefit of light and sunshine, as well as free circulation of air among the branches—two essential conditions to the successful growth of this or any other hardy fruit. These conditions are not present to the same extent in a pyramid, bush, or standard tree; therefore fruit of larger size, better quality and flavour, is obtained from Apple trees trained in this way than from any other form. Another point in favour of the espalier is the fact that it takes up but little room, and is therefore, for gardens of small extent especially, to be recommended.—*E. T. C.*

Apples, Dessert (*Gard. Chron.* No. 932, p. 314, figs. 140–145 inclusive; Nov. 5, 1904).—A list of 102 varieties was sent out to 106 observers, asking them to vote for the six best dessert Apples. A table is given showing the state of the poll, from which it will be seen that 'Cox's Orange Pippin' was easily at the top, followed by 'King of the Pippins,' 'Worcester Pearmain,' 'Ribston Pippin,' 'Blenheim Orange,' and 'Irish Peach.' An examination of the list will show the best varieties for different districts.—*G. S. S.*

Apples: What shall we Plant? (*Gard. Chron.* No. 931, p. 297, figs. 133–138 inclusive; Oct. 29, 1904.)—A long list of Apples was sent to 198 observers in various parts of the country, asking them to mark what they considered were the best six cooking Apples; a table is given of the replies, from which it appears that for general purposes over the whole country 'Lane's Prince Albert,' 'Warner's King,' 'Lord Suffield,' 'Ecklinville Seedling,' 'Bramley's Seedling,' 'Dumelow's Seedling' or 'Wellington' are the six best varieties, though for any particular district some alteration may be required.—*G. S. S.*

Apricot Blight. By Wendell Paddock (*U.S.A. Agr. Exp. Stn. Colorado, Bull.* 84, Oct. 1903; 2 plates and cuts).—Attention was called in the autumn of 1902 to an extensive disease in Apricots which was thought to be an attack of Pear blight. In the following year the district was visited again, when the disease was found in active condition, and steps taken for its investigation. Microscopical examination showed that the diseased parts of both twigs and fruit were swarming with bacteria, and that these germs were abundant in the watery fluid appearing through firm flesh of the fruits.

Since Professor Jones had proved that Pear blight may produce twig blight in various kinds of Plum trees, it seemed probable that this blight and rot of the Apricot was due to the same organism.

Experiments were undertaken, which were repeated a number of times, of inoculations of Apple twigs and fruits, and Apricot twigs and fruits, and the results were the same, namely, a typical case of Pear blight from all these sources.

The residue of the bulletin is occupied with details of the inoculations, and their results.—*M. C. C.*

Aquilegias, Hybrid (*Garden*, No. 1706, p. 69, 30/7/1904).—*Aquilegia vulgaris* will generally take care of itself in the garden, but, unfortunately, it is not so with most of the hybrids. All will grow in shady places like true alpines, but as a rule they must have a light soil if they are to last more than two seasons. They rarely make fine plants in wet, heavy soils, and a damp season seems more fatal to them than a severe one. Given a light soil, especially if it is a sandy one and not too dry, many of them will last for years. If the soil is heavy the best thing to do is to give a liberal supply of leaf-mould with it to a depth of at least a foot, so that the soil does not become too close.

The old-fashioned Aquilegias are essentially spring flowers, but the hybrids are in bloom most of June and July, unless the season is a very hot and dry one. Whatever the soil, it is a good plan to raise a fresh stock of plants every two or three years, so that there may be always a supply in their prime, which is in their second and third years.

E. T. C.

Araceæ and Liliaceæ, The Development of the Central Cylinder of.—By M. A. Chrysler (*Bot. Gaz.* xxxviii. No. 3, p. 161).—After comparing Van Tieghem's and Jeffrey's system of development of the variations from the protostele, the author examines numerous rhizomes of these families. The conclusion is that monocotyledons were derived from dicotyledons by the primary cylindrical stele breaking up into strands. Thus, in *Acorus Calamus* the central cylinder of a seedling consists in its lower region of a solid mass of vascular tissue composed of a core of xylem and a ring of phloem, with pericycle and endoderm—*i.e.* a typical protostele. A parenchymatous pith appears where the traces of the second leaf are given off; subsequently some bundles run inwards into the medulla before turning out to the leaves.

"The simple siphonostelic stage persists in *Acorus* for several internodes, and the stem looks much like that of a dicotyledon; higher up some segments of the stele become amphivasal, and this may be regarded as the first appearance of a monocotyledonous character."

"The plan of the young stele—e.g. *Smilacina*—bears a close resemblance to that of a dicotyledon, and differs from the older stele of a dicotyledon only in the absence of cambium."

From the above facts &c. the author concludes that "these considerations lead to the conclusion that the monocotyledons are not an ancient group, but that they have branched off from the dicotyledons"—or, as an alternative, that both groups sprang from a common stock more closely resembling that of dicotyledons.—*G. H.*

Arachnanthe Lowii. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 283). A long and interesting note of the discovery and history of the plant under cultivation. Other interesting particulars are given.—*H. J. C.*

Aralia in American Paleobotany. By E. W. Barry (*Bot. Gaz.* xxxvi. No. 6, p. 421).—This is a critical analysis and tabular arrangement of the evolution of numerous fossil leaves reducible to *Aralia.*—*G. H.*

Arcteria, the rarest of the Heathers. By F. V. Coville (*Bot. Gaz.* xxxvii. No. 4, p. 298).—This is a description with figure of a fragmentary specimen in the Harvard University Herbarium, which Dr. Asa Gray described as *Cassiope oxycoccoides.* It came from Bering Island, and was found in 1882; but no living plant has been discovered. The author shows that in several characters it differs from *Cassiope.*—*G. H.*

Arethusa sinensis. By W. B. H. (*Bot. Mag.* t. 7935).—Native of Western China. Nat. ord. *Orchideæ*; tribe *Neottieæ.* This is a scapose herb, 4 to 9 inches high, with 2 to 3 lanceolate leaves and 1 to 7 flowered scapes of red and white flowers, the lip having fringed crests and a purple margin.—*G. H.*

Arundinaria Falconeri. By O. Stapf (*Bot. Mag.* t. 7947).—Native of Temperate Himalaya. Nat. ord. *Gramineæ*; tribe *Bambuseæ.* A perennial monocarpic grass, 30 feet in height, olive-green, tinged with purple. Leaves lanceolate. The inflorescences on leafless culms form large panicles with purple anthers. The pistil has three stigmas.
G. H.

Asclepiadeæ, African. By J. Britten (*Journ. Bot.* 503, pp. 350–1, 11/1904).—Notes in supplement to N. E. Brown's monograph in the "Flora of Tropical Africa," mentioning specimens in the British Museum Herbarium, and correcting some points of nomenclature. Among species specially mentioned are *Ceropegia Steudneri* and *C. denticulata, Podostelma Schimperi, Leptadenia,* and the Indian *Dischidia clavata.*—*G. S. B.*

Asparagus Culture at Bathurst Experimental Farm. By R. W. Peacock (*Agr. Gaz. N.S.W.* pp. 317–322, April 1904).—The culture of this popular vegetable is described under the following headings:—Varieties ('Conover's Colossal' proved the superior); choice of soil; situation; preparation of the soil; raising plants; selection of plants; after treatment; cutting; manuring; and injurious insects. It was proved that after deducting cost of cultivation, marketing, &c., a margin of profit from 40*l.* to 50*l.* per acre could be obtained.—*H. G. C.*

Assimilation by Chlorophyll in the absence of Oxygen. By J. Friedel (*Compt. Rend.* Jan. 1905, p. 169).—It is stated that the assimilation performed by chlorophyll is not modified when the amount of oxygen is reduced to 2 per cent.; the proportion of carbonic acid is the same as when 18 per cent. of oxygen is present. Later researches show that assimilation does not vary even when 50 per cent. of oxygen is present. This proves that the presence of oxygen in the atmosphere is not indispensable for the process of assimilation.—*G. M.*

Assimilation of Nitrogen by the Root Nodules of Leguminous Plants: Importance of the Removal of Products of Growth. By John Golding (*Jour. Agr. Sc.* vol. i. part i., pp. 59–64; Jan. 1905).—A preliminary note on experimental work which indicates that the removal of the products of assimilation favours the continued production.—*F. J. B.*

Aster, Contribution to the Life History of. By M. Opperman (*Bot. Gaz.* xxxvii. No. 5, p. 353). –This is a full description of the formation of the embryo-sac, nuclei, and antipodal cells. Of these it is observed, "The fertilisation of an antipodal egg is clearly demonstrated in Aster."—*G. H.*

Atavism or Cryptohybridism. By Dr. Erich Tschermak (Wien) (*Beih. Bot. Cent.* xvi. pp. 11–35).—Gives seventeen cases of the reappearance of an ancestral character by crossing two varieties of which neither possesses the character in question. The manner in which the characters were observed to occur followed Mendel's law rather than that of Galton-Pearson. The following were the cases examined:

(*a*) *Pisum arvense.*—Red flowers appeared in hybrids of the pink 'Svalöfer' races with white *sativum* races and with two 'Victoria' races (neither red-flowered). Wrinkled seeds were found in hybrids of 'Svalöfer' and 'Victoria' races, both of which have round seeds. Violet-spotted seedcoats appeared in hybrids of the same two races (neither has this character), but only when the pollen was from the 'Svalöfer' race. Dark yellow-brown testa appeared in hybrids of the same two races. Violet spots in the leaf axils also appeared in hybrids of the same two races.

(*b*) *Phaseolus.*—(1) Yellow and brownish-green to black marbled testas appeared as the result of crosses of two races, neither of which had this character. (2) The same with two other hybrids in five other experiments.

(*c*) *Matthiola.*—Clear lilac flowers blooming late in the season appeared as the result of crosses of dark red, early-flowering forms, and white-flowered varieties.

(*d*) *Hordeum.*—Six rowed barley as a cross between two-rowed and four-rowed forms. Also a few four-rowed forms as a cross between a two-ranked and a six-ranked variety.

The discussion of these results leads to a confirmation of Mendel's theory in many of the experiments, but the evidence of atavism in hybrids is decidedly interesting.—*G. F. S.-E.*

Atmosphere, moist and dry, Influence on Form and Structure of Plants. By Ph. Eberhardt (*Ann. Sc. Nat., Bot.* xviii. pp. 60–152; 1 plate and 17 figs.; 1903).—After a summary of previous work, the author proceeds to examine the growth of plants under moist and dry conditions. The method followed is to grow seedlings or cuttings in an apparatus which ensures a continuous exposure to either a moist or a dry atmosphere, while check plants are grown under normal conditions. The figures and description give an interesting comparison of the growth under these conditions. Nineteen species are dealt with, including Lupine, Scarlet Runner, Sensitive Plant, Broad Bean, Laburnum, Poplar, Willow, Cotoneaster, Castor Oil, Aster, Fuchsia, Lilac, &c. The plants are thus a wide selection, yet the general effect of environment in each case is much the same. We translate the more important effects of growth in dry air; as a rule moist air gives the converse, while normal growth is intermediate. A dry atmosphere:—restricts growth in height, and increases the rigidity of stems; diminishes the length of internodes, but increases the number; reduces the size of the blade, petiole, and stipular region of the leaf; increases the thickness of the leaf and deepens the colour, the palisade tissue being deeper while the spongy tissue is reduced; promotes greater development of hair structures and stomata; increases the development of the root, and in the *Leguminosæ* tends to retard the growth of root-tubercles; hastens flowering and fruit; augments glands and nectaries in plants which have them; diminishes the diameter of epidermal cells; reduces cortex and pith, but promotes the differentiation of sclerenchyma and cork, and causes a greater development of wood; favours the production of secretory canals and secretions, including raphides.—*W. G. S.*

Avocado in Florida. By P. H. Rolfs (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* 61, 1904; 4 plates and 9 figs.).—The Avocado or Alligator Pear (*Persea gratissima*, Gaertn.) has not been very extensively cultivated in Florida, the chief supply up to the present time having come to the United States from the West Indies. This bulletin suggests that it is a salad fruit worthy of improvement and cultivation in Florida, Porto Rico, Hawaii, and those districts of California which are free from frost. The methods of propagation and cultivation are detailed. The trees are best budded or grafted, as they do not come true from seed. Instructions as to picking, grading, and packing the fruit, and a description of some of the chief variations, are given. An ideal fruit weighs about 1 lb. to $1\frac{1}{2}$ lb., is Pear-shaped or oblong, has the seed closely surrounded by flesh, and is either yellow or scarlet in colour. The fruit is eaten raw with or without various condiments, or may be pickled. Spraying with Bordeaux mixture keeps the commonest fungal disease, caused by a species of *Glœosporium*, in check.—*F. J. C.*

Bacteria of the Soil (*U.S.A. Exp. Stn. Kansas, Bull.* 117, 5/1903; 3 figs.).—Notes are given on bacteria in general, and on the ways in which bacteria may be cultivated. Tables follow showing the variation in numbers of bacteria found in soil at varying depths, in different localities, and under different treatment.—*F. J. C.*

Bamboos, Himalayan. By O. Stapf (*Gard. Chron.* No. 907, p. 305; No. 908, p. 325; No. 909, p. 340; No. 910, p. 356; May 14, 21, 28, June 4, 1904).—The author in this paper gives a full account of the history, introduction into Europe, the habitat, &c. of two species of Bamboos, *Arundinaria Falconeri* and *A. falcata*, and says: "Nevertheless, there is still considerable confusion concerning these two species, and it has become more complicated by the accession of *A. nobilis*, a new species proposed by the author of 'The Bamboo Garden,' and by the doubtful position of the *A. gracilis* of the horticulturists. An account of their history and distinctive characters may not be out of place." *G. S. S.*

Bark-Beetles. (In *Nat. Zeit. Land-Forst.* ii. 1904.)—(1) Herr Eggers classifies and gives notes on the *Scolytidæ* and *Platypodidæ* found in Hesse (pp. 88–100; 1 fig.). (2) Herr Fuchs contributes a paper on the occurrence of the same groups in Bavaria (pp. 253–259).—*W. G. S.*

Basidiobolus Ranarum Eidam, New Researches on the Development of. By Zigmunt Woycicki (*Flora*, xciii. 1904, pp. 87–97; t. iv.).—This deals with the formation of the zygospores from two adjacent sister-cells of the hypha. The nucleus of either copulating cell divides karyokinetically, and one daughter-nucleus passes into the functionless beak, the other remains in the zygote, which thus contains two "cousin-nuclei." A second *amitotic* nuclear division takes place in both of these, two of the four nuclei so formed being absorbed, the other two "second-cousins" conjugating and fusing. The process shows close analogy with that of *Spirogyra*, as described by Chmielevsky. In the nucleus of this species the chromatin is confined to the so-called nucleole or karyosome. The nuclear membrane disappears in karyokinesis. The cell-plate is peripheral in origin, and forms a diaphragm, converted into a disk by centripetal growth.—*M. H.*

Bay Oil and Bay Rum (*Jour. Imp. Dep. Agr. W.I.* vol. iv., No. 2, pp. 119–128).—The preparation of Bay oil and Bay rum are West Indian industries about which there is little available information. The Bay tree of tropical America, *Pimenta acris*, is widely distributed, and there is apparently more than one variety. After a botanical and general description, with an enumeration of uses, we are informed that "Bay rum" is procured by distillation, and this in a very simple manner. The leaves are picked from the trees and then dried; in this state they are placed in a retort, which is then filled with water, and the process of distillation is carried on. The vapour is then condensed in the usual way, and forms what is known as "Bay oil," a very small quantity of which is required for each puncheon of rum.

The dried leaves of *Pimenta acris* are shipped in large quantities from Dominica to New York. Information is also given of this particular industry in Dominica and Montserrat, and it is also stated that, "in consequence of the insufficient supply of good quality of leaves, genuine Bay oil has been very scarce."

The best kind of leaf is derived from the true Bay tree, *Pimenta acris*, but among other Bay trees known in the West Indian Islands there is one with the leaves possessing the taste and odour of Lemon. The oil obtained from the leaves of this tree, if mixed with the true Bay oil, is said to destroy its value in commerce. For the tree with Lemon-scented leaves the name is suggested of *Pimenta acris* var. *citrifolia*.—*M. C. C.*

Beech Coccus. By — Brotherston (*Gard. Chron.* No. 917, p. 58, July 23, 1904).—This insect has spread very much lately in various places, and it is very injurious to trees which are badly infested by it. Frequently no notice is taken of this pest until the stems of the trees are almost covered with it. It is then much more troublesome to get rid of this insect than if it had been destroyed when there were comparatively few on the bark. Probably (as is the case with the attacks of many insects) the trees are not in vigorous growth when first infested. Paraffin in some form is the best remedy to use; a solution of paraffin emulsion is the best. Paraffin and soapy water is usually effective if the mixture be kept very well stirred; but this is not easy, as the paraffin is so much lighter than the water that it will float on the top. It should be applied with a large brush or garden engine.—*G. S. S.*

Beet, Varieties of the. By Auguste Dieuleveut (*Rev. Hort.* pp. 97–99, Feb. 16, 1904; 6 woodcuts).—A number of strongly recommended varieties described and figured, few of which are in vogue.
C. T. D.

Begonia, An Ecologically Aberrant. By W. Trelease (*Rep. Missouri Bot. Gard.* pp. 79–81; pl. 28 and 29; 1904).—A description by Dr. J. N. Rose of a new species of tuberous Begonia, *B. unifolia,* from the Iguala cañon, Mexico, growing on ledges of disintegrating limestone, and found also near Jojutla, Morelos. It has but one radical leaf, which is closely applied to the rock, the scape rising through its sinus. The flowers are nearly white.—*G. S. B.*

Begonia decora René Jarry-Desloges. By R. Jarry-Desloges (*Rev. Hort.* pp. 232–233, May 16, 1904; coloured plate).—A very fine form of the 'Rex' type. Leaves pale bluish-green ground, flushed medially with pink, with a bold pinnatiform, dark brown centre, and well-defined margin of same tint.—*C. T. D.*

Begonia, new Species from Tropical Africa. By E. Gilg (*Engl. Bot. Jahrb.* xxxiv. pp. 86–98, March 1904).—The author describes nineteen new species, chiefly from the Cameroons, recently collected by various German collectors.—*A. B. R.*

Begonias, Cuttings of Tuberous. By Georges Bellair (*Rev. Hort.* pp. 382–384, Aug. 16, 1904; 3 woodcuts).—Cuttings should be taken in the ordinary way from matured growths, severed just below a dormant eye, and inserted from July to mid-September in beds under a north wall; compost sandy peat. They should be well watered, and, if necessary, protected from heat by screen. Care should be taken that the eye should not be a flowering one, since, though the cutting will produce a corm at its base, the eye will be lacking and growth prevented. The corms, if potted up in October and kept from frost, will start growth in March.—*C. T. D.*

Bell Glasses (Cloches), Ventilation of. By J. Curé (*Rev. Hort.* pp. 15–16, Jan. 1, 1904).—Two woodcuts show a simple arrangement for admitting air to various extents by means of wooden pegs notched step-fashion on one side to carry the bell-glass rim at any desired height.
C. T. D.

Bicarpellary Beans. By E. Drabble (*Journ. Linn. Soc.* vol. xxxvii. p. 17, figs. 1–6).—An interesting series of these fruits were obtained in the autumn of 1903. The degree of development attained by the second carpel varied considerably, as may be seen from the figures. The writer quotes various authors who have described bicarpellary fruits of the order *Leguminosæ*, and says: "In the beans figured and described above there can be no doubt that they arose from a single flower, as the calyx was in most cases still present, and comprised the usual five sepals." He also discusses the question whether this peculiarity "may be regarded as a reversion to an ancestral state."—*G. S. S.*

Birch Timber, Destruction by Fungi. By I. I. Lindroth (*Nat. Zeit. Land-Forst.* ii. pp. 393–406; 7 figs.; 1904).—The author describes the progress of the destruction of Birch timber attacked by *Polyporus nigricans.* This has not been done before, and this careful description adds another to the investigations on timber-rot begun by the late Prof. R. Hartig. The author draws attention to the occurrence of this fungus not only on Birch, but on Goat Willow and Aspen. Infection takes place through wounds and gradually causes disintegration of the timber; the illustrations show the progress of the decay.—*W. G. S.*

Birds: How they Affect the Orchard. By F. E. L. Beal, B.S. (*U.S.A. Dep. Agr. Yearbook*, 1900; illustrated).—The author claims that the good birds do in orchards in destroying insects and noxious mammals far outweighs the harm that is often more apparent.

Among the birds which must be considered useful to the fruit-grower are the *woodpeckers*, of which there are about forty-five species in the United States, and of which the most important are the downy woodpecker and the hairy. They eat wood-boring larvæ, ants, and scale.

The yellow-bellied woodpecker often damages the bark of trees, and the red-bellied woodpecker bores holes in the Oranges in Florida. These birds have a remarkable development of tongue, which, sharply pointed and barbed at the end, and capable of muscular elongation, enables them to spear their prey, and withdraw it from the very heart of the tree.

Titmice, nuthatches, and *creepers*, being very small birds, eat very small insects, such as the eggs of aphides, and scale or lice.

Cuckoos, the most important being the yellow-billed and the black-billed. They eat the caterpillars of many harmful moths and butterflies, especially the hairy kinds which other birds avoid.

The *Baltimore oriole* (or golden robin), *warblers, vireos.*

Birds of prey, such as *hawks* and *owls*, are invaluable in destroying rodents and rabbits, which nibble the bark of young trees and do serious damage.

And lastly *shrikes* (the butcher-bird and the loggerhead shrike).

When birds are rearing their young, they invariably feed them on soft-bodied caterpillars and larvæ, in preference to hard beetles and seeds, and thus destroy large numbers of the former.

Among those that must be considered harmful, because they feed in winter and spring on the buds of trees and plants, are the following: *purple finch* and *house finch, robin, catbird, cedar waxwing.*

The robin has been proved to prefer wild fruits to cultivated, but where these are not available, as in the neighbourhood of large towns and in the prairie districts of the West, he feeds instead on cultivated small fruits.

A remedy might be found in planting wild fruits about gardens and orchards as a protection to the others.—*C. H. C.*

Bitter Rot of Apples (*Glœosporium fructigenum*). By M. C. C. (*Gard. Chron.* No. 928, p. 249, figs. 101–105 inclusive; Oct. 8, 1904).—This fungus attacks Apples, Pears, Grapes, Peaches, Nectarines, and other fruit, often causing much injury. It occurs generally throughout Europe, in the United States, Australia, and Tasmania. During the winter any cankers formed by the fungus on the branches should be cut out and burnt; all diseased fruit should be at once destroyed, and the trees should be sprayed with Bordeaux mixture before the buds open, and again frequently from midsummer until the fruit is nearly ripe. A very interesting account is given of the life-history of the fungus.—*G. S. S.*

Black Currant Gall-mite (*Eriophyes ribis*).—By Cecil Warburton (*Jour. R.A.S.* vol. 63, 1903, p. 304).—This pest, the author states, was the subject of careful investigation during the past season; but the results as regards the treatment of the disease were largely negative, demonstrating the uselessness of most of the remedial measures generally adopted.—*R. N.*

Bobwhite, The, as a Weed and Insect Destroyer. By Dr. S. D. Judd (*U.S.A. Dep. Agr. Year Book*, 1903, p. 193; coloured plates).—A study of the bobwhite has been undertaken by means of field observations, experiments with captive birds, and examination of the contents of crops and stomachs in the laboratory. The results obtained from the above study are summed up as follows:—

This bird is probably the most useful abundant species on the farm. It is one of the most nearly omnivorous birds, consuming great quantities of weed seeds, and destroying many of the worst insect pests with which the farmer has to contend. In addition to the above, it is found that it does not injure grain, fruit, or any other crop. From an examination of over 800 stomachs it is found that 15 per cent. of the birds' food is animal matter, including beetles, grasshoppers, bugs, caterpillars, spiders, &c., while nearly half of the vegetable matter found consisted of weed seeds. Astonishing figures are given of the numbers of weed seeds actually found in the stomachs of these birds. One bird when killed was found to have eaten 10,000 seeds of pigweed; another, 5,000 pigeon-grass seeds.

Frequently crops are crammed with nothing but ragweed. The following constituted *one meal* of a certain bird: 200 to 300 smartweed seeds, 500 sheep sorrel seeds, and 700 of three-sided mercury. As to insects, striped cucumber beetles are eaten by the score, potato beetles by the hundred, and chinch bugs by the tablespoonful.

The bobwhite (*Colinus virginianus*) is of course closely related to the partridge and quail.—*V. J. M.*

Bog Plant Societies of Northern North America: Geographical Distribution and Ecological Relations. By E. N. Transeau (*Bot. Gaz.* xxxvi. No. 6, p. 401).—The swamps have been called "drained" and "undrained," but the plants of these are not always clearly differentiated, and further explanations are required. Fifteen plants characteristic of bogs across North America were considered. Of these three only are endemic, the rest are in Europe and Asia; hence they are preglacial and circumpolar. A consideration of the probable glacial conditions follows, and the paper concludes with a general summary, epitomised as follows:—

Colder North American bog societies are closely related to those of the Old World.

The climate is moist and subject to extremes.

Passing north or south arborescent species are the first to disappear, till only herbaceous species remain.

The bog societies are normally related to the conifer forests, but where surrounded by Oaks and Hickories they show no order of succession to the forests.

The present bog societies are continuations of early postglacial ones. Bog societies are composed of boreal species.—*G. H.*

Botanical Survey of the Huron River Valley. By L. H. Weld (*Bot. Gaz.* xxxvii. No. 1, p. 36).—This paper treats of "A Peat Bog and Morainal Lake," with photos and diagrams showing sections of subsoils. The lakes were formed in the moraine. A luxuriant flora probably flourished in the terminal moraine on the retreat of the ice. It was first invaded by aquatic and amphibious plants. As humus accumulated sedges and sphagnum followed; then shrubs, and finally a soft-wood deciduous forest.—*G. H.*

Brassica sinensis, the Pé-tsai (white vegetable). By J. Curé (*Rev. Hort.* pp. 342–344, July 16, 1904; 1 woodcut).—A description of a vegetable cultivated very largely in China, a species of Cabbage, which apparently might be introduced here to advantage as a winter vegetable capable of improvement.—*C. T. D.*

Broomrapes. By H. Garman (*U.S.A. Exp. Stn. Kentucky, Bull.* 105, March 1903; 15 figs.).—An account of the germination and parasitism of the Broomrape, *Orobanche ramosa*, on Hemp and other plants is given, together with notes on some other species (*O. ludoviciana, O. minor, Leptamnium virginianum, Thalesia uniflora*, and *Conopholis americana*), and on remedial measures. Cleaning Hemp seed by machinery was the best means; neither soaking seeds of Hemp in copper sulphate solution (1 lb. to 5 gallons) nor hot water (140° F.) applied for ten minutes proved injurious to the Hemp seed, but prevented the Broomrape from germinating; while copper sulphate applied at the rate of 1 ton per acre, and unslaked lime at 2·72 tons per acre, also had a beneficial effect. Iron sulphate at the rate of 680 lb. per acre, and gas-lime at the rate of $5\frac{1}{2}$ tons per acre, did not affect the germination of the Broomrape seed, while 2 tons of salt per acre prevented the germination of both Hemp and Broomrape. A list of 29 plants attacked by *Orobanche ramosa* and 44 attacked by *O. minor* is quoted from Koch's "Entwicklungsgeschichte der Orobanchen."—*F. J. C.*

Brown-tail Moth, The. By C. M. Weed (*U.S.A. Exp. Stn. New Hampshire, Bull.* No. 107, Feb. 1904 ; illustrated).—This insect, which I believe is the same as that which is called in this country the "brown-tailed moth" (*Porthesia chrysorrhœa*), and which used to be much more common here than it is at the present time, has increased in New Hampshire and other North-Eastern States to an enormous extent. The author says : "As far as is known the first colony of brown-tail moths was found in New Hampshire December 7, 1899." The caterpillars of this moth feed on the leaves of various trees and shrubs, Pear, Wild Cherry, Apple, Oak, and Hawthorn being the chief favourites. Not only are they at times "frightfully destructive" to the trees which they attack, but they are the cause of much suffering to human beings. "Some of the hairs of the full-grown caterpillars are furnished with minute barbs ; when the caterpillars moult these hairs are shed with the skin. . . . When these alight upon the human skin they cause an irritation, which upon rubbing may develop into inflammation." A physician in Somerville has seen a large number of cases, and says, "Some of the cases were very obstinate, and did not respond well to treatment. The same symptoms developed in nearly all cases. The trouble began with intense irritation, then an eruption appeared resembling eczema, with a sort of watery blister on the top ; there was an intense irritation all over the body, on the head, arms, and limbs." The caterpillars pass the winter in nests, which they make by fastening several leaves together with threads. The best remedy is, in the course of the winter, to cut the nests out of the trees and burn them.
G. S. S.

Bryum, European Species of. By Dr. Josef Podpěra (Prag) (*Beih. Bot. Cent.* xv. pp. 483–492).—Gives a critical discussion of many of the varieties and species of *Bryum*. Amongst others the following new species are described : *B. Reinharti* Podp., *B. Aschersonii*, *B. Sydowii*, as well as many new varieties and sub-species.—*G. F. S.-E.*

Bryum Geheebii, C. Müll. By Adalbert Geheeb (Freiburg i. Br.) (*Beih. Bot. Cent.* xv. pp. 89–94).—Tries to prove that this species is not *B. Funckii* Schwgr., that it only differs from *B. Gerwigii* (C. Müll.) Limpr. in the leaf midrib. It is a bad species, perhaps allied to *Bryum gemmiparum* De Not.—*G. F. S.-E.*

Budding and Grafting. By W. J. Allen (*Agr. Gaz. N.S.W.* pp. 1171–1182 ; December 1904).—An exceedingly practical article on this subject, and splendidly illustrated with a series of nineteen illustrations reproduced from photographs.—*H. G. C.*

Bulbophyllum auricomum. By W. B. H. (*Bot. Mag.* t. 7938).—Native of Burma. Nat. ord. *Orchideæ* ; tribe *Dendrobieæ*. A pseudobulbous herb, less than a foot high. Scapes, solitary, 4 to 10 inches long ; flowers very fragrant, nodding, white, with an orange labellum.—*G. H.*

Bulbophyllum virescens. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 272).—Particulars of the history and description of the plant are included.
H. J. C.

Bulbophyllum Weddelii. Anon. (*Gard. Chron.* No. 936, p. 382, fig. 167; Dec. 3, 1904).—This Orchid is remarkable for the curious way in which the lips of the flowers move with the slightest breath of wind. The reason of this peculiarity of the lip is that it is attached to the rest of the flower by a ball-and-socket joint, much in the same way as our legs are to our bodies; the mechanism of the joint is well shown in the figure. The sepals and petals are greenish, with some indistinct olive-green markings: they are glittering white, like mica, splashed with blackish-purple. Native of Brazil. Nat. ord. *Orchidaceæ*; tribe *Epidendreæ*. An epiphytic herb with many-flowered racemes.—*G. S. S.*

Bulbs in Grassland. By E. H. Jenkins (*Garden*, No. 1721, p. 328; 12/11/1904).—In this class of gardening failure is more evident than success. There is more than one reason for this. A by no means unusual source of failure closely follows on the heels of those who plant bulbs in grass lawns, in all probability the worst place in creation. Any good lawn, to keep it good, is subjected to a very heavy rolling many months in the year. In this way the under-sod becomes so consolidated that the bulbs literally have no chance whatever. This is especially true when the turf is raised, the bulb dropped in, and the turf firmly trodden down again. In the first place, the lawn is not usually a good place, and the mode of procedure is wrong. Even in woodland grass there are too many failures, and usually there is a due want of preparation. The round cheese-taster-like tool is not, as a rule, suitable for the work, and the dibber, where it can be used, is even worse.—*E. T. C.*

Bush Fruits (*U.S.A. Exp. Stn. Virginia, Bull.* 147, April 1903; 9 figs.).—Notes on varieties of Raspberries (*Rubus strigosus, R. neglectus,* and *R. occidentalis*), Blackberries, Red, Black, and Golden Currants, Gooseberries (varieties of *Ribes oxyacanthoides* and *R. Grossularia*), and Juneberries (*Amelanchier* sp.), cultivated at the Virginia Experiment Station. The European varieties do not appear to succeed in Virginia.—*F. J. C.*

Bush Fruits, Propagation of. By G. H. H. (*Garden.* No. 1720, p. 305; 5/11/1904).—Considering what an easy matter it is to propagate bush fruits, such as Gooseberries and Currants, from cuttings, one is surprised to see the specimens which encumber the ground in many gardens. Some of these have grown out of all bounds for want of the timely use of the knife, and others have old age and debility plainly written on every branch and twig. Exactly how long a Gooseberry or Currant bush will remain fruitful and profitable is largely a matter of treatment; but market men who grow them on commercial lines know that the heaviest crops and the finest fruits are obtained from young and vigorous specimens, and consequently a certain amount of propagation is continually going on to raise stock to take the place of old specimens when they show signs of debility. Old and partially worn-out Gooseberry bushes are subject to various evils. Branches are apt to die off when laden with fruit, and the bushes are apt to be rendered leafless by attacks from that little pest the Gooseberry mite, which always plays more havoc with an old specimen than it does with one possessed of the vigour and vitality of youth.—*E. T. C.*

Cabbage Rot: Vitality of the Cabbage Black Rot Germ on Cabbage Seed. By H. A. Harding, F. C. Stewart, and M. J. Prucha (*U.S.A. Agr. Exp. Stn. Geneva, Bull.* No. 251, Oct. 1904; 1 plate).—Black rot of Cabbage is a destructive bacterial disease caused by *Pseudomonas campestris* (Smith). No satisfactory method of controlling the disease in the field has yet been found. Concerning the ability of the disease germs to survive the winter on the seed, there has been a difference of opinion. Investigations on this point are the subject of the present bulletin.

The conclusion is that much of the Cabbage seed on the market is contaminated with germs of the black-rot disease, and some of these may survive the winter and become a source of infection to young Cabbage plants.

As a preliminary measure, it is advised that all Cabbage seed be disinfected before sowing by soaking for fifteen minutes in a 1–1,000 corrosive sublimate solution, or in formalin, one pound to thirty gallons It is not expected that this treatment will prevent either leaf or root infection in infected soils; but it may be safely relied on to prevent all danger from infected seed. It will not injure the germination.

The disease, it is contended, made its appearance in England in 1903 on the Swede Turnip.—*M. C. C.*

Cabbage Tribe, History of the. By Georges Gilbauth (*Rev. Hort.* pp. 90–93, Feb. 16, 1905; pp. 187–189, April 16, 1904; pp. 238–240, May 16, 1904).—An interesting series of articles, with some woodcuts.—*C. T. D.*

Calamitean Root, The Papillæ on the Epidermoidal Layer of the. By Grace Wigglesworth (*Ann. Bot.* xviii. October 1904, pp. 645–648; 3 figs.).—The authoress suggests that the fibrous fragments which project into the cells of the epidermoidal layer of Calamitean roots represent the short arrested branches of a fungus mycelium. The suggestion is based on similar appearances observed in recent plants.

A. D. C.

Calanthe discolor. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 131).—Particulars of this supposed hardy Japanese Orchid are given. Doubts are thrown upon the possibility of its standing our winters unprotected.

H. J. C.

Calceolarias, Hardy. By S. Arnott (*Gard. Mag.* 2668, p. 1835, 17/12/04).—Six species are described in this article under the heading of Hardy Calceolarias, but the term "hardy" cannot really be applied to any of the species of *Calceolaria*, if the term "hardiness" be understood to mean full exposure.

The so-called hardy species are stated to be *C. plantaginea*, *Kellyana*, *violacea*, *pinnata*, *alba*, and *andina*. None of these are truly hardy at Kew, but perhaps some of them may survive a mild winter in warmest districts.

An illustration of *C. polyrrhiza* is given.—*W. G.*

Calcium Cyanamide. By A. D. Hall (*Jour. Agr. Sc.* vol. i. part i., pp. 146–148; Jan. 1905).—A note on calcium cyanamide ($CaCN_2$). This substance is formed by passing atmospheric nitrogen (from which the naturally intermixed oxygen has been extracted by heated copper) over heated calcium carbide. The calcium cyanamide formed is a fine black powder which decomposes with water into calcium carbonate and ammonia. Experiments to ascertain its manurial value were made last year at Rothamsted, and appear to show that it is slightly less valuable than ammonium sulphate, but the experiments were not sufficient to give decided information. This new substance seems to be especially valuable in ensuring an ample continuous supply of combined nitrogen, because if the output of other nitrogenous manures be restricted there is here a means of keeping up the supply.—*F. J. B.*

Calcium Oxalate, its Function in Plants. By M. Amar (*Ann. Sc. Nat., Bot.* xix. pp. 197–291; 34 figs.; 1904).—Crystals of calcium oxalate are frequently found in the tissues of plants, yet their function is not yet fully explained. From the review of existing literature in this paper, two main theories stand out: (*a*) calcium oxalate may be a reserve supply capable of being utilised if need be; (*b*) it is an excretion by which an injurious excess of oxalic acid is combined with calcium to form a salt which is laid down as crystals. M. Amar's work suggests a third view. He believes that the crystals are excreta, and that they are produced by the neutralising of excess of calcium by means of oxalic acid. The plants investigated are chiefly *Caryophyllaceæ*, and only the briefest review can be given of the careful observations and experiments dealt with in the three chapters.

Chapter I.—Distribution of calcium oxalate crystals in the tissues of plants. This is shown graphically in a series of figures. Roots and rhizomes contain no crystals, or rarely a small amount. Stems show them in the nodes, but they rapidly diminish upwards and downwards in the internodes. Leaves always contain crystals, most in the blade, in tissues round the veins; also in somewhat less quantity in the leaf-stalk. Axillary buds have many crystals, and these may also occur in the carpels of flowers.

Chapter II.—Is calcium oxalate a reserve or an excretion? Plants grown in soil till they had two, three, or four pairs of leaves were washed and transferred to culture solutions containing no calcium. Other pairs of leaves were developed, but these showed no crystals, either in the leaves or stems developed in solutions without calcium. Nor did the plants utilise the crystals formed during their growth in the soil. He therefore concludes that calcium oxalate is not produced in the absence of calcium, and that plants are unable to make use of calcium stored as oxalate.

Chapter III.—Reason for the formation of calcium oxalate. Plants were grown in a series of solutions in which the amount of calcium nitrate was increased from nil to half a gram per litre. Assimilation was found to increase with increased calcium, but when a certain limit was reached the assimilation remained the same in spite of still further increase of calcium. Crystals were not formed so long as the calcium in the solutions remained below a certain limit, but above this the crystals increased more or less equivalent to calcium supply. Calcium was necessary for the full development of the plants up to a certain limit; beyond this it was not necessary, and therefore, the author believes, the excess of calcium was rendered non-injurious by its combination with oxalic acid. The crystals are excreted from the elaborated sap as soon as possible, *i.e.* in the leaves; any excess is carried to petioles and nodes, or even internodes, but the calcium oxalate only reaches underground parts when it is formed in very large quantities in the plant.—*W. G. S.*

Calla, Soft Rot in. By C. O. Townsend (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 60, June 1904; 9 plates).—The conclusions arrived at in this memoir are that the soft rot of the *Calla* is a bacterial disease, and is a short rod-bearing peritrichiate flagellum. It occupies the intercellular space in its host, and dissolves the layers which connect the cells, causing the tissue to break down into a soft slimy mass. This organism is able to attack a large number of vegetables; care should be taken in throwing any decayed parts away, but it does not attack tree fruits. The organism may remain dormant for many months in partly decayed corms, which enables the disease to be transported long distances, and to be held over from year to year. The soft rot of the *Calla* may be prevented by a careful selection of sound corms, and by changing the soil in the *Calla* beds at intervals of three or four years. The name proposed for the organism is *Bacillus aroideæ* Townsend.

In many cases the Callas were found to be rotting off at or just below the surface of the ground, the disease sometimes extending down into the corm, sometimes upward into the leaves, and frequently in both directions. Occasionally the disease seemed to start in the edge of the leaf-stalk, in the flower-stalk, or in some underground part of the corm, though as a rule it started at the top of the corm just above but near the surface of the ground. The disease was worse and spread more rapidly in houses where the Callas were grown in solid beds.

Successful treatment was considered impracticable, and preventive measures alone resorted to.—*M. C. C.*

Cañaigre. By R. F. Hare (*U.S.A. Exp. Stn. New Mexico, Bull.* 49, 1903).—This plant (*Rumex hymenosepalus*) is cultivated in several of the Southern States for the tannin contained in its roots. The bulletin gives directions as to its culture.—*F. J. C.*

Canned Fruits, Preserves and Jellies. By Maria Parloa (*U.S.A. Dep. Agr. Farmers' Bull.* 203, 1904).—An *exposé* of the process of canning and preserving fruits, with the effect of bacteria, yeast and mould spores on food substances generally and on canned fruits in particular. A list of the utensils needed is given, and the importance of a syrup-gauge is emphasised.

Three different methods of canning are described:—

(1) Cooking the fruit in jars in the oven.

(2) Cooking fruit in jars in boiling water.

(3) Stewing the fruit before it is put into jars.

Full directions are given for jelly-making, as well as marmalade, fruit purées, fruit preserved in grape-juice, and canned or bottled fruit-juice and syrups.

The fruits dealt with are Apples, Pears, Quinces, Plums, Peaches, Grapes, Tomatos, Rhubarb, and all the Berry tribe.—*C. H. C.*

Caralluma crenulata, Wallich. By A. Berger (*Gard. Chron.* No. 889, p. 19, fig. 9; Jan. 9, 1904).—This rare species, which has been flowered for the first time in Europe by Sir Thomas Hanbury in his garden at La Mortola, was received by him last May. The stems are irregularly branched, and from 2 to 6 inches in length. The flowers are about an inch in diameter, and are yellow in colour, nearly covered with dark brown-red spots and lines; they grow in a terminal umbel, and are nine in number; "the colour and shape of the flowers are very pretty, and the scent is not at all disagreeable. I hope to be able to propagate the species, as it makes subterraneous shoots, which soon make roots, and help to increase the plants."—*G. S. S.*

Carbonic Acid, Plants Grown in Excess of. By E. Demoussy (*Compt. Rend.* Nov. 1904, p. 883).—A series of experiments proved that in the majority of instances plants benefited by being grown in an atmosphere containing carbonic-acid gas in excess of the quantity present in the ordinary air. The average augmentation of gas was to five times the quantity normally present in the atmosphere. The plants experimented upon were grown in closed glass cases for two months, and included sixteen different families, among which may be mentioned *Reseda*, *Coleus*, *Geranium*, *Centaurea*, *Mentha*, *Nicotiana*, *Ricinus*, *Fuchsia*, &c. An equal number of check plants were grown under similar conditions, but not supplied with excess of carbonic-acid gas. At the end of the experiment the two lots of plants presented much the same aspect, those grown in excess of gas being more robust than the untreated lot. Many of the plants bloomed, and those growing in excess of gas flowered earlier and more abundantly than those growing in normal air.

Fuchsias alone did not profit by an excess of gas, but they did not suffer.—*G. M.*

Cardiospermum (oleiferous and fodder-plant). By G. Papasogli (*Bull. R. Soc. Tosc. Ort.* 12, Dec. 1903, p. 364).—It belongs to *Sapindaceæ*. The calyx consists of four persistent sepals; the four petals are furnished at the base with four petaloid appendages, united to form a cylinder around the sexual organs; there are eight stamens; the trigonous ovary is surmounted by three short styles; the fruit is composed of three swollen capsules united to form a triangular bladder-like structure; the seeds, one in each capsule, are globose, smooth, with the hilum marked by a remarkable cordiform spot, hence the generic name of the plant. There are eight species, the greater number being herbaceous: they are indigenous to Asia, Africa, and America. The shoots are, as a rule, weak, mounting upwards by means of tendrils attached to surrounding plants.

C. vesicarium (*C. Halicacabum* L.) grows wild in the East Indies and has graceful, glabrous shoots, rising under cultivation to three metres in height, and annual; the leaves are stalked, glabrous and alternate; the small, white, insignificant flowers occur to the number of two or three on each peduncle; the seeds are used for making chaplets of beads, bracelets and necklaces for ladies and girls; the Indians of Java eat the cooked leaves; the flowers are much sought after by bees.

Under cultivation the seeds are sown in clayey soil of calcareous and siliceous nature, and with a permeable subsoil; 100 parts of this soil contained: nitrogen 0·1, phosphoric anhydride 0·05, potash 0·4. The soil was previously prepared by digging, but was not manured. In August the plants had attained the height of 2·50 m. and presented the appearance of a dense wood. They flowered in September. A hectare of ground yields 5 cwt. of seed and about 6 cwt. of straw for beasts. The oil is easily obtained by pressure from the seed, the remainder being given to animals.

The oil is fixed, not volatile, of a light cedar-yellow; the taste is not strong, reminding one of Cucumber, and it has a slight scent of fresh Walnuts. It freezes at +14° C. and becomes quite solid at +10° C. It is scarcely soluble in absolute alcohol, and insoluble in 95 per cent. alcohol. It dissolves easily in amyl alcohol, ether, benzine, carbon bisulphide, chloroform, and the essential oils. When boiled with a solution of soda it forms soap.

The characteristic effects of treatment with nitric acid are also given.

W. C. W.

Carnations, Fragrant. By A. Hemsley (*Garden*, No. 1720, p. 315, 5/11/1904).—There are many scented Carnations still in cultivation, but it is no doubt a fact that many of the newer varieties have little or no scent. This especially applies to scarlets and yellows of the smooth-edged type. In fact, there are very few yellows with perfume. The old Andalusia, pale yellow, with fringed petals, was scented, but this variety seems to have gone out of cultivation. 'Mrs. Audrey Campbell' is slightly scented. We get the most powerful scent in the crimsons. The old crimson Clove is still the most powerfully scented. 'Uriah Pike' has a very pleasant perfume, and 'Countess of Warwick' is also a good free-flowering variety with a pleasant Clove scent. 'H. J. Jones,' a fine crimson, which appears to be a hybrid between the old Clove and the Malmaison type, has a strong scent. All the true Malmaisons are fragrant, and this is perhaps their greatest charm.—*E. T. C.*

Carnations, Layering. By A. H. (*Garden*, No. 1703, p. 33, 9/7/1904).—More Carnations are probably lost from neglect to layer them at the proper time than from all other causes put together. It is most important that a fresh stock of all good garden Carnations be annually obtained, as a young, well-rooted layer planted early will stand severe weather that would kill an old plant, whose gouty, woody stems were lying upon the surface of the soil exposed to all extremes of weather. Early layering should be the rule, as the shoots put down in July are by the end of August well rooted, and can be planted out in September if desired, or left upon the plants till later, as they will gain in strength and take no harm. It is not wise to attempt layering till the shoots are of sufficient length, strength, and solidity, but generally they will be found quite fit for layering by the middle or end of July, when an effort would be made to get them done as soon as possible, for the loss of a week or two then may have disastrous results later on if the autumn be cold and wet.—*E. T. C.*

Carnations, Malmaison Tree, 'Châtillon,' 'Madame Bixio.' By G. T. Grignan (*Rev. Hort.* pp. 14–15, Jan. 1, 1904; coloured plate illustrating these two varieties).—These forms resulted from crossing 'Malmaison' with a French variety named 'Tige de fer' (iron-stalked) by M. Nonin, Châtillon-sous-Bagneux, near Paris, and as shown by the plates are very fine forms indeed. 'Châtillon' a very double, broad-petalled, slightly fimbriate form, of a deep rose, and 'Madame Bixio' ('La Fiancée,' 'Tige de fer' × 'Malmaison,' double rose), described as white striped with bright cherry-red, but in the plate the white has a *nuance* of salmon.—*C. T. D.*

Catalpa, The Hardy, as a Farm Crop. By W. J. Green (*U.S.A. Agr. Exp. Stn. Ohio, Bull.* 149).—There are two distinct species of *Catalpa*, *C. bignonioides*, or the Indian Bean, and *C. speciosa*, both being perfectly hardy in this country and fairly plentiful as ornamental flowering trees. For timber purposes both stand in great esteem, the lasting properties of the wood having been long ago recognised, particularly when brought in contact with the soil. Elaborate directions regarding raising the Catalpa from seed, transplanting, and thinning are given, also the usual rate of growth and quantity of timber produced in a given period. For posts, poles, and railroad ties the timber of the Catalpa has been found most valuable.—*A. D. W.*

Catasetum monodon. By F. Kränzlin (*Gard. Chron.* No. 910, p. 354, June 4, 1904).—This new species is said to be a native of Brazil, but nothing is known of its habitat. The plant is described both in English and Latin, but it does not seem to be a very distinct species.

G. S. S.

Cattleya Disease. Sur une Maladie des Cattleya. Par MM. Maublanc et Lasnier (*Bull. Soc. Myc. France*, xx. fasc. 3, 1903; 1 plate).—This disease has appeared for several years on the leaves of *Cattleya* around Paris, and is here determined to have at first the fructification of *Glœosporium* (15–20×4–$6\ \mu$), which is the conidial form. This, it is admitted, may be the same as some other species of *Glœosporium* found on Orchids. Under cultivation perithecia were developed on the under surface of the leaves, which produced asci and sporidia (the latter oblong, slightly curved, continuous, 20–25×5–$7\ \mu$). The perithecia were developed on dead leaves, and the authors entertain no doubt of its being the perfect and ascigerous stage of the *Glœosporium*.—*M. C. C.*

Cattleya Mendeli, var. **Lackneri** (*Gartenflora*, Jan. 1, 1904, p. 1; coloured plate).—This Orchid was raised in the nurseries of Herr Otto Beyrodt, of Marienfelde, Berlin. The sepals and petals are white flushed with pink. In the labellum the purple is divided into two distinct zones; the outer one dark purple flushed with white, the inner zone being violet veined with a lighter shade of the same colour. The upper part of the labellum is white, and the throat deep yellow veined with a light yellow.

R. C. R. N.

Celastrineæ, Anatomy of and Latex in. By August Metz (Würzburg) (*Beih. Bot. Cent.* xv. pp. 359-306).—Gives a full description of the anatomical details of seventy-two species and thirteen varieties of twenty-nine genera belonging to this order, as also of the anomalous genus *Siphonodon*. Glandular hairs are wholly wanting. Sometimes hairs are absent. Hypoderm is only found in a few genera. The leaves are almost always bifacial. Calcium oxalate is found in all the species. The existence of caoutchouc, first mentioned by Radlkofer in 1893, is now found to be by no means unusual. Tubular caoutchouc-holding cells occur in twenty-one species of *Hippocrateaceæ*, and in nine species of *Celastrineæ*. There are also, in the leaf parenchyma of some thirteen species, cells containing caoutchouc or guttapercha-like bodies. But in *Euonymus* this was only found in one species and not in two others. Tannin is frequently found in special cells or cell groups. The leaf of each species is fully described anatomically.—*G. F. S.-E.*

Cellulose in the Xylem of Woody Stems, On the Occurrence of. By M. C. Potter (*Ann. Bot.* xviii. Jan. 1904, pp. 121–140; 1 plate).—The author finds a gelatinous thickening layer, which gives a cellulose reaction, to occur very commonly though irregularly in the fibre-walls of the xylem in a number of trees.

Lignin substances extracted from the xylem by water are destroyed by certain micro-organisms, and these flourish more vigorously in the sap-wood than in the heart-wood extracts. This point suggests that the heart-wood contains some substances not readily attacked by fungi or bacteria, and accounts for the fact of its greater durability.

The presence of this unlignified layer in the wood-fibres probably represents a stage of arrested development. The delignification cannot be entirely attributed to an enzyme secreted by fungi.—*A. D. C.*

Cembran Pine Bark-Beetle. By C. Keller (*Nat. Zeit. Land-Forst.* i. pp. 337-342; 3 figs.; 1903).—After reviewing existing literature, the author gives his observations on *Tomicus cembræ* Heer, in Switzerland. Interesting details are given of the way in which the insect tunnels under the bark and in the sap-wood. The larvæ of the camel-neck fly (*Raphidia*) are recorded as destroying the bark beetle.—*W. G. S.*

Cembran Pine Bark-blister. By H. C. Schellenberg (*Nat. Zeit. Land-Forst.* ii. pp. 233–241; 2 figs.; 1904).—Certain rust-fungi with an æcidial stage known as *Peridermium* cause leaf-blister and bark-blister on species of *Pinus*. One of these, *Peridermium strobi* Kleb. (with its teleutospore stage on species of *Ribes* under the name *Cronartium ribicola*), is the cause of a bark-blister on Weymouth Pine (*Pinus Strobus*), and has been observed all over Europe, including Britain. In the United States, the home of the Weymouth Pine, neither the *Peridermium* nor the *Cronartium* has been found. *Peridermium strobi* has also been observed on the Cembran Pine in Russia, and the author confirms this by new observations in the Engadine of Switzerland. The *Cronartium* stage occurred near the affected Pines on *Ribes alpinum* and *R. petræum*, and both stages are figured. A theory is advanced that *Peridermium* *strobi* is a native of Europe, and occurred originally on the Cembran Pine. When the Weymouth Pine was introduced it was attacked with greater virulence, hence the more frequent records of this *Peridermium* on it. *W. G. S.*

Cembran Pine Leaf-cast. By H. C. Schellenberg (*Nat. Zeit. Land-Forst.* i. pp. 306–9, 1903).—The author records the common occurrence of this in nurseries in Switzerland, and ascribes to this the paucity of seedlings in the older forests. The leaf-cast is traced to *Lophodermium pinastri*, a fungus already well known to cause leaf-cast on Scots and Austrian Pine. Experiments proved that infection of the Cembran Pine may take place from diseased needles of Scots Pine. For the successful culture of Cembran Pine, a mixture with Larch and Spruce (which are not attacked by this fungus) is better than planting with Scots Pine. Since the disease is always most destructive in the nursery, the Cembran and Scots Pines should not be grown near each other.—*W. G. S.*

Centaureas. By G. G. (*Gard. Mag.* 2632, p. 242, 9/4/04).—A review of the species and varieties of this genus, with historic, descriptive, and cultural notes. Both perennial and annual species are dealt with. *W. G.*

Cerasus serrulata rosea plena. By Ed. André (*Rev. Hort.* pp. 440-1, Sept. 16, 1904; photograph and coloured plate).—A very handsome and floriferous double form, with large rosy, mauve-flushed, double flowers in bunches.—*C. T. D.*

Cercospora resedæ. By C. Gebhardt (*Die Gart.* No. 17, p. 195, January 23, 1904).—A destructive parasitic fungus often found on *Reseda odorata*. Plants treated with the well-known Bordeaux mixture, although slightly affected, survived, while the non-treated plants died before flowering.—*G. R.*

Chamædorea pulchella. By W. B. H. (*Bot. Mag.* t. 7959).—Native of Tropical America. Nat. ord. *Palmæ*; tribe *Areceæ*. A slender Palm with terminal crown of leaves, 4 feet long. Male panicle much branched, corolla pale yellow; female inflorescence unknown.—*G. H.*

Chara, The Development of the Spermatozoid in. By David M. Mottier (*Ann. Bot.* xviii. April 1904, pp. 245–254; 1 plate). The author made a study of spermatogenesis in *Chara fragilis*. The mature spermatozoid consists of a band of cytoplasm, a nucleus, a blepharoblast, and two long cilia. The blepharoblast, which is a modification of the plasma membrane, extends the whole length of the spermatozoid. No centrosome-like body, as described by other writers, was observed.—*A. D. C.*

Chemotropism of Roots. By F. C. Newcombe and A. L. Rhodes (*Bot. Gaz.* xxxvii. No. 1, p. 23).—This gives an account of experiments to discover whether roots are influenced by certain chemical salts &c. by applying them to one side only of the roots. While some showed no curves (e.g. *Lupinus albus*) with potassium nitrate, Radish "showed a considerable number of primary and secondary roots bending towards it; but *Lupinus albus* is chemotropically positive toward solutions of di-sodic phosphate. *Cucurbita Pepo* showed a general indifference.

The behaviour of all the roots tested gave no indication of osmotropism. Lupin roots curved away from all chemicals except the sodic salt.—*G. H.*

Cherry, The. By W. J. Allen (*Agr. Gaz. N.S.W.* pp. 423–437, May 1904).—A treatise on the culture of the Cherry in Australia, where the demand for this fruit is increasing from year to year. The fruit finds a ready sale, chiefly for dessert purposes. The article is dealt with under the following divisions:—Stocks; raising seedlings; budding; soil and situation; transplanting and distance to plant; fertilisers; pruning; cultivation; picking and marketing; diseases and varieties. It is splendidly illustrated with photographic reproductions of 38 varieties, as well as a coloured plate of six varieties.—*H. G. C.*

Chestnut in Southern Maryland. By Raphael Low (*U.S.A. Dep. Agr. Bur. For., Bull.* 53).—For trees, trolly, telegraph and telephone poles, and various kinds of fences the Chestnut comes, perhaps, next to the Oak in general utility.

It shoots freely from the root, and for this reason is particularly valuable in the production of coppice-wood, for which woodland commodity Southern Maryland is justly remarkable.

The soil requirements, reproduction, coppicing, and harvesting are all described in a lucid manner, while the numerous tables add much to the value of the work, as do also the well-executed illustrations.—*A. D. W.*

Chironia, Monograph of. By Emil Schoch (Zürich) (*Beih. Bot. Cent.* xiv. pp. 177–242; with 2 plates).—Gives a complete monograph of the species of this genus of *Gentianaceæ*. The distribution is very carefully worked out, and full details given of the literature &c. There is also some information about the anatomical characters of the genus. The descriptions are very full and quite sufficient for recognition.

G. F. S.-E.

Chloræa crispa. By W. B. H. (*Bot. Mag.* t. 7955).—Native of Chile. Nat. ord. *Orchideæ*; tribe *Neottieæ*. A terrestrial herb with racemes of white flowers, having a nearly orbicular labellum with fimbriate lamellæ on the surface.—*G. H.*

Chloræa incisa. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 158).—Descriptive characteristics and other interesting particulars are given.

H. J. C.

Chlorophyll Assimilation. By Dr. C. Bernard (*Beih. Bot. Cent.* xvi. pp. 36–52, with two text figures).—Dr. C. Bernard, at the suggestion of Professor King, made a series of experiments to test whether assimilation is due to a ferment or enzyme produced by the protoplasm, and whether it can proceed outside the living plant. His results were all negative and in no way confirm Friedel and Macchiati. There is a useful discussion of the literature—*G. F. S.-E.*

Chlorosis, A Cure for. By Mokrzecki (*Gard. Chron.* No. 890, p. 36, figs. 17 and 18; Jan. 16, 1904).—Hitherto there has not been any cure for this disease, but the author claims to have found one. He says: "It is a well-established fact that chlorosis in plants is due to the lack of iron, and for the purpose of cure a certain amount of green vitriol (iron sulphate) was introduced into the soil; with the solution of these salts the leaves were sprayed, and in the autumn cuttings and stems were smeared with it also. But all these efforts gave only partial results, as the cure was not always secured." It appeared that a sufficient amount of iron was not absorbed by the trees by these methods, so "I bored from one to four holes 1–1½ centimetre in diameter, and deep enough to put from 4–12 grammes of sulphate of iron; these holes were smeared over with cement." The wounds heal rapidly, and the ascending sap carries the solution up to the leaves, in which the green colour soon begins to appear. Other salts of iron, such as the phosphate and chlorate, do not effect the cure so readily. "By this method I have effected a permanent cure in many hundreds of trees, of different varieties, not excepting coniferous and evergreen trees."—*G. S. S.*

Chocho, The. By A. F. F. Somerville (*Agr. Gaz. N.S.W.* pp. 835, 836, September 1904).—Chochos are about 5 inches long, Pear-shaped, having a very rough, prickly skin, pale yellow in colour, though there is a green variety. They may be purchased for 1*d.* to 3*d.* each in Sydney, and one plant will supply the wants of any one family, provided it is put into good soil and gets plenty of water. Two fruits are enough to make a dish for four persons, and they can be boiled or baked. The writer had a chocho vine two years old which carried at the end of May 300 fruits. The chocho is cultivated in some countries for its tubers and fruits, the former growing to a size of a good Yam, which they resemble in flavour.
H. G. C.

Chromosomes, The Bivalence of, after Numerical Reduction, as Indicated by their Rotation in the "Maturation" of the Animal Ovum. By J. P. Lotsy (*Flora,* xciii. 1904, pp. 65–86; 19 cuts).—The numerical reduction in chromosomes in the male and female primitive reproductive cells "gonotokouts," in which half the somatic number of chromosomes makes its appearance, is probably due to the union 2 and 2 of the chromosomes, one from either parent in each pair. The separation of these (as postulated by Mendel, de Vries, Weismann, Haacke, and others) is effected by the transverse separation in the final mitotic division which divides the mature egg (oosphere) from its abortive sister, the second polar body.—*M. H.*

Chromosomes: Their Individuality in the Vegetable Kingdom. By O. Rosenberg (*Flora,* xciii. 1904, pp. 251-259; 7 cuts).—In the cells of *Capsella, Zostera, Calendula* the number of pseudonucleoles is constant and identical with that of the chromosomes of the species, so that these bodies appear to be permanent centres in the "resting" nucleus, which is in function *active,* for the formation of the chromosomes when it passes into kinesis. An amœboid condition of the nucleus is noted in the trophic cells of the suspensor of *Capsella,* with peripheral position of the pseudo-nucleoles, which may be seen split, as in the mitotic spireme. An active share in metabolism is ascribed to them.

M. H.

Chrysanthemum: Mode of Strengthening Flower Stalks. By A. Choulet (*Rev. Hort.* pp. 168–169, April 1, 1904).—An interesting description of the process of root-shortening &c., which has the effect of rendering the stalks stiff and capable of sustaining erect heavy flowers of otherwise drooping habits.—*C. T. D.*

Chrysanthemum ornatum. By W. B. H. (*Bot. Mag.* t. 7965).—Native of Japan. Nat. ord. *Compositæ*; tribe *Anthemideæ*. A branching herb. Leaves with white felt below and on the margin; flower-heads loosely corymbose, with ray white and disk yellow; heads $\frac{3}{4}$ to 2 inches diam.—*G. H.*

Chrysanthemum Rust. By U. Brizi (*Bull. R. Soc. Tosc. Ort.* 12, p. 376, Nov. 1904).—This rust, *Puccinia chrysanthemi* Roze., appeared about 1896, and was probably introduced from America, where it had been long known and was not very injurious. Some regard it as of Japanese origin. In 1897 almost all the collections in England and France were infested by it. The English were the first to find successful means of combating the pest.

The rust appears on the lower surface of the leaf as very numerous small pustules, which give rise to yellowish-brown summer-spores. At the end of autumn the winter-spores appear, which infect the leaves next year at the end of spring or summer. The better grown the plants, the more liable they are to be attacked.

In this case prevention is better than cure.

When the leaves fall in autumn it is best to burn all which are the least affected. In the spring a choice should be made of the healthy cuttings. In the summer all affected leaves should be searched for and removed. Application of a fungicide to both leaf-surfaces is recommended.—*W. C. W.*

Chrysanthemums, Best, List of about 300 (*Rev. Hort.* pp. 213–216, May 1, 1901).—A classified list, compiled by the *Chrysanthemum* section of the National Horticultural Society, in ten groups.—*C. T. D.*

Chysis and their Culture. By W. H. W. (*Orch. Rev.* vol. xii. p. 124).—Useful information as to culture is given, and the various species and hybrids are enumerated.—*H. J. C.*

Cicadas in Kentucky. By H. Garman (*U.S.A. Exp. Stn. Kentucky, Bull.* 107, May 1903; 7 figs.).—The author describes the various kinds of locusts found in Kentucky, and gives an account of the life-history of each. The injuries caused by the 17-year locusts to trees are due to the sucking of the sap from roots by the nymphs, and to the punctures made by the adult female in the twigs when she lays the eggs. These cause the twigs to break off or the bark to split lengthwise, admitting water and the spores of fungi, which results in decay. Various trees are attacked, particularly Elm, Apple, Hickory, Oak, Hackberry, and Black

Locust. Birds and small mammals feed upon the nymphs, particularly when they come out of the soil (at night), while the fungus *Massospora cicadina* attacks and kills large numbers of the insects.—*F. J. C.*

Cider, Preparation of Sterile Must. By G. Perrier (*Compt. Rend.* Jan. 1905, p. 234).—In the ordinary method the must of cider obtained by pressure or by diffusion is left to ferment without the addition of yeast; consequently the result is sometimes satisfactory, sometimes otherwise, often furnishing cider of only medium quality, and rarely constant.

The aim should be to obtain sterile must to which can be added pure yeast, either of one kind or more, and thus secure cider of good quality. Numerous experiments demonstrated the difficulty of sterilising must, which undergoes undesirable changes when exposed to heat, antiseptics, &c. It is not practicable to sterilise must containing yeast; hence an endeavour was made to obtain must perfectly free from yeast. Pasteur's researches showed that wild yeasts are present only on the surface of Grapes, and the same is true of Apples. The object, then, was to render the fruit sterile so far as yeast on its surface was concerned. The experience of three years has shown that this can be effected by the use of formaldehyde [formalin]. The method is as follows:

The fruit is first washed in ordinary water, and afterwards in water containing eight parts of pure formalin in a thousand parts of water. The fruit remains in this solution from five to ten minutes, and is then again washed in pure water to remove all trace of formalin. The fruit is then crushed in the ordinary manner, first taking the precaution to wash all apparatus with water containing four parts of formalin to one thousand parts of water.

Must obtained by this method does not ferment spontaneously; it is sterile so far as the presence of yeast is concerned. Samples of must thus prepared made the voyage from Rennes to Buenos Ayres and back again without undergoing fermentation. All traces of formalin disappear after some hours, and when yeast is added fermentation commences normally, and the result is a perfectly natural cider not containing a trace of formalin.

The advantages gained by this simple and inexpensive method of sterilising the Apples are:—1. The preservation of must from one year to another, thus anticipating a scarcity of fruit. 2. To furnish at all seasons of the year a supply of newly made cider.—*G. M.*

Citrous Trees and Fruits: Wither-tip and other diseases of. By P. H. Rolfs (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 52, March 3, 1904; 6 plates).—Wither-tip was unknown in Florida until 1886. In 1901 it had only a passing interest, whilst it is now present in every Citrus-growing region of the State.

The diseases caused by the fungus *Colletotrichum glœosporioides* (Penz.) manifest themselves as wither-tip on Orange, Pomelo, and Lemon twigs, as leaf-spots on leaves of various citrous species, as anthracnose on Lime blossoms, recently set Limes, Lime twigs, and Lemon twigs, as Lemon-spot of ripe Lemons, and as canker on Limes.

On the Orange and Pomelo the fungus causes the most severe damage, defoliating young twigs, causing them to die, reducing the wood which should produce bloom, and cutting back the growth of young trees. In Lemon groves the most severe damage is done to mature fruit, whilst in Lime groves the greatest loss occurs during the blooming season, the disease often causing all the bloom to fall. Trees less severely attacked often have 80 per cent. of the fruit cankered, and its market value reduced.

Wither-tip and leaf-spot are best controlled by pruning out diseased twigs, and then spraying with Bordeaux mixture. Spotting of Lemon by spraying with ammoniacal solution of copper carbonate, and with sulphur spray while in the colouring bed or colouring house. Canker of Limes may be prevented by cutting out wither-tip before the blooming period, and then by spraying with Bordeaux mixture.—*M. C. C.*

Clays, Useful Properties of. By A. S. Cushman (*U.S.A. Dep. Agr. Bur. Chem., Circ.* No. 17).—A paper on the properties and chemical composition of different kinds of clay, written from the point of view of the potter.—*M. L. H.*

Clematis Hybrid. By F. Morel (*Rev. Hort.* pp. 308–310, July 1, 1904; coloured plate).—Three attractive hybrids: 'Mme. Raymond Guillot,' intense crimson inside, deep rose beneath; 'Mme. Moret,' bright scarlet, whitish below; and 'Mme. Lerocher,' rose-pink with deeper margin.—*C. T. D.*

Clerodendron myrmecophila. Anon. (*Gard. Mag.* 2633, p. 257; 16/4/04).—A descriptive note, with illustration of the new stove plant discovered in the forests in Singapore in 1896 by Mr. Ridley.—*W. G.*

Clivia (Imantophyllum) cyrtanthiflora, Van Houtte (*Gartenflora*, May 1, 1904, p. 225).—A hybrid between *Clivia nobilis* × *Clivia miniata*, which resembles its parent *Clivia nobilis* very strongly.

R. C. R. N.

Cobæa scandens. By Angiolo Pucci (*Bull. R. Soc. Tosc. Ort.* 4, p. 115, April 1904).—By some this plant is regarded as type of the order *Cobeaceæ*, by others as belonging to the *Polemoniaceæ.* In the author's establishment the plant is planted outside against a wall facing the east, and flowered up to December. It was then at the height of its vigour. The longest shoots reached the roof of the house (about 6 metres from the ground).

The campanulate corolla is 6–8 centimetres long and 4 centimetres broad, at first greenish, then gradually becoming violet, this producing one of the best effects; at the bottom of the corolla some glands secrete a sweet syrupy liquid. Professor Morren states that with five or six flowers one can sweeten an ordinary cup of coffee. The flowers are slightly scented at night.

The plant has to be renewed each year by seed sown under shelter from February to March. In warm localities the seed can be sown, as near the house as possible, outside; in colder places the seedlings are potted and kept protected until May. The plant prefers a light rich soil, and flourishes best in an east or north aspect. In those localities where it can exist in the open through the winter it is perennial, but ought to be renewed every three years, as, when getting old, it loses the lower leaves. The plant is a native of Mexico, and is named after the Spanish Jesuit Cobo.—*W. C. W.*

Cocoanut Palms in Cuba, Report of an Investigation of Diseased. By August Busck (*U.S.A. Dep. Agr. Div. Ent., Bull.* No. 38, N.S. 1902, pp. 20–23).—The Cocoanut industry in the province of Santiago is threatened by a parasitic fungus which has been identified as *Pestalozzia palmarum*, Cooke. The first outward indication that a Palm is attacked is the falling of the young fruit; subsequently the larger nuts drop and the leaves assume a pale yellowish colour. "Within a month all the large lower leaves droop and fall, leaving the pale sickly tops, which at the first heavy wind blow over and then only the naked trunks stand as ghastly tombstones where a few months before stood graceful valuable Palms. Palms of all ages are subject to this disease, though it seems more prevalent among the older plants." Cutting down and burning the diseased Palms is suggested as the best way of combating it.—*R. N.*

Codlin Moth, The (*Carpocapsa pomonella*). By C. B. Simpson (*U.S.A. Dep. Agr. Div. Ent., Bull.* No. 41).—The author states that this insect "is the most serious drawback with which the Apple-grower has to contend, as from one quarter to one half of the Apple crop is injured every year. The control of this insect, however, is not difficult, when compared with that of many insects, and hosts of Apple-growers are each year saving practically all of their crop from its ravages." Details are given of the injuries caused by this insect in different States, from which it appears that in Nova Scotia, Northern Maine, and Western Oregon, owing to the severity of the climate, this insect is doing but little injury; but in the great Apple regions of the Central States the injury is estimated at from 30 to 100 per cent. Not only are Apples infested by this pest, but Pears, Peaches, Prunes, Plums, Cherries, Quinces, and Apricots. "But under ordinary conditions their injury amounts to practically nothing. In cases where there is a lack of Apples, and the infestation is very abundant, considerable damage results. There are records of 40 per cent. injury to Peaches where the trees were quite near an Apple house in which infested fruit was stored." A fact is mentioned concerning this insect which, as far as I know, has not been recorded in this country—that is, that the larvæ at times feed on the leaves. The life-history of this insect is very thoroughly worked out, and much time has been given to ascertaining how many generations there are of this insect in the course of the year, and the conclusion come to is that there are only two, and "that it remains to be proven that even a partial third generation is present in any part of the United States." "Though the codlin moth has many natural enemies, the number, as compared with those of other Lepidopterous larvæ, is comparatively small. . . . Birds are by far the most efficient of the natural enemies of this insect." "The insect enemies of the codlin moth are either predaceous or parasitic, and are quite numerous as to species, but are usually few as to individuals." In discussing preventive measures, various methods of cultivation are mentioned which are of benefit in this respect. Arsenical sprays are recommended as the best remedial agents, and of these the one that takes the first place is arsenite of lime with soda. This compound in the States is about a quarter of the price of "Paris green." It is made by boiling one pound of white arsenic and four pounds of sal soda (crystal) in one gallon of water until they are dissolved; the loss of water by evaporation should then be made good. A pint of this solution should be added to fifty gallons of water, and finally three or four pounds of freshly slaked lime should be added. "It is always desirable to have an excess of lime present, in order to prevent all danger of burning." It is recommended that the spray should be applied a few days after the blossoms have fallen, and before the calyx has closed, and another about two weeks later, when the majority of the larvæ are entering the fruit. Spraying for the second generation should be carried out as soon as the caterpillars are hatched. This bulletin is well illustrated with sixteen plates and various figures in the text, and concludes with a very full bibliography down to 1898.—*G. S. S.*

Cœlogyninæ, Anatomy of the. By H. Zörnig (*Engl. Bot. Jahrb.* xxxiii. March 1904, pp. 618–741; 60 figs.).—The author has investigated the leaf-anatomy, and in part also the anatomy of the tubers of fifty-four species of this tribe of Orchids, including the genera *Cœlogyne, Pleione, Pholidota, Neogyne, Platyclinis, Otochilus, Crinonia,* and *Dendrochilum.* His figures illustrate the form of the stomata and surrounding epidermal cells, the general arrangement of the tissues in a transverse section of the leaf, and also to a smaller extent histological details of the transverse section and the nature of the cell-contents. He gives a key by means of which species of *Pholidota, Platyclinis,* and *Cœlogyne* may be determined by a study of the leaf-anatomy, and to a more limited extent of the structure of the pseudobulb.—*A. B. R.*

Coffee-leaf Stilbum. Sur la Maladie du Caféier, *Stilbella flavida.* Par M. A. Puttemans (*Bull. Soc. Myc. France,* xx. fasc. 3, 1903; 1 plate).—This communication rehearses that this fungus on the leaves, fruit, and young branches was first described by Cooke as a Hyphomycete under the name of *Stilbum flavidum* in 1880; disputed by von Tavel in 1894, who contended that it was a Hymenomycete, and called it *Physalacria*; in 1896 Spegazzini also considered it a Hymenomycete, and called it *Pistillaria*; afterwards, in 1903, Kohl restored it to its position as a Hyphomycete, and called it *Stilbella flavida,* after Lindau. The paper is principally descriptive and technical, and treats also of the relationship of the *Stilbum* to *Phyllosticta coffeicola,* with which it was often associated.—*M. C. C.*

Coffee Parasites. Champignons parasits sur les Caféiers. Par Dr. Geo. Delacroix (*Bull. Soc. Myc. France* xx. fasc. 3, 1904; 1 plate).—The species enumerated in this paper, which is mainly descriptive, are *Capnodium coffeæ* (Pat.) on the leaves; *Anthostomella coffeæ* (Del.) on floriferous branches, Mexico; *Hendersonia coffeæ* (Del.) on branches, Mexico; *Rhabdospora coffeicola* (Del.) on dead branches, Mexico;

Phyllosticta coffeicola (Del.) on leaves, Vera Cruz, in company with *Stilbum flavidum* (Cooke); and *Phyllosticta comoensis* (Del.) on leaves, Gaboon.—*M. C. C.*

Coffee, Sooty Fungus. La fumagine des Caféiers. Par A. Puttemans (*Bull. Soc. Myc. France,* xx. fasc. 3, 1904 ; 1 plate).—The two fungi here described were found parasitic on coffee-leaves at São Paulo, Brazil. The first, *Capnodium brasiliense* (Putt.), resembles in its external features other allied species of *Capnodium* in forming sooty patches on the living leaves. The other species, *Limacinia coffeicola* (Putt.), is a sphæriaceous fungus, with perithecia clad with setæ in the upper portion, and containing subfusoid biseptate sporidia ($15–18 \times 5–6\,\mu$).—*M. C. C.*

Colour of Flowers. By F. W. Card (*U.S.A. Exp. Stn. Rhode Is., Rep.* 1903; pp. 213–214).—It has been reported that by watering plants with a solution of sugar the red colours of leaves and flowers may be deepened. The plants experimented with were Phlox, Balsam, varieties of Aster, and ten-week Stocks, planted in plots in the open ground. A reasonable application (up to 100 lb. per acre) of nitrate of soda, muriate of potash, or sugar failed to have any appreciable effect on the colours of the flowers.—*F. J. C.*

Columelliaceæ, The. By Ph. van Tieghem (*Ann. Sc. Nat., Bot.* xviii. 1903, pp. 155–164).—The one genus and four species placed in this order have proved difficult to classify. The author describes the results of his examination of stem, leaf, and flower of three species, and assigns the group a place near or within the *Gesneriaceæ.*—*W. G. S.*

Commelinaceæ, Researches on the Morphology of. By J. Clark (*Flora,* xciii. 1904, pp. 483–513; 31 cuts).—A discussion of the morphological and symmetrical relations of stem, inflorescence, and flowers. The cleistogamous flowers of *Commelina benghalensis* come off on short lateral branches of the subterranean shoots, not the roots, as hitherto believed. The veil over the anthers of *Cochliostema* is due to the concrescence of 1-seriate multicellular hairs growing from the filament.
M. H.

Coniferæ, The Double Vascular Bundle in the Leaf of some. By G. Chauveaud (*Ann. Sc. Nat., Bot.* xix. pp. 335–348; 9 figs.; 1904).—Leaves of several species of *Abies* and *Pinus* have a double vascular bundle, generally regarded as resulting from the forking of a single bundle in the petiole. The author finds in very young leaves one bundle only, which in development becomes double through the resorption of the first-formed sieve tubes and wood elements. The drawings of sections of developing leaves of *Abies bracteata, Pinus Pinea,* and *P. sylvestris* show the nature of the division. Similar results were obtained with other species.—*W. G. S.*

Coniferæ, Tissues in the Phloem. By G. Chauveaud (*Ann. Sc. Nat., Bot.* xix. pp. 321–333; 4 figs.; 1904).—From a series of investigations on *Coniferæ* the author distinguishes a tissue on the outside of the phloem, which he calls "liber précurseur." This he describes and figures in *Abies Pinsapo* in his present paper, but he has already described it in other *Coniferæ* elsewhere. A section through the radicle in one stage shows: (*a*) a thick external part of the phloem, the "liber précurseur"; (*b*) a thinner middle layer, the primary phloem; (*c*) a very thin inner part, the beginning of the secondary phloem; in addition there are secretory canals of the pericycle region. The "liber précurseur" is made up of elongated elements with sieve-plates, generally unthickened, but in *A. Pinsapo* thickened so as to be indistinguishable from adjoining primary phloem sieve-tubes. This tissue is confined to radicle, hypocotyl, and cotyledons (the figures show its occurrence in each of these), and it is not found in the later-formed stem and leaves.—*W. G. S.*

Conifers, Centripetal Wood in Leaves of. By Dr. Ch. Bernard. (*Beih. Bot. Cent.* xvii. pp. 241–310; with 88 figures and 1 coloured plate).—Describes and figures the anatomical structure of the leaves of a great number of the rarer species of *Coniferæ* and of Cycads. His conclusions are that transfusion tissue is notning but the centripetal wood to be found in all stages of transition from Cycad to *Pinus*. Its function may be changed; it can be adapted to the conduction of sap ("sucs"), and thus its origin may be rendered obscure; but the mesarch nature of the bundles will be evident in those individuals which retain their ancestral characters. The Conifers are "diploxylons," but the reduction of the centripetal wood is accentuated. The "parenchyme transversal" or "accessory transfusion tissue" is morphologically separate, though it may be physiologically a continuation of the centripetal wood. It has most frequently a supporting function. The author calls this tissue "hydro-stéréome transversal." The most important character of centripetal wood consists in the presence of small elements situated against the protoxylem. After these, follow two lateral wings which lead to lignified cells, which are larger, pitted, spirally, or reticulately thickened. This character is sometimes so evident that, in the less modified types, the circular arc which is typical of Cycads may be found. It is probable that, in the more modified types, the origin of the centripetal wood may be found by taking series of sections, or by studying cotyledons, very young leaves or, perhaps, cone-scales. There is a bibliography of 58 numbers, and the plate and figures are extremely well done.—*G. F. S.-E.*

Conifer Disease, A. (*Botrytis cinerea*, Pers.) (*Jour. Bd. Agr.* vol. x., No. 1, pp. 17–21, with coloured plate; 1903).—This disease was first discovered in Germany attacking the topmost shoots of seedlings, also the tips of the lower branches of older trees. This fungus causes the shoots to "curve downwards or become variously twisted, and the leaves die and become separated from the branches, but are frequently prevented from falling, being held in a tuft by a delicate weft of brown, cobweb-like mycelium." The young shoots of Silver Fir (*Abies pectinata* DC.), Spruce (*Picea excelsa* Link), and Larch (*Larix europæa* DC.) have been successfully inoculated with this disease. It has also been observed on Junipers, and in Hungary on species of *Abies*, *Picea*, and *Larix*; in the British Isles on *Pinus sylvestris* L., and seedling Wellingtonias.

Preventive Measures.—"Perfect cleanliness in the seed-beds is of primary importance. Weeds should not be hoed up and left to die on the ground in the spring, when the leaves of seedlings are quite young, as the *Botrytis* grows on all kinds of dying and dead plants, and the spores pass on to the leaves of the seedlings.

"In one instance the fungus causing the diseases was found to spread from stable manure, which had been imperfectly buried in the soil; the projecting portions of straw were thickly covered with the *Botrytis*.

"The *Botrytis* is very dependent on moisture, and only produces spores in a humid atmosphere; hence it is so important that damp, low-lying situations should be avoided for nursery purposes.

"When the disease is present, spraying with the following solution, elsewhere called 'violet mixture,' will check its progress:

Sulphate of Copper	2 lb.
Carbonate of Copper	3 lb.
Permanganate of Potash	3 oz.
Soft Soap	½ lb.
Rain water	18 gallons

"Every part of the ground within, and for some distance beyond, the affected part should be thoroughly wetted. The soft soap should be dissolved in hot water. The remaining ingredients are soluble in cold water.

"All diseased seedlings should be collected and burned."—*R. N.*

Cordyline indivisa vera. By J. Ryan (*Garden*, No. 1717, p. 261; 15/10/1904).—This magnificent plant is seldom met with in gardens in this country. It is a native of New Zealand, and from experience of it during the last few winters we think it will prove hardy in many parts of the British Isles in a position sheltered from the wind, which spoils the leaves by splitting the ends of them. An excess of moisture at the roots during the winter is fatal to it; therefore it should have a well-drained soil, composed of leaf-soil, peat, loam, and sand. The colour is pale green, with a deep orange midrib and veins. It is such a noble plant that it is a pity it is not more common. It has stood out during the last four winters, and is not injured by ordinary frosts, but in a very severe one we cover it with bass mats.—*E. T. C.*

Corn-growing. By C. P. Hartley (*U.S.A. Dep. Agr., Farmers' Bull.* 199, 1904; illustrated).—The "Corn" alluded to in this pamphlet is of course Indian Corn, and its object is to show that the same quantity of Corn now produced in the United States could be grown on half the present acreage, without any increase in work or expense.

This change could be effected by—

1. Improvement in the quality of seed used.
2. Improvement in the condition of the soil.
3. Improvement in methods of cultivation.

The first condition seems obvious, yet farmers are more careless in this respect than in any other farming operation.

The soil has a great influence on production, and several illustrations are given to show the thin crops resulting from a generally poor soil, or from infertile spots in an otherwise fertile field, or from undrained spots, or from close proximity to timber (as is often seen in English fields near the hedgerows). Several methods of improvement are suggested, amongst others terracing (to prevent soil-washing), autumn ploughing (turning in a green crop at the same time), surface cultivation, as being better for this particular plant than deep ploughing, but frequent enough to check weeds and maintain a loose soil mulch of two or three inches; planting an enriching leguminous crop between rows of Corn in poor soil &c.

Illustrations of useful and necessary machinery are given.—*C. H. C.*

Corydalis Wilsoni. By J. D. H. (*Bot. Mag.* t. 7939).—Native of Central China. Nat. ord. *Fumariaceæ*; tribe *Fumarieæ*. A glabrous herb, with many flowered racemes of large golden-yellow flowers.—*G. H.*

Corynocarpus (Forst). On the Genus. Supplementary Note. By W. Botting Hemsley (*Ann. Bot.* xviii. Jan. 1904, pp. 179–180).—This is merely a supplementary note to the author's paper on the genus (*Ann. Bot.* xvii. 1903, p. 743). The note has reference to a paper on *Corynocarpus* by Van Tieghem.—*A. D. C.*

Cotoneaster angustifolia. By M. T. M. (*Gard. Chron.* No. 939, p. 441, fig. 191; Dec. 24, 1904).—This plant is one of the many fine things that have been found in the Chinese province of Yunnan. It has been in cultivation at Kew since 1899, but it does not seem to have attracted much, if any, attention until a spray densely covered with its yellow fruit was exhibited at one of the recent fortnightly shows of the Royal Horticultural Society. It was shown by Messrs. Paul and Son on behalf of M. Maurice de Vilmorin. The seeds from which the plants were grown were obtained from Eastern Tibet, where apparently this species is subject to severe frost, so that it should be quite hardy. M. Vilmorin says: "The young plants are for the first three to four years erect, but then the lateral branches begin to take much development, and the two bushes at Les Barres, left entirely unpruned, are of similar habit, that is, about 4 feet high and 6 feet wide, with the branches mostly horizontal, the lowest trailing on the ground."—*G. S. S.*

Cotoneasters. By W. T. (*Gard. Mag.* 2667, p. 810; 10/2/04).—An excellent descriptive account of the species of *Cotoneaster* in cultivation by a writer whose knowledge of them is evidently intimate.

The species include the new *C. angustifolia* from China, and introduced by M. M. de Vilmorin, of Paris.

An excellent illustration of a fruiting branch of this novelty is given with the article.—*W. G.*

Cotton-boll Weevil, The Mexican (*Anthonomus grandis* Boh.). By W. D. Hunter and W. E. Hinds (*U.S.A. Dep. Agr. Div. Ent., Bull.* 45).—This insect "has the unique record of developing in less than twenty years from a most obscure species to undoubtedly one of the most important economically in the world." The female, with the aid of her proboscis, makes a hole towards the lower part of the calyx, within which she deposits an egg, either just inside the base of a petal or among the lowest anthers. Within a few days the eggs hatch, the young grubs feed and undergo their transformations within the boll or square, to the great detriment of the latter. When the perfect weevil leaves the chrysalis case it either gnaws its way out or escapes when the carpels open; it subsequently feeds on the external portion of the boll. The difficulty of controlling this insect is great, "for the weevil lives, in all stages except the imago, within the fruit of the plant . . . that it is remarkably free from parasites or disease, that it frequently occupies but fourteen days for development from egg to adult, and the progeny of a single pair in a season may reach 134,000,000 individuals." This bulletin is illustrated with sixteen very good plates and numerous figures in the text. The life-history, parasites, and means of destroying this insect are given in detail; also figures are given of various beetles which have been mistaken for this weevil.—*G. S. S.*

Cotton-boll Weevil Ant, Kelep, or Guatemalan, The. By F. O. Cook (*U.S.A. Dep. Agr. Bur. Ent., Bull.* No. 49, 1904).—An interesting account is given of this insect, which preys upon the Mexican cotton-boll weevil. It is a native of Guatemala, but it is hoped that it may prove of great service in the cotton-fields of Texas and elsewhere.

G. S. S.

Cotton Cultivation. By A. I. Boyd (*Qu. Agr. Journ.* xiv. pt. 2, p. 121; pt. 3, p. 188; pt. 4, p. 269).—A useful series of articles on cotton cultivation is supplemented in succeeding parts of the same journal by numerous notes and suggestions on the same subject, and incidentally on cotton-growing in the British Empire; also on cleaning and preparing cotton for the market.—*M. C. C.*

Cotton Cultivation in the West Indies (*Jour. Imp. Dep. Agr. W.I.* vol. iv. No. 3, 1903).—This number of the journal is occupied by a series of papers, bearing more or less directly on the cultivation of Cotton in the West Indies, and consists of articles on "Cotton cultivation in the United States," "the origin and distribution of Sea Island Cotton," varieties of Sea Island Cotton, the improvement of Sea Island Cotton by seed selection, cultivation of Sea Island Cotton, Cotton cultivation in the West Indies (St. Kitts, Antigua, Montserrat, Barbados, Carriacou), the agricultural chemistry of Cotton, fungoid diseases of Cotton, and insect pests of Cotton.—*M. C. C.*

Cotton, Sea Island, in the United States and in the West Indies. By Sir Daniel Morris, K.C.M.G., and Mr. J. R. Bovell, F.L.S. (*Jour. Imp. Agr. Dep. W.I.* vol. iv. pt. 4, 1904).—This entire part of the journal is occupied by the above subject, which includes the account of a "Mission to the Cotton Districts of U.S. America, Sea Islands of S. Carolina, Sea Island Cotton on James Island, Yield and Cost of Production, Cotton Ginneries in U.S.A. and the West Indies, Recent Sales of W.I. Sea Island Cotton, Cotton Oil Factories, Treatment of Cotton-seed for feeding purposes, Notes on Pests attacking Cotton in the West Indies, and four Appendices on cognate subjects."—*M. C. C.*

Cotton, West Indian Anthracnose. By L. Lewton-Brain, B.A., F.L.S. (*Jour. Imp. Dep. Agr. W.I.* vol. v. pt. 2, 1904, pp. 178–194, with seven figs.).—This is a full and circumstantial account of the fungus disease of cotton, called Anthracnose, which is well known in the United States, and is attributed to *Colletotrichum gossypii* (South), which is succeeded in some instances by a species of *Fusarium*. This paper adds little to what was already known, and there is no reason to suppose that the fungus differs in any way from the ordinary pest, which has occupied attention in the United States.—*M. C. C.*

Crab Apples, Varieties of (*U.S.A. Exp. Stn. Virginia, Bull.* 132; 1/1902).—The cultivation of Crab Apples is advocated on account of their culinary value, their value in making jelly, cider, &c., and their beauty in flower and fruit. The following varieties are recommended for planting in Virginia:—'Blushing Maid,' 'Hyslop,' 'Lake Yellow,' 'Montreal,' 'Queen,' 'Red Siberian,' 'Transcendent,' and possibly 'Whitney,' but the last is susceptible to fungal attacks of various sorts. 'Elgin,' 'English,' 'Maiden Blush,' 'Quaker Beauty,' and 'Soulard' have not proved so useful. Other varieties are under trial. The orchard was planted in 1888.—*F. J. C.*

Crossosoma californicum. By W. B. H. (*Bot. Mag.* t. 7949).—Native of California. Nat. ord. *Dilleniaceæ.* This is a dwarf shrub with oblong lanceolate, coriaceous leaves. Flowers white, about 2 inches diam., with many yellow anthered stamens.—*G. H.*

Crotalaria capensis. By W. B. H. (*Bot. Mag.* t. 7950).—Native of South Africa. Nat. ord. *Leguminosæ*; tribe *Genisteæ.* First introduced in 1774 to Kew. It is a branching evergreen shrub, 5 to 10 feet high, with trifoliate leaves and racemes of fragrant yellow flowers, striped with red-brown, 1½ inch diam.—*G. H.*

Cryptomeria japonica: The Gametophytes, Fertilisation, and Embryo of. By Anstruther A. Lawson (*Ann. Bot.* xviii. July 1904, pp. 417-441; 4 plates).—A full account of the fertilisation of this plant; from the main results the following points may be noted:—

The reduction division which leads to the formation of the tetrads takes place during the latter half of October, although pollination does not take place until March of the following spring. Both male cells in the pollen tube are functional. The cell-walls in the prothallium are formed as the result of a peculiar method of free cell-formation.

As near as could be estimated there are nine or ten chromosomes in the nucleus of the gametophyte, and eighteen or twenty in the sporophyte.—*A. D. C.*

Cryptostegia madagascariensis. By W. B. H. (*Bot. Mag.* t. 7984).—Native of Madagascar. Nat. ord. *Asclepiadaceæ*; tribe *Periploceæ.* A climbing glabrous shrub. Leaves coriaceous, lanceolate to orbicular; flowers in terminal cymes, 2½ to 3 inches across, rose-coloured. *G. H.*

Cunonia capensis. Anon. (*Gard. Mag.* 2670, p. 857; 31/12/04).—An illustration of this rare Cape shrub, so seldom seen in flower in this country. It bears racemes of white flowers, reminding one of a *Clethra.* It has recently flowered in the Trinity College Gardens, Dublin.—*W. G.*

Cut Flowers, Hints about. By Alger Petts (*Garden* No. 1697, p. 377; 28/5/1904).—It is a common experience that some flowers will not continue fresh in water even for a day. Not only do they fade, but the whole thing withers as if the stalk failed to reach the water. By a knowledge of a few simple facts much disappointment and vexation may be avoided. In the first place, all flowers should be put into water as soon as possible after they are cut. If left out of water for some time the cut ends become dry and shrivelled, with the result that some of them have a greatly lessened power of absorption of water. In such cases a half-inch or so should be cut off the ends of the stalks immediately before they are put into water. This is a good plan to adopt with flowers which have been travelling, in addition to which, in such cases, they should be immersed in water up to their heads for an hour or so; and if the water is tepid so much the better.—*E. T. C.*

Cyaniding Insect-infested Plants. By E. F. Hawes (*Gard. Mag.* 2634, p. 274; 23/4/04).—The nature of this insecticide is described, and detailed instructions are given as to its application to various kinds of plants and the particular insect pest to be destroyed.—*W. G.*

Cyanophyceæ, Morphology and Physiology of the. By F. Brand (*Beih. Bot. Cent.* xv. pp. 31–64; 1 plate and bibliography).—Gives a long and critical discussion of Resting spores, Limit cells (heterocysts), Gonidia (conidia) and Mikrogonidia, Separation bodies, and of the active movements of Hormogonia.

The resting spores are produced without rejuvenation and under very unfavourable conditions. Generally they are enlarged vegetative cells with thicker cell-walls and stores of food material. The occurrence of these resting spores in the different families is detailed. The heterocysts or limit cells are, according to the author, connected (probably) by protoplasmic threads with the neighbouring cells through the pores, and contain reserve material. The author found them in *Nostoc commune*, and states that they give rise to gonidia. These gonidia (conidia) are formed by rejuvenation and division, and directly pass into the vegetative condition without a resting period. The author describes his observations of them in *Phormidium uncinatum*, Gom. The separation bodies may be either dead cells or special intercellular excretions, and allow of the breaking-up of a thread or the separation of a side branch. The substance excreted seems not to be cellulose. The movements of *Oscillatoria* threads and of those of other species are fully discussed. They appear to be caused by light at least in part, but are, according to the author, in part autonomous. The hormogonia show at least three motions, viz. swimming in direction of the longitudinal axis, twisting round the longitudinal axis, and, as discovered by the author, turning of the longitudinal axis itself round its middle point. In consequence of this last motion the free hormogonia often follow a path which is a spherical triangle with the sides concave outwards.—*G. F. S.-E.*

Cycadeæ, Reproductive Organs of. Part I. By Marie C. Stopes (*Flora*, xciii. 1904, pp. 435–482; 37 cuts).—This paper deals only with the carpel and ovule in the genera *Bowenia, Cycas, Dioon, Zamia, Ceratozamia, Macrozamia*, and *Encephalartos*. The integument of the ovule is known to be drupe-like, with an outer fleshy and an inner hard layer, which are merely due to differentiations in liquefication, and have a common vascular system. An inner fleshy layer is now demonstrated, with its proper vascular system, and is homologised with the (distinct) internal coat of the fossil *Lagenostoma*. Details are given of the formation of the pollen-chamber at the apex of the nucellus.—*M. H.*

Cyclamen hiemale, nov. spec. By Herr Friedrich Hildebrand (*Gartenflora*, Feb. 1, 1904, p. 70).—This hardy Cyclamen was sent from Mersina in Asia Minor. In appearance it is something between *C. coum* and *C. ibericum*; in fact, some of our English authorities give this *Cyclamen* under *C. coum*. Herr Hildebrand, however, claims that this is a new species. He gives its time of flowering as from November to January.—*R. C. R. N.*

Cyclamen, New. By F. Hildebrand (*Gartenflora*, Feb. 1, 1904, p. 70).—In the spring of 1898 a carefully prepared monograph of the genus *Cyclamen* was published by this botanist, in which thirteen species are described, mostly from living specimens, being all that were then known to him. Of these thirteen species eight or nine have been known in British gardens for many years, but none of them more generally and successfully grown than *C. persicum* (*C. latifolium*, as we are now told to call it), which, under long and skilful cultivation, has become the *facile princeps* of the genus. Since the publication of Hildebrand's monograph, no fewer than five more species or sub-species have come to light previously unknown to science :—(1) *Cyclamen libanoticum*, from the historic Mount Lebanon in North-West Syria, is described in Engler's "Jahrbuch" for 1898, p. 477, as a suitable plant for cultivation, the seedlings of each generation improving, as regards their flowers, in size, colour, and variation. (2) *C. Pseud-ibericum*, which appears to be a sub-species of *C. ibericum*, but differing chiefly in its tubers and larger flowers. (3) *C. Mindlerii*, of Greek origin, found by Herr Mindler on the island of Ægina, but not yet in cultivation. (4) *C. Meliarakisii*, also of Greek origin, and named after a former director of the Botanic Garden at Athens, and recently introduced to European gardens through Max Leichtlin, of Baden-Baden ; it may, however, prove to be *C. græcum* or a variety of it. And (5) *C. hiemale*, a discovery of Herr Siehe, who sends it from Mersina in Asia Minor. This may prove of some value as a winter-flowering plant, being quite distinct from *C. persicum* (*C. longifolium*), with handsome foliage and carmine-red flowers with a dark red spot.—*A. H. K.*

Cyclanthaceæ, Anatomy of. By Ernst von Oven (Rogasen) (*Beih. Bot. Cent.* xvi. pp. 147–198 ; with one plate).—Gives a description of the anatomy of the leaves, petioles, peduncle, and roots in ten to twelve species of *Cyclanthus, Carludovica*, and *Ludovia*. The author selects as specially remarkable the presence of sclerenchymatous fibres in the phloem of the larger leaf and flower-stalk bundles. In *Cyclanthus cristatus* two to four vascular bundles become confluent; cells with net-like thickening and also showing after-division are found in the ground-tissue of *Carludovica latifolia* petioles. Peculiar sunken strips are found on the epidermis of *C. Laucheana*. Many mucilage canals occur in the root of *C. lancifolia* whose epithelium grows into the cavity.—*G. F. S.-E.*

Cydonia sinensis. By W. B. H. (*Bot. Mag.* t. 7988).—Native of China. Nat. ord. *Rosaceæ*; tribe *Pomaceæ*. This Quince was said to have been introduced in the last decade of the eighteenth century, but this is not confirmed. It was confounded with *C. cathayensis*, but the author distinguished them. The petals are 7 to 8 lines long, pink, white at base, with a zone of a deeper red. Fruit is oblong-ovoid, 6 inches long.
G. H.

Cymbidiums, Hybrid. By W. H. Young (*Gard. Mag.* 2652, p. 562; 27/8/04).—A descriptive account of the hybrids of *Cymbidium* artificially raised, and also of the introduced natural hybrids. The origin of the garden hybrids is given, and the cultural notes, by one of the most successful Orchid-growers, make the article of value.

An excellent illustration is given with the article of *C. Sanderæ.*
W. G.

Cymbidium Parishii var. **Sanderæ.** By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 163).—This plant having been certificated at the Royal Horticultural Society's meeting held on May 17th as *C. Sanderæ*, Mr. Rolfe afterwards identifies it as a variety of the little-known *C. Parishii*, particulars of its history &c. being included.—*H. J. C.*

Cymbidium rhodochilum. By W. B. H. (*Bot. Mag.* tt. 7932–7933).—Native of Madagascar. Nat. ord. *Orchideæ*; tribe *Vandeæ*. One of the most striking of recently introduced Orchids, with flowers crimson and green; 4 inches diam.; lip, 3-lobed, crimson, with a central yellow band.—*G. H.*

Cymbidium virescens. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 150). A Japanese species of botanical interest. Its history and other particulars are appended.—*H. J. C.*

Cymbidium Wilsoni. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 79). Description and other particulars are given of this new and interesting plant.—*H. J. C.*

Cyperus fertilis. By H. Conrad (*Die Gart.* No. 44, p. 522, July 30, 1904; with figure).—A native of tropical West Africa, adapted for stove culture. The plant forms thread-like runners with small graceful rosettes from which new runners are given off. A fine plant for hanging baskets.
G. R.

Cypripedium Calceolus and macranthos. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 185).—History and interesting particulars of this natural hybrid *Cypripedium* are included.—*H. J. C.*

Cypripedium 'Gaston Bultel.' By O. Opoix (*Rev. Hort.* pp. 160–161, April 1, 1904; coloured plate).—This is a very handsome form obtained by crossing *C.* 'Madame Coffinet' × *C. Fairieanum.* Dorsal sepal very broad, mauve ground, merging into pale yellow in centre and with many deep rosy pinnatiform stripes radiating from base to near the edges. Petals similarly striped and tinted, but yellowish towards apices. Labellum rose in front, merging into green below, and internally yellow. Stalks deep mauve-red. Prefers higher temperature than *C. Fairieanum.*
C. T. D.

Dahlias "à collerette." By R. Gérard (*Rev. Hort.* pp. 63–66, Feb. 1, 1904; coloured plate).—Describes numerous forms in which the flower consists of the ordinary single Dahlia petals and centre, with an intermediate row of white, yellow, or otherwise pale-tinted florets, strongly contrasting with the richer and deeper colours of the outer petals, giving a very charming result. The coloured print illustrates four varieties: 'Président Viger' (deep crimson petals and white or pinkish collerette), 'Maurice Rivoire' (deep rosy petals, somewhat incurved, and yellowish-white collerette), 'Madame La Page-Viger' (somewhat deeper red than last and flatter petals, with primrose collerette), and 'M. Massange de Louvrex' (bright yellow ground striped deep orange, with white collerette). The collerette is an interesting feature, but requires development as yet. A number of others are described.—*C. T. D.*

Dahlia, Centenary of the. Anon. (*Gard. Chron.* No. 909, p. 344, May 28, 1904).—Just 100 years ago Dahlia seeds were received for the first time in London, and plants were raised and flowered the same year. The subsequent history of this plant is given in this article. The first double variety was raised in 1805, only a year after its introduction; so that it appears that it was a plant which soon lent itself to the ingenuity of the florist.—*G. S. S.*

Dactylostalix ringens. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 323). History and references to this Japanese species are here given.
H. J. C.

Daldinia concentrica, Conidia of. By Marin Molliard (*Bull. Soc. Myc. France,* xx. fasc. 2, 1904, pl. vi., fig. 5).—After alluding to the fact that these conidia were figured and described by Tulasne (*Selecta fung. carp.* t. ii. pl. xiii. figs. 14–16), without a name, this author proceeds to describe them, as found by himself, and calls the mould which bears them *Nodulisporium Tulasnei.* These conidia are ovoid ($7–8 \times 4\frac{1}{2}–5\ \mu$), colourless or slightly grey, and borne on hyphæ, after the manner of species of *Botrytis.* As *Daldinia* has latterly been declared to be a wound parasite of forest trees, the knowledge of its conidia obtains a fresh importance.—*M. C. C.*

Date Palm, Culture of (*Jour. Imp. Dep. Agr. W.I.* vol. v., pt. 2, 1904, pp. 139–149).—After a brief account of the culture of the Date Palm, its climatic requirements, planting and cultivation, irrigation, pollination, yield, &c., this communication proceeds to "Date Culture in the United States," and afterwards to "Date Culture in the West Indies," especially in Trinidad, Antigua, Jamaica, and Porto Rico. The only fungoid disease which has hitherto given trouble in connection with the Date Palm is that known as *Graphiola phœnicis*, which is known throughout Europe, wherever the Date Palm or *Chamærops* is cultivated, whether in the open or in hot-houses.—*M. C. C.*

Date Palm, The. By E. Bonavia (*Gard. Chron.* No. 913, p. 401, June 25, 1904).—Dr. Bonavia gives a *résumé* of reports on the cultivation of this Palm: "Persian Gulf Dates," by D. G. Fairchild, and "The Date Palm," by W. T. Swingle; Bulletins of the Department of Agriculture, Washington. The first bulletin is mainly occupied with descriptions of the various plantations in the Persian Gulf, and of the best varieties cultivated there: it has several good illustrations. "On the banks of the Shat-el-Arab, which is formed by the junction of the Euphrates and Tigris Rivers, is to be found the largest single Date-producing region in the world. There are probably over five or six million Palms planted along the banks of the river on a strip of land varying from less than a mile to four miles in width and some seventy miles in length." The second bulletin treats more of the propagation and cultivation of these Palms. They have been introduced into the deserts of Arizona, where they grow well. "A Date Palm will continue bearing, if well cared for, until it is one hundred or more years old, producing an average of from 60 to 200 lb. of fruit per year." "If waterlogging be prevented, this plant can live and thrive when irrigated with water so salt as to kill all ordinary plants. In Central Australia experiments have been made in cultivating this Palm, which have been so far very successful."
G. S. S.

Date Palm, The, and its Utilisation in the South-Western States. By Walter T. Swingle (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 53; plates).—Deals with Date Palm culture in general, and is intended to draw attention to its peculiar suitability to that part of South-Eastern California generally called Colorado Desert, but which, since the completion of a system of irrigating canals fed by the Colorado River 60 miles away, this writer prefers to call by the less invidious title of Salton Basin. One great peculiarity about the Date Palm is its indifference to, and even preference for, an amount of alkali in the soil which would be fatal to almost any other form of vegetation, and, as the most pressing need of Southern California and of parts of Arizona is for a crop which will withstand alkali, and as the climate of these two regions is suited to Palms, the Department is anxious to encourage a great extension of Date-growing there. Tables are here given showing the enormous quantities of Dates imported yearly into the United States, and there seems no reason why American growers should not set themselves to supply this demand; while, from hints given in Bulletin No. 54 of unsavoury details connected with the packing of the Persian fruit, it would be obviously to the advantage of the consumer to be able to buy his Dates in a more civilised market. What the Date Palm must have during its growing season is blazing sunshine, good water, and plenty of it. An Arab proverb says it must have its feet in running water and its head in the fire of the sky, while, at the same time, it is able to withstand at least as much cold as it would ever have to encounter in Arizona or Salton Basin during the dormant season.

Facile princeps among Saharan dates which include all the choicest varieties, is the famous "Deglet Noor," and taking the ripening of this, a late and tender sort, as the supreme test of climate, we find by tables that the mean daily temperature has in no hitherto recorded season at Salton Basin fallen below what has been proved to be high enough for the perfect ripening of the Deglet Noor; and the rainfall both there and in the Salt River Valley is less during the flowering and ripening seasons, when it is liable to have disastrous consequences, than at Biskra, in Algeria where date culture is an established industry.

The available supply of irrigating water is also as ample, and certainly purer than that supplied to the Persian Gulf groves. This bulletin gives a complete life-history of the Date Palm and many careful soil analyses of home and Saharan soils, is profusely illustrated, and provided with an excellent index.—*M. L. H.*

Dates, Persian Gulf, and their Introduction into America. By David G. Fairchild (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 54, 1903; plates).—Contains an account of a journey to the Date Palm groves along the Persian Gulf, undertaken with the view of procuring specimens for introduction into Arizona. Palms had been raised in America from the seeds of imported fruit, and proved to bear excellent Dates, which ripened earlier than those of the earlier-planted North African varieties. Therefore, as the bulk of the Dates sold in American markets comes from the Persian Gulf, it was thought that other superior varieties might be found there which, on account of their early ripening, would be peculiarly suited to the short hot seasons in Arizona. The stickiness of the Mesopotamian Date is a certain disadvantage to it as compared with the North African fruit, but it was thought possible that there might still be Persian Gulf Dates to be found which should be free from this defect. The writer does not pretend that he was able to make his account absolutely exhaustive, but he puts together a great deal of information on the region in general, on its climate, soil, and system of irrigation, on the local varieties of Date, on the native methods of cultivation, and on Date diseases, packing, shipping, and on the cost and profit of Date culture.—*M. L. H.*

Dendrobium bellatulum. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 135).—The original discovery and descriptive characteristics are given of this Dendrobium. It belongs to the *D. formosum* group. Native of China. Nat. ord. *Orchidaceæ*; tribe *Epidendreæ*. A densely tufted plant, 2 to 4 inches high. Flowers axillary, $1\frac{1}{2}$ to 2 inches diam., white with a vermilion lip.—*H. J. C.*

Dendrobium cymbidioides and D. triflorum. By R. A. Rolfe (*Orch. Rev.* xii. p. 69).—Historical and distinguishing descriptions are fully entered upon.—*H. J. C.*

Dendrobium linguiforme. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 137; fig.).—The introduction, description, and historical particulars are given.—*H. J. C.*

Dendrobium regium. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 228). Description of this new *Dendrobium*, from a plant flowered at Kew, and other interesting items are afforded.—*H. J. C.*

Dendrobium Williamsoni. By W. B. H. (*Bot. Mag.* t. 7974).—Native of North-East India. Nat. ord. *Orchidaceæ*; tribe *Epidendreæ*. Caulescent, stems 6 to 12 inches. Leaves oblong-lanceolate. Flowers 2 to 3 inches across, ivory-white; lateral lobes of the lip tinged with yellow, having a zone of bright orange-red; lip bearded.—*G. H.*

Derbesia, On the Cell-contents of. By A. Ernst (*Flora*, xciii. 1904, pp. 514–532; t. xxii.).—The chloroplasts resemble those of *Bryopsis*; they are spindled-shaped, often curved, with 1–3 pyrenoids, which are, however, absent from the smaller ones. Starch formation takes place even in the absence of pyrenoids, which are, indeed, never present in *D. neglecta.* Formed proteids occur in the form of threads (fluorescing bluish-green), spherulites, and isometric octahedral crystals. Calcium oxalate occurs in *D. tenuissima* in square prisms, tetragonal pyramids, or combinations of the two.—*M. H.*

Dianthus call-alpinus. Anon. (*Gard. Mag.* 2643, p. 408; 25/6/04). A good illustration of this beautiful hybrid Rock Pink raised between *D. callizonus* and *D. alpinus.* It combines the characters of both parents, both in growth and flowers, which are 1½ inch across; bright pink with a crimson zone.—*W. G.*

Dicentra chrysantha. By W. B. H. (*Bot. Mag.* t. 7954).—Native of California. Nat. ord. *Fumariaceæ.* A perennial glabrous herb with dissected leaves and golden-yellow flowers.—*G. H.*

Dictyotaceæ, Studies in the. I. The Cytology of the Tetrasporangium and the Germinating Tetraspore. By J. Lloyd Williams (*Ann. Bot.* xviii. Jan. 1904, pp. 141–160; 2 plates).—An alternation of generations is established for this alga. The first division of the tetraspore mother-cell is a reduction division, the chromosomes being reduced to sixteen in number, and the earlier mitoses of the young plant produced from the tetraspore show the reduced number. The male and female plants have sixteen chromosomes, and the tetrasporic plants have thirty-two, up to, and including, the stalk cell division of the tetraspore.
A. D. C.

Dictyotaceæ, Studies in the. II. **The Cytology of the Gametophyte Generation.** By J. Lloyd Williams (*Ann. Bot.* xviii. April 1904, pp. 183–202; 3 plates).—The development of the oogonia and antheridia was investigated, and also the processes of fertilisation and germination of the egg. Parthenogenesis was found occasionally to occur. The sexual cells are produced simultaneously in fortnightly crops, the eggs reaching maturity at each spring tide. Remarkable periodicity of this nature has not hitherto been observed in *Algæ.*—*A. D. C.*

Digitalis ferruginea, Abnormal Flowers of. By Friedrich Hildebrand (*Beih. Bot. Cent.* xvi. pp. 347–366; 2 plates).—Gives a detailed account of the many abnormal forms noticed in two plants of this species. Petals occasionally free, flowers actinomorphic, many transitional states between stamens and petals or between other parts of the flower. Variations in the number of petals &c. from 3 to 8. The more the branch bearing irregular flowers is branched, the greater seems their deviation from the type.—*G. F. S.-E.*

Dipodium pictum. By W. B. H. (*Bot. Mag.* t. 7951).—Native of Malaya. Nat. ord. *Orchideæ*; tribe *Vandeæ.* This Orchid is remarkable for the leaf disarticulating 3 inches above the insertion. The name is taken from the two-stalked pollinia. It is a perennial herb with a weak stem, about 7 feet long. Racemes form a loose panicle. Flowers are blotched on the outside with crimson on a pale yellow ground, 2 inches diam. Blotches faintly visible above.—*G. H.*

Dipsaceæ, The Floral Biology of. By A. Günthardt (*Flora*, xciii. 1904, pp. 199–250; 30 cuts [tables]. — The flowers are proterandrous in most species, homogamous in some (e.g. *Scabiosa atropurpurea* ('Snowball'), proterogynous in *Knautia sylvatica*). The primitive centripetal order of opening is rare, since this is affected by relations of light and space in the crowded heads. Usually after the marginal flowers have opened anthesis begins anew and in an intermediate zone, and spreads upwards or downwards. Some species possess long prominent bristles on the sepals, or receptacular paleæ. The latter arrangement seems unpleasant to insects, which pay short repeated visits to such heads, while they crawl all over the heads which lack this armour, ransacking all the flowers open before quitting them. Gynodiœcy occurs in *Knautia arvensis* and *sylvatica* and *Scabiosa Succisa*, the purely female heads being smaller and of different colour.—*M. H.*

Diseases of Fruit Trees in Iowa. By G. M. Lummis (*U.S.A. Hort. Soc., Iowa, Rep.* 1902, pp. 30–34).—The speaker deprecated careless pruning and the leaving of hollow, worthless trees in woodlands. The disease on Catalpas caused by *Polyporus versicolor* was the one chiefly dealt with. In the discussion which followed the evil effects of malnutrition in laying a tree open to disease were pointed out.—*F. J. C.*

Diseases of Plants. By N. A. Cobb (*Agr. Gaz. N.S.W.* pp. 1–19, Jan. 1904).—A lengthy article, which is beautifully illustrated with coloured and other plates. The diseases interesting to horticulturists are:

The Brown Rot of Fruit, caused by the fungus *Monilia fructigena*—a rot most prevalent under moist conditions, and confined to no particular kind of fruit, though it does most damage on Cherries, Peaches, and Plums. It will attack a great variety of ripe and ripening fruit, and will even attack tender foliage under encouraging conditions. It causes enormous losses, which have been estimated at from £50,000 to £100,000 in a single fruit-raising district. Descriptions of the disease and remedies are given.

A Cherry Blight New to the State.—The Cherries are attacked at blossoming time, and the effects become visible at that time or soon after.

The young fruit, as soon as the petals have dropped and while it has still the elongated form characteristic of the earliest stages, loses its normal green colour and becomes brown and shrivelled, sometimes almost black. In such cases the stem of the young fruit is also attacked, the indications being a brown coloration and a shrivelling and drying up in a curled and distorted fashion. The fruits attacked at a little later stage also assume an unnatural colour, but they do not dry up so readily or so completely. If the fruit reaches the ripening stage the ripening is characterised by unnatural colours. Instead of a rich transparent creaminess, a leprous appearance in the early stages is seen, and when at last the reds and purples appear they are not pure and transparent, but have a dulness somewhat like that of raw meat. Most of the damage is done before the Cherries are half-ripe, and the entire crop may be destroyed. The fruit that reaches a marketable size has a more or less unfavourable colour, and the flavour is decidedly flat if the fruit actually contains the fungus, as it may do, and yet reach a marketable size. The dead fruit hangs on for some time, but finally drops off. The foliage does not appear to suffer much.—*H. G. C.*

Diseases of Plants in Connecticut. By G. P. Clinton (*U.S.A. Dep. Agr. Exp. Stn. Connecticut, Report for* 1903; with 28 plates).—This is a most extensive and valuable report on the fungous diseases of plants cultivated in Connecticut. It commences with an introduction setting forth the chief causes of injuries to plants. This is followed by some account of parasitic fungi, their prevention, detailing the various forms of fungicides, followed by notes on specific troubles. Here we have upwards of 260 descriptions, more or less explicit, of the principal diseases recognised in the State, with suggestions as to their treatment. At the end of each notice there are references in most cases to previous reports and bulletins in which that special disease has been noticed.

We note that a species of mould, or mucedine, long known as a saprophyte, and one of the most beautiful, called *Botryosporium pulchrum*, is suspected of acting as a parasite on Tobacco, but for certainty on plants of *Vinca major*. "The plants became so abundantly infested with the fungus that they were all killed." Referring to the diseases of Violet, the reporter observes that "the spot disease of *Alternaria violæ* (G. & D.) seems to be the chief trouble with greenhouse Violets in this State."

The twenty-eight plates are a great acquisition to this useful report.

M. C. C.

Dyschoriste Hildebrandtii. By C. H. Wright (*Bot. Mag.* t. 7973).—Native of East Tropical Africa. Nat. ord. *Acanthaceæ*; tribe *Ruellieæ*. A shrub 3 feet high. Leaves ovate-lanceolate; corolla lilac, with violet streaks in the throat and on the lower lip.—*G. H.*

Ecology of Swamps. By S. M. Coulter (*Rep. Missouri Bot. Gard.* pp. 39–71; pl. 1–24; 1904).—A comparison of the plant-associations of various types of swamps in the central United States and Bermuda, including a Tamarack and Black Spruce swamp, in which *Larix americana* and *Picea nigra* are dominant; an Arbor-vitæ swamp with *Thuya occidentalis*; a Cypress-Tupelo gum swamp with *Taxodium distichum* and

Nyssa uniflora; Mangrove swamp with *Rhizophora Mangle* and *Avicennia nitida*; and others. Full lists of the associated species are given, and photographs of the scenic aspects.—*G. S. B.*

Ecology: The Vegetation of the Bay of Fundy Salt and diked Marshes: An Ecological Study. By W. F. Ganong (*Bot. Gaz.* xxxvi. No. 6, p. 429).—This forms the conclusion of previous papers, and deals with (B) the Mesophytic Division, Culture Section, and (C) Hydrophytic Division. The former deals with reclaimed salt-marsh formation and roadside formation; the latter, with wet-marsh formation and bog, the water-margin and swamp formation.

In concluding the article, the author discusses "The Succession of the Plants of the Marshland in Space and in Time." The succession on newly reclaimed mud is first *Salicornia* type, next some Sedge, but not abundantly. *Spartina juncea* follows with *Triglochin*, *Puccinellia*, and *Hordeum*. These are followed by Couch and *Agrostis*. These are immigrants of the first year. As new ones come in the older die out, till Timothy Grass appears, all others excepting Couch disappearing. It is said by the farmers that the presence or absence of various immigrants is dependent very much upon drainage.—*A. H.*

Economic Plants of Porto Rico. By. O. F. Cook and G. N. Collins (*U.S.A. Contrib. from Natl. Herb.* vol. viii. pt. 2, 1903, pp. 269; plates 60).—Contains lists with descriptive notes of the economic plants of the district with their common American and native names, and illustrations of the chief. A valuable handbook for settlers and travellers in the region.—*F. J. C.*

Eelworm, Root-knot (*Heterodera radicicola*).—By Cecil Warburton (*Jour. R.A.S.* vol. 63, 1903, p. 299; figs. 1, 2).—The author states that several applications for advice with regard to the attacks by this pest have, with a single exception, been in connection with either the Tomato or Cucumber roots.* In October 1902, however, he received from Kent specimens of Swede plants undoubtedly suffering from root-knot disease; a fact of very great importance to the farmer, as it proves that our climate is no barrier to the spread of this destructive pest in the open air. As a remedy for plants under cultivation on a comparatively small scale, he recommends the use of carbolic acid at the rate of 33 oz. to 15 cubic feet; and as a means of prevention, he strongly disapproves the use of composts containing the refuse of diseased crops.—*R. N.*

Eelworms in Plants. By Ritzema Bos (*Zeit. f. Pflanz.* xiii. pp. 193–198, 1903; 2 figs.).—The author has already traced many cases of disease in plants to the action of eelworms. New examples are here described which show that Field Peas, Flax, and *Anemone japonica* must be added to the list of possible host-plants of *Tylenchus devastatrix*.
W. G. S.

Egyptian Agriculture, Notes on. By G. P. Foaden (*U.S.A. Dep. Agr. Bur. Pl. Ind. Bull.*, 62; 7/1904).—Some valuable information is

* The pseudo-bulbs of the *Calanthe* have been known to be attacked by this disease in this country with disastrous results.—*R. N.*

given on Egyptian agriculture by the secretary of the Khedivial Agricultural Society, Cairo, on the methods of cultivation of Egyptian Cotton, with a selection of varieties. Sugar-cane, Beet, Wheat, Barley, Rice, Beans, Onions, and other minor crops are discussed. The whole subject is dealt with from the composition of Nile mud, which adds 15,000 lb. of sediment per acre annually, consisting of nitrogen 0·12 per cent., phosphoric acid 0·21 per cent., and potash 0·68 per cent. This gives to the soil in the Nile Valley 18 lb. of nitrogen, 31½ lb. of phosphoric acid, and 102 lb. of potash annually per acre. It has been found by practice that it is impossible to grow two cereal crops in succession owing to the limited amount of nitrogen in the deposit. But by alternating with a leguminous crop, which to a large extent obtains its nitrogen from the air, some excellent results are obtained.—*E. F. H.*

Elodea canadensis, The Morphology of. By R. B. Wylie (*Bot. Gaz.* xxxvii. No. 1, p. 1; with 5 plates).—In this paper the author treats of the floral development, the female gametophyte, the microsporangium, the male gametophyte, the phenomena of pollination, fertilisation, and embyro, concluding with a general summary. The following features may be specially noted:—"The pollen grains adhere in tetrads, and have a greater specific gravity than water. The extine possesses spines which hold back the surface film and imprison sufficient air to keep the spores afloat." Gas bubbles aid in detaching the staminate flowers and in bringing them promptly to the surface of the water; while pollen grains floating near to the female flowers are brought into contact with the stigmas by means of gravity.—*G. H.*

Embyro-sac in Hybrids, Obliteration of the.—By G. Tischler (*Beih. Bot. Cent.* xv. pp. 408–420; with one plate).—G. Tischler found that four hybrid plants—*Cytisus Adami*, two species of *Syringa*, and *Ribes Gordonianum*—are quite unable to produce seed on account of the embryo-sac being reduced to a narrow slit.—*G. F. S.-E.*

Encephalartos Lemarinelianus. By E. André (*Rev. Hort.* pp. 58–59, Feb. 1, 1904; 1 woodcut).—A description and illustration of a new Cycad from the Congo. A fine robust species, with serrate subdivisions, rendering it, to judge by the woodcut, a more feathery form than *C. revoluta*. Fruit resembles large Pineapples.—*C. T. D.*

Entomology in Connecticut, Economic. By W. E. Britton (*U.S.A. Exp. Stn. Conn., Rep.* 1903, pp. 199–282; 8 plates).—A transcript of the law concerning the inspection of nursery stock is given, and brief notices of some of the insect pests of the year, together with longer reports upon the more troublesome, some of which are noted under other headings in these abstracts. One hundred and eighty-five specimens of insects were received for identification during the year.
F. J. C.

Enzyme-secreting Cells: A Study of these in the Seedlings of Zea Mays and Phœnix dactylifera. By Howard S. Reed (*Ann. Bot.* xviii. April 1904, pp. 267–285; 1 plate).—The greater part of the results obtained in this work was from fixed and stained material. In both plants the secreting cells are full of proteid granules in the resting condition. As secretion begins these granules gradually disappear. In *Zea* this disappearance coincides closely with the consumption of the endosperm; in *Phœnix,* however, the granules disappear long before the endosperm is dissolved. There is no evidence that solid matter is extruded from the nucleus.—*A. D. C.*

Ephedra trifurca, Spermatogenesis and Oogenesis in. By W. J. G. Land (*Bot. Gaz.* xxxviii. No. 1, p. 1; with plates i.–v.).—The author deals with the formation of the microsporangium, the reduction division and male gametophyte, the female gametophyte, and the archegonium. The paper concludes with a summary of the observations.—*G. H.*

Epilobium patagonicum. By A. B. Rendle (*Journ. Bot.* 504, p. 367; 12/1904).—Description of a new species, allied to *E. Haenkeanum,* collected by Mr. Hesketh Prichard on low slopes at Punta Bandera, Patagonia.—*G. S. B.*

Epipremnum giganteum. By W. B. H. (*Bot. Mag.* t. 7952).—Native of Malayan Peninsula. Nat. ord. *Aroideæ*; tribe *Calleæ.* A climbing shrub with large coriaceous, sub-elliptical blades on a petiole, 6 to 8 feet long. Spathes coriaceous, 1 foot long, orange-yellow; spadix cylindrical, orange.—*G. H.*

Eremuri, The. By W. Irving (*Garden,* No. 1724, p. 376; 3/12/1904). Now that the culture of these noble plants is becoming better known they are rapidly increasing in favour, and they form a striking feature in many gardens, with their stately stems bearing long racemes of numerous flowers. The genus consists of about twenty-five species in all, and of this number ten have been introduced into cultivation in our gardens. Several of the species are really handsome plants, well suited for warm, sheltered positions, among low-growing shrubs or loose-habited plants. They thrive admirably in rich sandy loam, which should be well drained, as they dislike anything in the way of stagnant moisture. There are numerous stout and fleshy root fibres, disposed horizontally around a central crown, so that planting must be carefully done, particularly as the roots are very brittle. They should also always be in a position where the roots will not be disturbed or injured by digging.—*E. T. C.*

Eremurus Elwesii: ? Hybrid or Species. By S. Mottet (*Rev. Hort.* pp. 18–19, Jan. 1, 1904; 1 woodcut).—M. Mottet considers it a spontaneous hybrid between *E. himalaiacus* and *E. robustus,* though artificial crosses between these two have given different results.

C. T. D.

Erysiphaceæ, Cultural Experiments with Biologic Forms of the. By E. S. Salmon (*Ann. Bot.* xviii. April 1904, pp. 320–1).—This is the author's abstract of his paper published in the *Phil. Trans. Royal Society* B. cxcvii. 1904. The paper is of importance to those who are interested in vegetable pathology.

It is shown that *under certain methods of culture, in which the vitality of the host-leaf is interfered with, the restricted powers of infection characteristic of "biologic forms" break down.* Injury to a leaf, through heat, for instance, rendered it susceptible to the attacks of a "biologic form" which is unable to attack uninjured leaves of the same plant. The following hypothesis is advanced as to the actual manner in which the injury to a leaf causes it to become susceptible to a "biologic form" otherwise unable to infect it. It is supposed that the leaf-cells of each species of host-plant contain a substance or substances—possibly an enzyme—peculiar to each species, which, when the leaf is uninjured and the cells are vigorous, are able to prevent the successful attack of any mildew except the *one* "biologic form" which has become specialised to overcome the resistance. When the vitality of the leaf, however, becomes affected by injury, this substance is destroyed, or becomes weakened, in the leaf-cells in the neighbourhood of the injury, so that the conidia of *other* "biologic forms" are now able to infect them.

The author suggests that injuries to leaves, caused in nature by hail, storms of wind, attacks of animals, &c., may produce the same effect as the artificial injuries described above in rendering the injured leaf susceptible to a fungus otherwise unable to infect it. Conidia produced on these injured places would be able to infect uninjured leaves, and would spread indefinitely. Such may be the explanation of a common phenomenon—the sudden appearance of disease caused by parasitic fungi on plants hitherto immune.

A case is described which, it is believed, gives evidence that the injuries produced by aphides caused leaves previously "immune" to become susceptible.—*A. D. C.*

Erysiphaceæ, On Specialisation of Parasitism in the. By E. S. Salmon (*Beih. Bot. Cent.* xiv. pp. 261–315).—Details of experiments showing the powers of infection of *Erysiphe graminis* on various species. The *Oidium* on *Bromus interruptus* is capable of infecting fully *B. mollis* and *B. tectorum*, and to a much less extent *B. brizæformis* and *B. velutinus*, but could not touch twelve other species belonging to its own and other divisions of *Bromus*. An *Oidium* on *B. hordeaceus* caused full infection on *B. mollis* and two other species, "subinfection" on three species, and failed on thirteen other species. The *Oidium* of *Trifolium pratense* was also found to be a true "biologic form" specially adapted to this species. Other experiments are detailed. Larvæ were discovered feeding on *Sphærotheca*, mildew of Gooseberries, and also at Cambridge and other places, but most unfortunately it could only be discovered that they belonged to a fly, *Agromyza* sp., or to some closely allied genus. The author raises the interesting question as to whether residence of the fungus on some special host-plant affects its power of infection on other species.

Neger considers that the ascospores of two "biologic forms" of *Erysiphe* are probably able to infect both host-plants, whilst the conidia (*Oidium*) adapts itself very quickly to any particular substratum. Salmon's experiments were carried out in the laboratory.—*G. F. S.-E.*

Escallonia Britteniana. By A. B. Rendle (*Journ. Bot.* 503, p. 330 ; 11/1904).—Description of a new species collected by Mr. Hesketh Prichard on the low slopes of Punta Bandera, Mount Buenos Aires, Patagonia. This shrub is near the Chilian species *E. alpina*, but has very glabrous leaves and larger flowers. It bears leafy, five to seven-flowered terminal racemes, with petals 12 mm. long, of which 8 mm. is claw, and 4 mm. across.—*G. S. B.*

Ether and Chloroform, Treatment of Plants with. By J. Foussat (*Rev. Hort.* pp. 105–107, March 1, 1904) ; J. Lochot (*Rev. Hort.* pp. 250–252, 1 illustration, June 1, 1904) ; and G. Bellair (*Hort. Rev.* pp. 333–335, July 16, 1904).—Three interesting articles, with illustrations of results with Azaleas, Lilacs, and other plants, and detailed description of process.—*C. T. D.*

Etherisation, Lilac and Viburnum forcing by. By Georges Bellair (*Rev. Hort.* p. 84, Feb. 16, 1904).—Description of process and advantages over ordinary forcing—viz. reduced forcing period, stronger bunches, better furnished and less discoloured, and lacking weakly appearance induced by usual course.—*C. T. D.*

Eucalyptus ficifolia. By Ed. André (*Rev. Hort.* p. 568, Dec. 1, 1904 ; coloured plate).—The plate shows two varieties *E. ficifolia* and *E. f. rose* ; the former with corymbs of large deep salmon-red flowers, 1½ inch across, the latter with pale salmon ones. Very handsome. Native of Australia.—*C. T. D.*

Euonymus, Three Cultivated Forms of. By E. Koehne (*Gartenflora,* Jan. 15, 1904, p. 29).—A description of three not very well known varieties of *Euonymus* : *Euonymus latifolia*, var. *planipes*, *E. yedoënsis* and *E. hians*. The first two mentioned are garden varieties, and the last is a natural species.—*R. C. R. N.*

Euphorbia viperina. By W. B. H. (*Bot. Mag.* t. 7971).—Native of South Africa. Nat. ord. *Euphorbiaceæ* ; tribe *Euphorbieæ*. An erect, thornless shrub 1 to 2 feet high, clothed with "podaria," or leaf-bases. Involucre campanulated with white lobes, fringed ; glands with crenulate lobes.—*G. H.*

Evergreens without Leaves. By H. Friend (*Gard. Chron.* No. 902, p. 225, April 8, 1904).—In this article an interesting account is given of various evergreen plants that are devoid of leaves, both British and foreign ; as examples of the former the Butchers' Broom, Gorse, and Needle-whin ; among those which are not indigenous, the Cacti, some Euphorbias, and *Phyllanthus*. Some reasons for the eccentricities of these plants in this matter are given.—*G. S. S.*

Evolution of Sex Organs in Plants. By F. Lyon (*Bot. Gaz.* xxxvii. No. 4, p. 280 ; with 16 figs.).—The plants examined are *Equisetum limosum*, *Isoëtes lacustris*, *Selaginella apus*, *Lycopodium complanatum*, *L. Phlegmaria*, *Adiantum cuneatum*, *Atrichum*, *Ulva lactuca*, and other Algæ.—*G. H.*

Experiment Station Work in America (*U.S.A. Dep. Agr., Office of Exp. Stn., Bull.* 123, 1903).—This bulletin, recording the proceedings of the sixteenth annual convention of Experiment Station workers, is full of interest to all engaged either in teaching or in research in agricultural or horticultural matters. One point of particular interest is the increased attention given to vegetable physiology in the curriculum of the more up-to-date colleges. The bulletin, running to 145 pages of small print, is too long for review here, but would well repay perusal by all interested in horticultural and agricultural progress.—*F. J. C.*

Fagelia Prichardi. By A. B. Rendle (*Journ. Bot.* 504, p. 371; 12/1904).—Description of a new suffruticose 'Calceolaria,' collected on the Burmeister Peninsula, Patagonia, by Mr. Hesketh Prichard, and belonging to the subsection *Scaposæ* of the section *Eucalceolaria.* The species has yellow flowers, spotted with crimson, and comprises two forms—one, from banks of streams on low ground, with leaves 4 inches and peduncles 6 inches long; the other, subalpine, less than half the size of the first, with somewhat the habit of our common Daisy, and recalling *F. Darwinii*, which also occurs in the same area.—*G. S. B.*

Fairy Rings. By Herr P. Hennings (*Gartenflora*, May 1, 1904, p. 228). An article relating to this strange phenomenon, and which is well worth consulting by those who are interested in mycology and in the various species of fungi which give rise to the formation of these rings.

R. C. R. N.

Fegatella conica, On the Structure and Biology of. By F. Cavers (*Ann. Bot.* xviii. Jan. 1904, pp. 87–120; 2 plates, 5 figs.).—A full account of the structure and development of this British Liverwort. The author is of the opinion that *Fegatella* is the lowest member of the *Marchantioideæ-Compositæ.* The organisation of the female receptacle, however, approaches that of the *Operculatæ.* It appears, therefore, to occupy an intermediate position between the two highest series of the *Marchantiaceæ.*—*A. D. C.*

Ferns for Amateurs. By G. T. Grignan (*Rev. Hort.* pp. 263–266, June 1, 1904; 5 illustrations).—Interesting article on the best exotic forms, culture, and propagation.—*C. T. D.*

Ferns from Equatorial America. By G. Hieronymus (*Engl. Bot. Jahrb.* xxxiv. pp. 417–560; Oct. 1904).—A systematic account of the Pteridophyta collected chiefly by the late Consul Lehmann in Guatemala, Columbia, and Ecuador. Novelties are described in several genera.

A. B. R.

Ferns, New, of 1903. By W. T. (*Gard. Mag.* 2620, p. 58; 16/1/04). A descriptive list of new Ferns introduced during the year. Most of these are varieties of old species, and remarkable chiefly for their frond variation and elegance of growth.—*W. G.*

Fertilisers (*U.S.A. Agr. Exp. Stn. Connecticut Report*, 1904).—A long report on method and results of analysis of a very large number of manures sent in by manufacturers, dealers, and farmers of the State, comparing guaranteed and found quantities of nitrogen, phosphoric acid, and potash in commercial fertilisers, also analyses of lime from various districts, and tables showing the basis for valuing manures, founded on the wholesale price of fertilising materials for each month.—*C. H. H.*

Fertilisers. By F. W. Robison (*U.S.A. Exp. Stn. Michigan, Bull.* 217 ; vii./04).—In Michigan, for the protection of the farmer, all fertilisers are analysed and licensed by the State, and the analyses published in an annual bulletin. Only those goods licensed may be sold, and those only for the time stated in the licence. The following note is interesting :—"There is abundant evidence to show that commercial fertilisers can never, on the American farm, entirely supersede the use of barnyard manure. Pound for pound most fertilisers contain very much more nitrogen, potash, and phosphoric acid than does barnyard manure, but in most instances the growing test is in favour of the manure. There is unquestionably an influence, physical, chemical, or bacterial, or all together, that has a favourable effect on plant life, and which cannot be attributed solely to the nitrogen, phosphoric acid, and potash present." In the analyses given most of the fertilisers seem to be above the guarantee of nitrogen, phosphoric acid, and potash given.—*F. J. C.*

Fertilisers and Manures, Experiments with, on Different Varieties of Asparagus and Raspberries. By A. T. Jordan (*U.S.A. Agr. Exp. Stn.* No. 173).—(*a*) Asparagus. Selection of varieties in planting important—'Palmetto,' a disease-resisting variety, exceeding 'Elmira,' which is the second in order, by 32 per cent. in average of six crops. The net yield when complete fertiliser 1(= analysing nitrogen 45 per cent., phosphoric acid, available, 7·7 per cent., potash 13·3 per cent., applied at the rate of 500 lb. per acre in autumn) was employed exceeded that obtained by the use of manure by 13·7 per cent.

(*b*) Raspberries. 'Cuthbert' is the best market variety ; 'Marlbro'' comes in a week earlier. Complete fertiliser gives lowest annual cost, and equals one quarter the cost of manure, while it gives a return per dollar of cost over four times that with manure. A larger total yield was obtained by using complete fertiliser in spring, and bone and potash in the autumn, but the cost is 59 per cent. more than with complete fertiliser alone, so that the net returns are practically identical.—*F. A. W.*

Fertilisers, Use of: Review of Results of Experiments with Nitrate of Soda. By E. B. Vorhees (*U.S.A. Agr. Exp. Stn. New Jersey*, No. 172).—1. On Market-garden Crops, *i.e.* those of high commercial value, table Beets, Asparagus, early Tomatos, Cabbage, Turnips, &c. 2. On Field Crops, *i.e.* those of low commercial value, hay and grain, Wheat, Rye, &c.

The relations of cost of material applied to value of crop are exceedingly important, and should be considered in purchasing materials. For instance, the liberal application of materials containing nitrogen to crops which possess a low market value may result in a maximum production ; yet, because the nitrogen is so expensive, the value of the increased yield may not be equal to the cost of the nitrogen applied. And it is shown in the experiments conducted with nitrate of soda, on different crops, that in the case of grain and forage crops, which utilised the nitrate quite as completely as the market-garden crops, the increased value of crop, due to nitrate, does not in any case exceed $14 per acre, or a money return at the rate of $8.50 per 100 lb. of nitrate used; while in the case of the market-garden crops the value of the increased yield reaches, in the case of one crop, the high figure of over $263 per acre, or at the rate of about $66 per 100 lb. of nitrate. Where the increase in yield will more than pay the cost of application, it cannot be too strongly urged upon the attention of farmers:

1. That the constituents, nitrogen, phosphoric acid, and potash, as found in commercial supplies furnishing these elements, do serve as plant food, nourishing the plant in the same manner as those in home manures, and should therefore be liberally used in order to guarantee maximum crops.

2. Of these constituent elements nitrogen is of especial importance, because it is the one element which, in its natural state, must be changed in form before it can be used by the plants. Hence, its application in an immediately applicable form is especially advantageous for quick-growing vegetable crops, whose marketable quality is measured by rapid and continuous growth, and for those field crops which make their greatest development in spring, before the conditions are favourable for the change of the nitrogen in the soil into forms usable by plants.—*F. A. W.*

Fig Trees on Walls out of Doors. By H. W. Ward (*Gard. Chron.* No. 891, p. 49; Jan. 23, 1904).—The author in this paper gives very clear directions for the cultivation of Fig trees in the above position. The article is divided under three headings: The selection of varieties; the rooting medium; training and pruning.—*G. S. S.*

Flora of Europe, New Members of the. By Dr. F. Höck (*Beih. Bot. Cent.* xviii. Abt. ii. pp. 79–112).—Finishes this series of papers with a complete list of the 627 species noted as escapes and emigrants in middle Europe: of these at least fifty have established themselves during the fifty years of observation, which is one species a year. Of these fifty, some thirty species are North American, twelve Mediterranean, four from South and East Asia, three from South America, and one from tropical Africa. No south temperate (Australian, New Zealand, or Cape Colony) plant has established itself, though a considerable number occur in the 627 listed. The author points out that commercial intercourse has a very strong influence, most being found near Hamburg, Berlin, and seaports or centres of population; most are apparently accidentally introduced in wool or corn or other seeds. At the same time the percentage of observing botanists increases with the population, and this has an important bearing on the question as shown by the case of Strassburg, where Ludwig has during the last year found many.

The inability of the south temperate plants to establish themselves is ascribed to their not being fit to stand the strain of European competition.

A curious point may be mentioned by the referee. Of all those considered as established by the author, only *Impatiens parviflora*, *Ornithopus sativus*, *Lonicera tatarica*, *Symphoricarpus racemosus*, *Solidago canadensis*, and *Mimulus luteus* can be considered as well known and in a sense British plants; but there are several, not considered as established by Höck, which do occur in our lists. There can be no question as to the value of the paper to British botanists, but it would he more valuable with a map.—*G. F. S.-E.*

Flora of Kiautschou and District. By E. Gilg and Th. Loesener (*Engl. Bot. Jahrb.* xxxiv. Beibl. i. pp. 1–76, March 1904).—A systematic account of plants collected in that portion of China which has recently come under German influence. There is also a classified list of those plants which are of economic value.—*A. B. R.*

Flora of Tropical Africa, Contributions to. By A. Engler and others (*Engl. Bot. Jahrb.* xxxiv. pp. 302–376; illustrated; Aug. 1904).—Contains descriptions of novelties in the following orders of flowering plants:—*Burseraceæ*, *Violaceæ*, *Tiliaceæ*, *Sterculiaceæ*, *Apocynaceæ*, *Asclepiadaceæ*, *Rubiaceæ*, *Cucurbitaceæ*, and *Euphorbiaceæ*.
A. B. R.

Flowers and Insects of Great Britain, Part II. Observations on the natural orders *Dipsaceæ*, *Plumbaginaceæ*, *Compositæ*, *Umbelliferæ*, and *Cornaceæ*, made in the Clova Mountains. By J. C. Willis, M.A., and I. H. Burkill, M.A. (*Ann. Bot.* vol. xvii. No. 66, p. 313).—It is difficult not to imagine a time when flowers and insects shall be commonly studied together as a biologic unity. Their interdependence is now well understood, yet much in detail requires still to be observed, and probably in recent years no better work has been done for Britain than that recorded by the present authors. "In Part I. of this series (*Ann. Bot.* ix. p. 227, 1895) we described the results of work in the more southern and lowland districts of Britain; the present and following papers deal with the flowers and insects of a definite area in the Eastern Grampians of Scotland, and form a contribution to the study of the problem of the composition, distribution, and origin of the flora of that region and its interdependence with those of the insect fauna. Numerous factors have been active in producing the present phenomena of the vegetation of Northern Europe, and among them the floral ecology of the plants concerned has doubtless been one of much importance; its share may best be determined by comparative work upon limited areas in different parts of Europe. Our observations were made during vacations spent at Clova between 1894 and 1899. We selected Clova for our work because it is the focus of the distribution of Alpine plants in Britain, and because of special facilities for our work which the owners of the land there gave us." In this part the insect visitors of thirty-four plants are recorded. "Out of the whole available anthophilous insect fauna of (for the time of our observations) 17,306 individuals, 6,156 went to class B′ (*Dipsaceæ*, *Plumbaginaceæ*, and *Compositæ*), and 1,482 to the massed flowers of class A′ (*Umbelliferæ* and *Cornus suecica*). The species of plants obtained attention as in Tables IX. and X.; B′ obtained many more of the desirable insects than A′ and very much fewer of the injurious, which could find but small encouragement where the honey is hidden. Class B′ is found by our observations to fall very markedly into two divisions: one division contains the plants whose flowers belong to the rose-purple-lilac-blue series, the other contains those whose flowers belong to the yellow-white series. The latter is visited by less desirable insects than the former, and therefore, as shown in Tables XII. and XIII., approaches A′. Both halves of class B′, as well as class A′, obtain more desirable visitors in North Central Europe than they do at Clova. Whether, as in Tables XIV., XV., and XVI., we contrast Müller's or MacLeod's or Knuth's and Verhoeff's observations with ours, we see in each case that long- and mid-tongued *Hymenoptera* make far more species visits in Germany or Flanders than they do in Scotland, and that in Scotland short-tongued flies make far more species visits than they do in Flanders and Germany." A valuable list of literature is given in this paper. Part III. of this subject may here be alluded to. It is entitled "Observations on the most specialised Flowers of the Clova Mountains" (*Ann. Bot.* vol. xvii. No. 67, p. 539). "We now publish our observations on the fertilisation, about Clova in the Eastern Grampians, of the flowers specially adapted for the visits of bees and butterflies. The next part of our paper will complete the series, and will terminate with a general review." Fifty-seven plants of various orders are dealt with, and they belong to classes F and H, F including those suited to diurnal and nocturnal *Lepidoptera*, H those of the *Lychnis, Crocus, Viola, Orchis, Tropæolum, Pinguicula*, Labiate, Explosive Leguminous, Leguminous, *Digitalis, Erica*, Simple Pendulous, *Pyrola, Galanthus*, and *Campanula* types. "We found that in class B′ the blue-lilac flowers attracted the best of the insects, that the rose-purple came next, that yellow followed, and that white or eyed flowers came last. Experience with classes F and H is different, and our figures are as follows: with white at the top, rose-purple second, yellow third, and lilac-blue last." This is but a chance example of many interesting and important points, for which reference to the papers themselves must be made.—*R. I. L.*

Flower-stalk, Joints of the. By J. Velenovský (*Beih. Bot. Cent.* xvi. pp. 289–300; with 2 plates).—Suggests that in all cases in which the pedicel is jointed the part above the joint is really the perigone of the flower. He finds that bracts never occur above the joint. The *Malvaceæ* have an epicalyx generally supposed to be formed of bracts, but he considers this to consist of stipular outgrowths of the sepals.—*G. F. S.-E.*

Fluorine: Its Estimation in Soils and Plants, and in Smoke Damage. By W. Gr. z. Leiningen-Wusterburg (*Nat. Zeit. Land-Forst.* ii. pp. 273–287, 321–330, 357–366; 1 fig.; 1904).—When trees and plants are injured by smoke, it is known that fluorine-containing gases, along with sulphur dioxide, are the chief poisonous agents. The quantity of fluorine absorbed by plants is extremely small. Existing methods for estimating the quantity are not exact enough, and the author describes an improved process, for details of which the original must be consulted. By his method he confirms that leaves of plants damaged by smoke contain more fluorine compounds than healthy ones.—*W. G. S.*

Forestry. By F. W. Rane (*U.S.A. Agr. Exp. Stn. New Hampshire, Bull.* 106).—The author divides this into two parts: (1) How to make a beginning, and (2) Waste lands, how to convert them into forests. When it is stated that 80 per cent. or more of the land of New England is not cultivated, or better described as waste land, the necessity for afforesting will at once be seen. Excellent advice is given as to how cleared and partially cleared lands may be restocked at the least possible expense, and the recropping of depleted sandy barrens and low or wet lands is a step in the right direction. There are eight good illustrations which convey to the reader excellent examples of waste lands and their reclamation.

A. D. W.

Forestry: A Farm Woodlot. By F. A. Waugh (*U.S.A. Agr. Exp. Stn. Hatch, Bull.* 97).—This may best be described as a definite example of practical forestry as carried out in the State of Massachusetts, where store wood, fencing, and rough lumber are the main requirements. Fence-posts, stakes, and firewood are always in demand on a farm, and the American Larch is peculiarly suitable for such, while for fruit-boxes the timber is, perhaps, most in favour. As usual, the illustrations help the text considerably.—*A. D. W.*

Forestry, A Primer of. By Gifford Pinchot (*U.S.A. Dep. Agr. Farm., Bull.* 173).—Not for a long time have we perused a more instructive and interesting book on forestry than that compiled by Mr. Pinchot, to whom every student of the craft must feel indebted for the very able and lucid manner in which he has dealt with his subject.

Beginning at the parts of a tree, the writer goes through the food, composition, transpiration, growth, and structure of the wood, rate of growth and various requirements, in such a clear and simple manner that even the amateur cannot fail clearly to grasp the life-history of a shrub or tree.

The illustrations, which are remarkably clear and to the point, convey, in connection with the text, a very lucid idea of the various points brought forward, particularly spurs of growth under old trees, destructive lumbering, injury by snow, and the reproductive power of the Chestnut.—*A. D. W.*

Forestry Association, Proceedings of the Iowa Park and.—This is an interesting and valuable volume, the papers which have been contributed on forestry subjects being, even to those in charge of woodlands in this country, concise and to the point. But this is not all, for the short, pithy papers on parks for cities and villages, study of trees in the public schools, starting a lawn, railway embellishment, and the architect and the landscape artist are all much to the point, and must appeal to everyone who is at all interested in our public parks and plantations. "The Economic Value of Iowa Birds," by Mr. J. T. Bailey, should be read by everyone; indeed, bird life is often quite a secondary thought when dealing with our parks and woods—a fact that is to be regretted when the usefulness of birds and their services to humanity are considered. Even in our country the value of such birds as the woodpecker, starling, and others in destroying injurious forest insects has been seriously undervalued. The numerous beautiful illustrations go far in elucidating the text.

A. D. W.

Forestry: The Forests of the Hawaiian Islands. By William L. Hall (*U.S.A. Dep. Agr. Bur. For., Bull.* 48).—Contains an interesting account of the forests of these islands as the result of a careful examination made in 1903. The rapid decadence of the native timber trees, with an account of a proposed forest service and the future policy to be adopted, are of great interest, particularly as the cultivation of rice and sugar is largely carried out, and to be successful is so dependent on the rainfall from the mountains, this, again, being controlled by the presence of woodlands.

Injurious forest insects, fires, and rough-growing grasses have been active agents in the despoiling of these island forest lands.—*A. D. W.*

Forest Lands in Hampton and Beaufort Counties, South Carolina: A Working Plan for. By T. H. Sherrard (*U.S.A. Dep. Agr. Bur. For., Bull.* 43).—Formerly the Long-leaf Pine was the chief timber-producing tree of these regions, but, like many other forest tracts, the original species, through carelessness in lumbering, has almost become a thing of the past. By conservative lumbering, aided by the keeping in check of forest fires, if carried out at once, this Pine can be saved from destruction.

The original and present forests are carefully dealt with by the author, while the working plan and map show clearly the system of procedure.

The illustrations of the Long-leaf and Cuban Pine help greatly to elucidate the text.—*A. D. W.*

Forest Planting in Western Kansas. By R. S. Kellogg (*U.S.A. Dep. Agr. Bur. For., Bull.* 52).—This is an excellent report that embodies a large amount of practical information regarding the afforesting of Western Kansas, a State which unfortunately cannot boast of a large area of woodlands. Of unusual value is the report in that the methods of treatment which have proved most successful are embodied by the author, and that the results obtained amply justify the necessary expenditure connected with afforesting.

Some twenty-six species of trees are recommended, amongst others our well-known Austrian Pine (which, by the way, is more valuable for shelter than the production of good timber), the White Poplar, Black Walnut, Catalpa, Mulberry, and Lombardy Poplar. The map and seven illustrations which accompany the text go far in elucidating matters.

A. D. W.

Forest Resources of Texas. By W. L. Bray (*U.S.A. Dep. Agr. Bur. For., Bull.* 47).—With a merchantable forest that covers about 10 per cent. of its entire area, the lumber annually cut in the State of Texas amounts to nearly a billion feet—an industry that is exceeded only by that of cotton and cattle. Unfortunately, owing to existing loose methods, the exhaustion of this great economic resource is being gradually brought about, and the conditions affecting the prosperity of large areas of woodland are gradually changing for the worse. As the State requires extensive forests for internal use, the reservation of certain forest areas, similar to what has taken place in the State of New York, will alone obviate the ruthless waste of timber that is at present going on. Fire and flood, too, are important factors in the spoliation of the Texas forests; but with a definite State policy, carried out by a board or commission, it is to be hoped that in the near future proper control of the woodlands will not only remedy existing evil, but be the means of largely increasing the present output of lumber. An excellent list of timber trees suitable for Texas is given, which, aided by many illustrations and maps, renders the work of great practical value.—*A. D. W.*

Forestry: The Timber of the Edwards Plateau of Texas: its Relation to Climate, Water Supply, and Soil. By W. L. Bray (*U.S.A. Dep. Agr. Bur. For., Bull.* 49).—The transformation of prairie into timber land must surely, in so far at least as conserving the water supply is concerned, be a matter of public interest and fraught with great good to the immediate district. In Texas especially the heavy rain and cloudbursts exert a powerful influence in carrying away large quantities of the surface soil down even to the original rocky bed; but where judicious planting has been engaged in, the harm done is comparatively small, and erosion of the soil is of rare occurrence.

Rarely have we read a more interesting account of the influence of woods on the climate, soil, and water supply than that recorded by Mr. Bray; while the species of trees and their affinities are well thought out and clearly portrayed.

There are numerous suitable illustrations.—*A. D. W.*.

Forest Trees, Tests of (*U.S.A. Agr. Exp. Stn. Kansas, Bull.* 120). This is a series of experiments that have been carried out at the above college with reference to tree-planting. The notes and observations, numerous carefully compiled tables, and excellently executed illustrations of trees are all of the greatest value, particularly in an economic sense.
A. D. W.

Formalin. By E. F. Ladd (*U.S.A. Exp. Stn. Dakota, Bull.* 60, 1904).—Since formalin is coming into use as a fungicide, it is important that it should be of standard strength. The recognised standard is a 40 per cent. solution of formaldehyde in water; but analyses carried out in Dakota showed that the strength varied from 21·60 per cent. to 42·41 per cent., only a few of the samples tested being up to 40 per cent. In addition to this, in purchasing 1 lb. of formalin solution the buyer frequently received only 10 oz.—*F. J. C.*

Formicide, Acorus Calamus as a (*Rev. Hort.* p. 536, Nov. 16, 1904).—The dried powdered roots of this plant are said to be immediately fatal to ants.—*C. T. D.*

Fossil Flora of the Antarctic Regions. By A. G. Nathorst (*Compt. Rend.* June 1904, p. 1447).—Among the most important of results accomplished by the Swedish Antarctic expedition, directed by M. O. Nordenskjöld, was the discovery of fossil plants belonging to the Jurassic and Tertiary periods. Among the specimens collected are representatives of *Equisetaceæ, Filices, Cycadaceæ, Coniferæ.* One of the most interesting members of the last-named order are the isolated scales of cones of *Araucarites cutchensis*, which belong to a different type from those growing in South America at the present day.—*G. M.*

Fragmenta Phytographiæ Australiæ occidentalis. By L. Diels and E. Pritzel (*Engl. Bot. Jahrb.* xxxv. April and December 1904, pp. 54–528; illustrated).—The authors made a botanical excursion through the extreme western portion of West Australia in 1901 and 1902. The present is a systematic account of the plants collected, in which they have received help from specialists in various groups. It includes notes on the distribution of the various genera and species, and forms a valuable contribution to our knowledge of the flora of this part of the Australian continent.—*A. B. R.*

Frost-bitten Leaves. By K. v. Tubeuf (*Nat. Zeit. Land-Forst.* ii. pp. 293–295; 2 figs.; 1904).—Illustrations are given of Red Horse-Chestnut and Beech leaves injured by frost. The Chestnut leaves are injured between the lateral ribs of the leaflets, and have a shape strongly suggestive of the incised or laciniate varieties; in this case, however, frost was the cause. The Beech leaves are curiously marked with brown stripes between the ribs.—*W. G. S.*

Fruits, Blooming Period of. By F. W. Card and A. E. Stene (*U.S.A. Exp. Stn. Rhode Is., Rep.* 1903, pp. 199–208).—The question of the blooming periods of fruit trees is of importance in the study of self-sterility. A summary of the dates of blooming of different varieties of Apples, Pears, and Plums is given, and it is noted that in one case—that of the Plum 'Wild Goose'—the flowers do not open until the blossoms have fallen from all the other varieties in the vicinity. The blooming period lasts longer in Rhode Island than in stations further west.
F. J. C.

Fruit Culture in California. By Dr. Bartrum (*Gard. Mag.* 2619, p. 46; 9/1/04).—The writer relates an instructive conversation he had with his friend (Mr. Cowan, of California) upon this subject.

The Californian methods of cultivation and other details bearing on this industry are discussed, and make very interesting reading.—*W. G.*

Fruit-growing in Iowa. By W. Greene (*U.S.A. Hort. Soc. Rep.* 1902, p. 359–363; 5 maps).—Gives statistics concerning the quantity of various fruits grown in Iowa, and compares number of trees, acreage, &c. with that of other States in the Union.—*F. J. C.*

Fruit Industry of Jamaica. By W. E. Smith (*Jour. Imp. Agr. Dep. W.I.* vol. v. pt. 1, 1904, pp. 53–63).—Naturally this concerns chiefly the Banana industry, and that is of no small importance when we are told that the fruit exports of Jamaica exceed one million pounds sterling annually, and it is estimated that 33,000 acres of land are under Banana cultivation. We are informed of the variety of Banana grown, method of purchase, size of bunches, price, &c., Banana cultivation, cost of cultivation, prospects for Banana cultivation in Trinidad, cutting, handling, and transporting Bananas, railway charges, loading and carriage by steamers, the transportation of Bananas, purchase of suckers, Citrus fruits, Pines, &c., with some general and concluding remarks. It is a noteworthy record that seventy-one millions of Oranges were shipped from Jamaica during 1903.—*M. C. C.*

Fruit Packing. By J. M. Buisson and Ch. Parigot (*Rev. Hort.* pp. 233–235, May 16, 1904; 11 woodcuts).—Interesting examples of packages shown at the Packing Exhibition, Paris, with descriptive remarks.—*C. T. D.*

Fruit in North Dakota. By C. B. Waldron (*U.S.A. Agr. Exp. Stn. N. Dakota, Bull.* 59, 1904).—For Strawberries in this district a windbreak on the south is necessary to shelter from the drying south winds, and choice is made of a north or north-east slope. As the rainfall is small, sandy and gravelly soils have to be avoided, and deep mellow soil chosen in which the roots extend down 2½ feet. On the experiment station it has not been found necessary or profitable to fertilise the soil, but land much less fertile would be benefited by well-rotted stable manure.

The deepest and best soil in the district should be selected for fruit. Wild Plums of many types, some of them of excellent quality, are found commonly growing in all parts of the State. Many have been transplanted to the home garden. Now over a hundred varieties of the same Plum which is found growing wild in the State are offered for sale. Where mice and rabbits injure the trunks during winter, tar paper is bound round each tree. Specially hardy varieties of Apple are required for the North-West. For protection, it is found advisable, where the soil will admit, to plant the trees from six inches to a foot deeper than they grew in the nursery; the growth is a little slower, but the wood is better ripened, thus reducing the danger of blight, winter-killing, and drought. Very low-headed trees succeed best.—*C. H. H.*

Fruit, Peat for packing. By Cino (*Bull. R. Soc. Tosc. Ort.* 2, p. 47, Feb. 1904).—The chief external causes of the malpreservation of fruit are: the evaporation of the liquids composing them, causing wrinkling of the skin and loss of weight; mouldiness and spotting, arising from condensation of atmospheric moisture on their outer surface when slight changes of temperature occur; injury caused by insects; spontaneous rotting.

The consequences resulting herefrom are: the ugly appearance of the fruit; its commercial depreciation; often its complete loss.

All these causes may be partially avoided by the judicious use of yellow pulverised peat.

It is only the Dutch peat, entirely free of inert and earthy products, which is completely effectual in preserving fruit and vegetables. The peat is quite inodorous, and can therefore convey neither taste nor smell to the fruit. Cork, on the contrary, transmits its peculiar odour to the fruit.

As the peat absorbs moisture, it protects the fruit from all hygrometric condensation. It asphyxiates all insects which try to enter the boxes.

The antiseptic property of the peat prevents the development of noxious fermentations on the surface of the fruit, and retards the production of internal ones.

Powdered peat is prepared at Griendtsveen, in South Holland.

For the packing of delicate fruits, and especially for those which have to travel far, moss-peat is better than powdered peat; it is less costly than wood-shavings.—*W. C. W.*

Fruit Pests, Destruction of. By Albert H. Benson, M.R.A.C. (*Qu. Agr. Journ.* xiii. p. 538, Dec. 1903).—After enumerating the principal fruit pests, fungus and insect, known in Queensland, with details and recommendations as to spraying, the writer enumerates the various fungicides and insecticides, with formulæ, concluding with a table enumerating nearly a hundred of the principal pests, with the subjects of their depredations, and, opposite to each, indication of the treatment to which they should be subjected. Especial information is given on gas treatment for scale insects, with figures and details of bell tents employed for that purpose. In the same journal is a reprint of a similar article on the insect and fungoid pests of West Australia.—*M. C. C.*

Fruits, Promising new. By William A. Taylor (*U.S.A. Dep. Agr. Year Book*, 1903, p. 267; coloured illustrations).—Notwithstanding the very strong tendency in recent years among commercial fruit-growers to restrict their plantings to a few varieties of proved productiveness, beauty, and shipping quality, the writer states there are strong indications that an increasingly large number of growers are seeking fruits that combine these desirable features with distinctive flavour and superior dessert quality. The article is a long one, giving full descriptions and beautiful coloured illustrations of what the writer describes as the cream of the new sorts.

The earliest and quickest method of testing new varieties of tree fruits is the well-known practice of top working. A single established tree may in this way be made to carry a large number of new sorts for experimental purposes.

Among those described are the 'Akin' Apple, the 'Terry' Apple, the 'Hiley' Peach, the 'Welch' Peach, the 'Splendor' Prune (produced by a cross of the French Prune and the English Pond Prune), and the 'Cardinal' Strawberry.—*V. J. M.*

Fruit Trees, Damage by Deep Planting of. By Ed. André (*Rev. Hort.* pp. 272–273, June 16, 1904).—Results of experiments to determine this, viz. that in all cases deep planting resulted in weakness of growth and susceptibility to disease in precise proportion to excess of depth.

C. T. D.

Fruit Trees Frozen in 1894. By M. B. Waite (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* 51, pt. iii., March 30, 1904).—Advises against the wholesale sacrifice of fruit orchards that have been frozen. The aim should be, with good cultivation and fertilisation, to grow the tree out of the injury. If the bark is entirely blackened and dead, more or less separated from the trunk, and the wood turned a very dark brown colour, the case is hopeless; but scarcely 10 per cent. of the orchards were in this state, even after the severe frosts of the winter of 1903–4.

When the bark adheres, or is only partially separated, the chances for recovery are good. And when it is not separated at all, and the cambium appears alive, though water-soaked and injured, the trees will almost invariably recover after moderate pruning, followed by good cultivation and moderate fertilising.

Pear orchards are less likely to recover than Peach and Plum trees, but they are so much slower coming into bearing that pruning or even cutting off below the snow-line, to admit of fresh shoots, should be attempted before they are condemned altogether.—*F. A. W.*

Fruit and Vegetable Industries. By W. H. Clarke (*Agr. Gaz. N.S.W.* pp. 1183–1204, December 1904).—This is a lengthy article tracing the fruit from the tree and the vegetables from the field through all the ramifications of the business to the consumers' hands. The article deals with "How the Fruit is grown and handled," "Concerning the working of Orchards," "Transportation of the Fruit," "Impressions of the Fruit Industry," "The Vegetable Industry," and "In the Market." It is profusely illustrated.—*H. G. C.*

Fumigation with Canna Leaves (*Rev. Hort.* p. 431, Sept. 16, 1904).—Dried stalks and leaves of Canna are stated to be equally efficacious as Tobacco leaves for fumigation purposes.—*C. T. D.*

Fungus Diseases of Fruits in Michigan. By B. O. Longyear (*U.S.A. Dep. Agr. Exp. Stn. Michigan, Bull.* No. 25, March 1904; 42 woodcuts).—We can do little more than enumerate the principal of the fruit diseases which are included in this bulletin. One of the most prominent is "Apple scab," due to *Fusicladium dendriticum.* The "bitter rot," caused by *Glœosporium fructigenum*; "black rot" or *Sphæropsis malorum,* also capable of producing canker on Apple branches; "Fire-blight"; "Pear scab" (*Fusicladium*); leaf-blight of *Entomosporium maculatum*; leaf-spot (*Septoria*); Quince rust; soft rot of fruits; pink mould on Apple following "scab"; Peach yellows; Peach leaf-curl; crown gall of Peach; Peach scab (*Cladosporium*); black knot on Plum and Cherry; brown rot (*Monilia*); Plum pockets, shot-hole fungus (*Cylindrosporium*); gummosis of stone fruits, powdery mildew of Cherry; black rot of the Grape (*Guignardia*); downy mildew (*Plasmopara viticola*); powdery mildew (*Uncinula spiralis*); anthracnose (*Glœosporium*); Currant diseases such as leaf-spot (*Septoria*) and anthracnose (*Glœosporium*); Gooseberry rust, and powdery mildew; the Orange rust of Raspberry and Blackberry (*Cæoma luminatum*); anthracnose of Raspberry, Raspberry-cane blight (*Coniothyrium*); Strawberry-leaf disease (*Sphærella*); and finally of wound fungi, with formulæ of fungicides and hints on spraying.—*M. C. C.*

Fungus-spores, Effect of Exhalations from Plants on Germination of. By F. W. Neger (*Nat. Zeit. Land-Forst.* ii. pp. 484–490, 1904).—The author has made numerous experiments on the germination of spores of *Bulgaria polymorpha* on various substrata; the results are of interest to the mycologist. The spores were sown in water or in nutritive gelatine. In some cases pieces of bark or wood from Oak or Pine were added; in other cases the spores in water were placed near, but not in contact with, pieces of Oak or Pine; the effects of ether vapour were also tried. Ripe ascospores, which germinated slowly in pure water, gave better results when in contact with, or exposed to the exhalations from, the pieces of Oak or Pine, which appear to cause a chemical stimulus. Ether vapour also promoted germination. The experiments indicate that, in nature, the ascospores left dry soon lose the power of germination, but this can be again stimulated by their coming in contact with pieces of bark or wood. If the stimulus is only slight, conidia are most abundantly produced; if stimulus is stronger, germ-tubes are formed more abundantly.

W. G. S.

Fungi, Study of parasitic, in the United States. By Dr. G. P. Clinton (*Bull. Bot. Dep. Trin.* xliii. p. 87, July 1904).—An address treating the subject from an historical view, divided into three periods: of collection, 1812–70; instruction, dating from the establishment of a department of cryptogamic botany at Harvard University in 1870; and investigation, from the founding of experiment stations in 1887. The names of those who have been engaged in the work are given, and a brief outline of their subjects.—*E. A. B.*

Gall, Crown. By Wendell Paddock (*U.S.A. Agr. Exp. Stn. Colorado, Bull.* 86, Dec. 1903; 3 plates).—This bulletin is devoted to the so-called crown galls, which are irregular outgrowths of tissue that commonly form around the crown of a tree, just below the surface of the ground.

It is found on a variety of plants, including Almond, Apple, Apricot, Blackberry, Cherry, Chestnut, English Walnut, Grape, Peach, Pear, Plum, Poplar, and Raspberry. It has been found that the disease can be transferred readily from the Almond to Peach and Apricot trees. Serious investigation of the galls on other trees and plants has not yet been undertaken, but it is likely that the disease is of the same nature, if not induced by the same organism.

The disease does not appear to be so destructive to older trees as to nursery stock; some experiments indicate that in such cases the disease may be held in check in a measure. The mode of treatment consists in examining the trees every season and cutting away all traces of galls from about the crowns. The wounds then to be thoroughly covered with a wound paste. All diseased wood should be collected and burnt. The important point is to keep the disease out of the orchards, and secure nursery stock free from infection.—*M. C. C.*

Garrya, Notes on, with descriptions of New Species. By A. Eastwood (*Bot. Gaz.* xxxvi. No. 6, p. 456).—This includes five new species and one variety.—*G. H.*

Gentiana acaulis. By S. Mottet (*Rev. Hort.* pp. 34–35, Jan. 16, 1904; 1 woodcut of *G. scabra*).—It is incidentally remarked that humus (leaf-mould) is fatal to *G. acaulis*, and it should be planted in stiff clayey soil, unsophisticated in any way, opposite treatment explaining many failures in careful hands.—*C. T. D.*

Gentians, The. By S. Arnott (*Gard. Mag.* 2651, p. 543 ; 20/8/04). An excellent account of the cultivated species of *Gentiana*, and including some that are still rare in gardens.

The cultural notes in detail will be helpful to those who seek information about these beautiful plants.

Woodcuts are given of the rare *G. calycosa* and of *G. asclepiadea.*

W. G.

Geonoma gracilis. By W. B. H. (*Bot. Mag.* t. 7963).—Native of Tropical America. Nat. ord. *Palmæ* ; tribe *Areceæ.* A slender Palm, about 4 feet high, 1½ inch diam. Leaves 2½ feet long, panicles loose, male and female flowers sessile, monœcious.—*G. H.*

Gladiolus 'Princeps.' By Philip de Vilmorin (*Rev. Hort.* pp. 208–209, May 1, 1904 ; coloured plate).—A hybrid *G. cruentus* × *Childsii* (Leichtlin), thus involving four different species. A splendid variety, deep carmine, bold, broad-petalled flowers, with the two lower petals bearing a white transverse bar in centre with an extension towards the apex along the midrib.—*C. T. D.*

Glaucium tricolor. By S. Mottet (*Rev. Hort.* pp. 110–111, March 1, 1904 ; 1 illustration).—Highly recommended as a half-hardy perennial newly sent out by Messrs. Vilmorin. Very floriferous, brightly coloured, and lasting a long time in bloom. Not dainty as to soil, but requires warm, sunny station.—*C. T. D.*

Gooseberries, Standard. By H. T. Martin (*Garden*, No. 1697, p. 376 ; 28/5/1904).—Growing the Gooseberry in standard form is not extensively seen in this country, yet it has its advantages. There are instances where they have been grown with excellent results. Under proper cultivation standard trees will bear large quantities of fine fruits of good flavour, and, apart from this, the trees are exceedingly ornamental. The advantages of the standard form of training for the production of dessert fruits are several. First, the trees are beautiful as well as useful ; secondly, they occupy but little room, which in many gardens is a consideration ; thirdly, the fruits, being borne well above the surface of the ground, do not become splashed during rainy weather ; and, lastly, they derive full advantage from sun and air, thus ensuring highly flavoured fruits.—*E. T. C.*

Grafts Curious (*Rev. Hort.* p. 77, Feb. 16, 1904).—A young undeveloped Pear, removed in the process of thinning out, was grafted on year-old wood, and after some time commenced to grow, and was only prevented from attaining full size by the consequent retardation.—*C. T. D.*

Grafts, Heterogeneous. By Ed. André (*Rev. Hort.* p. 207, May 1, 1904).—A list of such grafts effected by M. Adolphe van den Heede, e.g. *Phyllanthus nivosus roseopictus* on *P. mimosæfolius*, with fine mixed foliage effects ; *Ruellia picta* on *Strobilanthes Dyerianus; Thyrsacanthus rutilans* and *Schaueria flavicoma* (*Justicia*) on same ; *Pachyphytum Hookeræ* on *P. bracteosum*, *Gardenia florida* on *Coffea liberica*, *Rhipsalis funalis* on a species of *Phyllocactus; Æschynanthus tricolor* on *Æ.*

splendidus; *Acalypha Godseffiana* on *A. hispida*, and *A. musaica* on same; *Peristrophe angustifolia* on *Eranthemum tricolor*, *Tradescantia zebrina* on *T. Reginæ*, and *Begonia* 'Gloire de Lorraine' on *B. alba picta*. The object of these graftings has been harmonious association of very different characters. A graft of *Davallia elegans* on *Polypodium aureum* is also mentioned, but very properly under some editorial reserve, since an apparent graft on a terrestrial stolon might survive by self-rooting, and even a small portion of *Davallia* caudex would long survive independently.—*C. T. D.*

Graft Hybrid Pear and Quince (*Rev. Hort.* p. 222, May 16, 1904).—A Williams' Pear graft on a Quince induced a number of adjacent shoots with intermediate foliage, sections of which showed fusion of both types, fruiting of which is awaited with interest.—*C. T. D.*

Graft Hybrids. Anon. (*Gard. Chron.* No. 926, p. 217, figs. 84, 85, 86, 87, and 88; Sept. 24, 1904).—This is an interesting paper on grafting. The writer concludes by saying: "Enough has been said to show how phenomena regarded by practical men as merely curious, and not worthy their attention from an economic point of view, are in reality of the very greatest practical importance, and deserving all the study that physiologists and cultivators alike can bestow on them."—*G. S. S.*

Grape-growing for Home Use. By Dr. J. C. Whitten (*U.S.A. St. Agr. Missouri Bd., Bull.* iv., n. 1, pp. 5–12; April 1904).—If given good cultivation, the Grape will thrive in almost any soil which will grow general farm crops. The best location is high, stony, well-drained land; usually a south or south-east slope is preferable. The vines are usually planted about ten feet apart each way, trained to a three-wire trellis running north and south. Where the soil is too stony for hoeing, the vines are frequently trained to a single stake, so as to admit of cultivation both ways.

One- or two-year-old plants are selected for planting. If one-year-old plants are well-rooted and vigorous, they perhaps suffer less from being transplanted.

Clean cultivation should be given throughout the summer. If the soil becomes compact and firm after rain, it may be loosened up with a harrow-toothed cultivator to a depth of three or four inches, which will tear out any strong weeds. The aim should be, during dry hot weather in summer and early autumn, to keep the soil stirred about two inches deep so as to maintain a fine surface dust mulch. Finely cultivated surface soil is the best natural mulch to retain the moisture in the earth and to prevent injury from drought. Then follow descriptions of training and pruning in the first and subsequent winters.

Generally speaking, the vineyard should be given clean cultivation every year. It is not best, however, to keep the ground almost bare of vegetable matter. If allowed to go bare too long, vegetable matter will be exhausted, the soil will lose its mellow, spongy condition, and will tend to run together and pack and become lumpy, and may also wash badly in winter and spring. To avoid these undesirable conditions, a dressing of stable manure may be applied to the vineyard in autumn and ploughed and cultivated under in the spring. In large vineyards, where it is not feasible to use the stable manure, some green crop may be grown between the vines and turned under. For this purpose the Cow Pea may be sown, after thorough cultivation earlier in the season, in drills between the rows late in June, giving the ground a light harrowing, just as the Cow Peas are coming through, in order to break the crust that forms and to leave the surface soil in fine tilth, so that it will not bake. In the spring the crop is ploughed in, care being taken not to work the land too deeply, close to the vines, in order to avoid cutting off too many roots.

Then follows a census of the number of vines, 3,546,319; pounds of Grapes, 13,783,655; gallons of wine, 122,382; value of Grapes, wine, &c., $314,807 in the State of Missouri, with the quantity in each county.

C. H. H.

Grape 'Muscat Salomon.' By E. and T. Salomon (*Rev. Hort.* p. 466, Oct. 1, 1904; coloured plate).—Chasselas Doré × Muscat de Saumur. Highly recommended.—*C. T. D.*

Grape Root-worm. By M. V. Slingerland and J. Craig (*U.S.A. Exp. Stn. New York, Bull.* 208, xii./1902; 14 figs.).—The grub of a beetle, *Fidia viticidia*, Walsh, has wrought great havoc in Chautauqua, seriously injuring about 100 acres of vineyards in that famous Grape belt. Figures of the injuries done to the leaves by the beetles, and to the roots by the grubs, of the eggs, grubs, pupæ, and perfect insects, are given. The eggs are laid in summer under the loose bark of the vines; they are soon hatched, and the grubs make their way to the soil, where they feed on the roots during mild weather until June, when they pupate in earthen cells for about a fortnight.

The measures suggested against the attack are to plant resistent stocks if such can be found (experiments along this line are in progress), and to invigorate injured vineyards by generous feeding and judicious cultivation. Thorough stirring of the soil in June and July is considered the best means of checking the evil, for then the pupæ are turned out of their cells and must perish; the young grubs also are, to a large extent, prevented from reaching the roots. The beetles may be poisoned as they feed on the leaves by spraying; but as the beetles lay their first batch of eggs very soon after emerging from the pupa, this method does not seem so successful as with some insects; or they may be jarred from the vines on to sheets, and so caught.—*F. J. C.*

Grasses of Southern Missouri, Economic Notes on some of the. By S. A. Hoover (*U.S.A. St. Bd. Agr. Missouri,* vol. iii., n. 8, 1903; illustrated).—A descriptive list of some of the best-known grasses in Missouri, both cultivated and wild.

Of the latter the author has found more than ninety species in South-West Missouri.

Some of these, as Little Barley (*Hordeum pusillum*), Kentucky Blue Grass (*Poa pratensis* L.), Side Oats (*Bouteloua racemosa* Lag.), are useful as pasture. Others, as Johnson Grass (*Andropogon halepense* Scribner) and Broom Sedge (*Andropogon virginicus* L.), are troublesome weeds, especially the former. Amongst the cultivated grasses, Timothy (*Phleum pratense* L.) is the most valuable for hay. Red Top (*Agrostis alba* L.) makes good pasture.—*C. H. C.*

Ground-nuts in the West Indies. By William G. Freeman, F.L.S. (*Jour. Imp. Dep. Agr. W.I.* vol. iv. No. 2, pp. 101–110).—The Ground-nut, or Pea-nut, *Arachis hypogæa*, the subject of this communication, is grown throughout the Tropics, the United States, and in Southern Europe. After describing the plant and its produce, the writer proceeds to give an account of the "present condition of industry in the West Indies," and then proceeds to "the cultivation," the uses of Ground-nuts in confectionery, as a source of oil, oil cake and oil meal, and of the foliage as fodder. This is succeeded by "suggestions for the future," with commercial details as to market value, and its importance as an "article of export."—*M. C. C.*

Growth of Dandelion Stalk, Rate of. By Dr. K. Miyake (*Beih. Bot. Cent.* xvi. pp. 403–414; with 1 figure and 1 plate).—The author observed the growth of Dandelion stalks and found that the daily increase showed great variation. A maximum increase of from 2·7 to 4 cm. was found on the day on which the flowers opened. After this the rate of elongation sank to less than 1 cm.; during the ripening of the fruit the rate of growth gradually increased until the day before the fruits were scattered, on which there was again a maximum increase of from 5 to 7·8 cm. in one day. The stalk also increased in length on the day on which the fruits were scattered, and then suddenly ceased to elongate, and withered. The whole development takes three to four weeks. From first development to the middle of flowering, seven to ten days ($\frac{1}{3}$ to $\frac{1}{2}$ its length), the last half of the flowering period and first period of seed development takes six to eight days, and the elongation is only $\frac{1}{10}$ of its length; then for seven to ten days there is an energetic growth, during which the curvature seen in the preceding stage is straightened out. The growth takes place only in the upper part of the peduncle and near the head. Tables are given illustrating these points.—*G. F. S.-E.*

Gum-producing Tree from Madagascar. By H. Jumelle (*Compt. Rend.* Jan. 1905, p. 170).—Although numerous members of the vegetable kingdom yield gum, this has not previously been observed in any member belonging to the *Bignoniaceæ*. The tree in question is *Stereospermum euphorioides*. The gum is obtained by removing patches of the bark. Two or three months later large tears of white latex collect on the cut surfaces. By degrees the gum escapes more freely, changes to a brown colour, and forms hard masses. The gum is soluble in water, alcohol, &c.
G. M.

Gurania eriantha. By Ed. André (*Rev. Hort.* pp. 388–390, Aug. 16, 1904; coloured plate).—A vine with remarkably pretty spherical pendulous inflorescence, about $2\frac{1}{2}$ inches diam., composed of bright red slender pubescent flowers. Native of Peru; stove.—*C. T. D.*

Gymnosperm Morphology.—By J. Velenovský (*Beih. Bot. Cent.* xiv. pp. 127–133).—Gives a short account of the cone-scale structure of

Agathis, Araucaria, Cunninghamia, Taxodium, Cryptomeria, Sequoia, and other Conifers. Some peculiar abnormal forms are described (*Sequoia, Larix*). The *Cycadeæ* are shown to have no dichotomous branching, and thus differ from the Fern alliance.—*G. F. S.-E.*

Gypsophila paniculata, A double. By G. T. Grignan (*Rev. Hort.* p. 121, March 1, 1904; 1 illustration).—A great improvement on the ordinary form; dense masses of much larger and double pure white flowers.—*C. T. D.*

Haloxylon Ammodendron. By E. Ryssel (*Die Gart.* No. 20, p. 230, February 13, 1904).—During a visit in the north of Persia, the author describes the poorness of the flora, especially the absence of shrubs or trees. Water is found in the plains at a depth of 15–20 metres, and is usually not drinkable, as it generally contains salt, but *Haloxylon* sends its long roots down (and these are usually thicker than the stem). The wood is hard, heavy as iron, burns like the best English coal, and is often used in place of steam coal.—*G. R.*

Hamamelidaceæ, Affinities of. By Hans Hallier (Hamburg) (*Beih. Bot. Cent.* xiv. pp. 247–260).—Discusses the affinities of this order, which he considers to be a very important one genealogically. He looks on the *Illiciæ, Drimytomagnoliæ, Amentifloræ, Buxeæ,* as being descended from plants of this order. He even suggests an affinity with *Casuarina*.—*G. F. S.-E.*

Helipterum splendidum. By W. B. H. (*Bot. Mag.* t. 7983).—Native of West Australia. Nat. ord. *Compositæ*; tribe *Inuloideæ*. An annual, glabrous herb, 9 to 12 inches high. Leaves glaucous, $1\frac{1}{2}$ inch long, linear. Flower-heads erect; bracts scarious in many series; outer series small, brown; inner white, linear-lanceolate.—*G. H.*

Helichrysum vestitum. By S. A. Deacon (*Gard. Chron.* No. 901, p. 211, figs. 89 and 90, April 2, 1904).—Under the heading of "Flowers for Easter Decorations" a very interesting account is given of the cultivation, drying, packing, and exportation to Europe of this well-known "everlasting flower," which is grown in enormous quantities in a limited area on the south-western coast of Cape Colony. The extent to which this industry has grown recently is surprising; huge buildings have been erected in which to dry and pack the flowers, which are brought in from the veld not only on the heads of women and children, but in bullock-waggon loads at a time. They fetch from *5s.* to *10s.* a pound on the Continent. They are shipped by a German firm to Hamburg in the first instance. The writer says: "The huge snow-white heaps of these flowers in the packing-house are a most entrancing sight. They are packed for export in large paper-lined boxes made specially for the purpose, measuring $5\frac{1}{2}$ feet long by about $4\frac{1}{2}$ feet wide and deep. Every layer of flowers, a foot or so deep, is pressed down by boards and weights by which means 100 to 130 lb. weight of flowers is got into one of these large boxes, which are carried in bullock-waggons to the nearest railway station."—*G. S. S.*

Helicophyllum Alberti. By N. E. Brown (*Gard. Chron.* No. 931, p. 304, Supp. fig.; Oct. 29, 1904).—This remarkable and quaint Aroid is a native of Bokhara: it was introduced into cultivation at St. Petersburg in 1883; the next year it was sent to Kew, where it flowered in 1887. The spathe is of a rich blackish-purple, with a long protruding appendix of the same colour. The flower is sessile among the leaves. The genus *Helicophyllum* only differs from *Arum* in some minor particulars.—*G. S. S.*

Heredity in Bean Hybrids. By R. A. Emerson (*17th Ann. Rep. Agric. Expt. St. Nebraska, U.S.A.*, 1904, pp. 33-68).—A valuable report of a series of experiments carried out with various races of Dwarf and Runner Beans (*Phaseolus vulgaris*). In these experiments Professor Emerson has determined the following nine pairs of unit-characters, all of which clearly follow, in their heredity, the Mendelian type *Pisum* as regards dominance, segregation, and gametic purity:—Axial and terminal pods; stringless and stringy pods; tender and tough pods; green and yellow pods; blue-green and yellow pods; blue-green and green pods, stems, and leaves; coloured and white flowers; coloured and white seeds; and brown and yellow seeds. When the above unit-characters were crossed in the first generation the first-named of the pair was dominant over the second, which was recessive. When the hybrid dominants were self-fertilised in the second generation segregation took place in the proportion of about three dominants to one recessive. In the third generation the extracted recessives all bred true, while the dominants proved to be of two kinds, pure and hybrid, in about Mendelian proportions, thus demonstrating the fact of gametic purity. One interesting result obtained by Professor Emerson is worthy of special notice. White × Black seeds gave in the first generation mottled black and grey seeds. In the second generation these hybrid mottled seeds gave rise to three types: individuals bearing black seeds, individuals bearing white seeds, and individuals bearing mottled seeds. In the third generation the white seeds bred true; the black seeds proved to be of two kinds, pure blacks which bred true, and hybrid blacks containing white; the mottled seeds so far appear to be of three kinds, pure mottled, hybrid mottled containing black, and hybrid mottled containing black and white. The numbers are not sufficient to draw definite conclusions, but the qualitative results seem to suggest that there may be two pairs of unit-characters concerned here, viz. coloured and white seeds, and mottled and self-coloured seeds, and that the mottled character may possibly have been introduced by the original *white* parent, being carried by it in a latent state in all albino matings only to become patent when mated with a coloured form, much in the same way that the Dutch-markings character was found to have been introduced by an albino angora in the reviewer's recent experiments with rabbits.

It may be also interesting to note that in a few of Professor Emerson's experiments, dominance in the first generation was not always complete; *e.g.* in stringless × stringy pods there were some hybrids truly intermediate. In the second generation these segregated into three forms: stringless, intermediate, and stringy. In the third generation the intermediates gave all three forms again, proving them to be hybrids; both the stringless and the stringy proved to be of two kinds, pure and hybrid, for some bred true, while others did not. Curiously enough, the stringless hybrids gave about three stringless to one stringy, while the stringy hybrids gave about three stringy to one stringless. Here again, however, the numbers are not sufficient to draw conclusions, and it is to be hoped that Professor Emerson will be able to follow up these interesting and suggestive lines of inquiry with further experiments.—*C. C. H.*

Hessian Fly. By H. Garman (*U.S.A. Exp. Stn. Kentucky, Bull.* 103; 12/1902).—The later-planted wheat escaped injury in autumn (that sown from Oct. 6 onwards), but when standing near autumn-infested wheat was badly injured in the spring. Deep ploughing, spraying with dilute coal-oil emulsion and with Bordeaux mixture (to a less extent) reduced injury done by the fly. Lime and Paris green in water and dry lime alone did no practical good. Barley was found as susceptible as Wheat, but Rye was almost immune from attack.—*F. J. C.*

Heterophylly in Proserpinaca palustris. By George P. Burns (*Ann. Bot.* xviii., October 1904, pp. 579–587; 1 plate).—The following conclusion is arrived at: *Proserpinaca palustris* has two forms, an adult form and a juvenile form. Under good vegetative conditions it has a tendency to produce the adult form with the entire leaf, and to blossom and fruit; under poor vegetative conditions it has a tendency to produce the juvenile form with the divided leaf. Water environment is not the cause of the division of the leaf; neither does it depend upon light, temperature, gaseous content of the water, nor contact stimulus as such.—*A. D. C.*

Hibiscus. By Angiolo Pucci (*Bull. R. Soc. Tosc. Ort.* 9, p. 265, August 1904).—A very old genus which is not appreciated as it deserves. Belongs to the *Malvaceæ.* Some species are very hardy, others are delicate and require a warm stove in winter. The author is concerned here with two species only.

Hibiscus syriacus is one of the hardy species, and is a very vigorous shrub with caducous leaves. The specific name indicates the place of origin from which it was introduced in ancient times. It will grow in most soils provided they are not too clayey, for in the latter case the plant grows with difficulty and gets covered with lichen. Being a shrub of compact and regular growth, it can be raised in various forms, and bears vigorous annual pruning very well. Hence hedges can be made of it, but the author does not advise this except for gardens which are deserted during the winter. The best form for the plant, in his opinion, is the columnar. At the time of flowering these columns produce a magnificent effect, which is much prolonged, as the flowers keep appearing until the autumn. The plant is propagated by seed and cuttings.

H. Rosa-sinensis is also a shrub, coming from the warmer parts of China, and hence cannot exist outside all the year round, but requires a stove. It likes a dry heat, such as is produced in an old-fashioned stove, and plenty of light. In the middle of spring it can be taken out and placed in a very sunny aspect, and either isolated or in small groups on a lawn, but not mixed with other plants. In order to save the bother of potting the plants again in autumn, they should be planted outside in their pots, taking care to insure proper water-drainage. The plant flowers profusely, the flowers being very large and of a dazzling scarlet; but they are ephemeral. It requires soil consisting of a mixture of leaf-mould, clay, and very old manure. The general ugly aspect of the plant is compensated for by the splendour of the flowers. It is propagated by cuttings in the stove.—*W. C. W.*

Hippuris Shoots, Abnormal. By Prof. D. H. Solereder (Erlangen) (*Beih. Bot. Cent.* xviii. Abt. ii. pp. 23–26; with 3 text figures).—Describes abnormal side-shoots developed on an injury of the main stem in this plant. The account is very carefully and elaborately worked out, as one would expect, but it is almost impossible to make an abstract.

G. F. S.-E.

Hoeing, The Philosophy of. By E. J. Russell (*Gard. Chron.* No. 912, p. 385, June 18, 1904).—In this long article the praises of the hoe are loudly sung, and not without reason according to the author, who says: "Our position is that the hoe is among the most important of the weapons the gardener uses in his combat with the hosts of forces that sometimes seem to rise up against him. The effects of hoeing fall under three heads: air is introduced, the movement of water is modified, and the soil particles are broken up." There can be no doubt that the introduction of air into the soil is very necessary for the well-being of the bacteria in the soil, which not only break up the decaying vegetable matter in the soil, rendering it available for the use of the plants growing therein, but also change certain nitrogen compounds into others which are more readily assimilated by the roots. By loosening the surface of the soil the lower parts are kept moister than they would be otherwise, for the water has not the same opportunities of soaking into it (the surface soil) and evaporating into the air. The author, in conclusion, considers the effect of hoeing at different seasons of the year.—*G. S. S.*

Holly Hedges, The Making and Keeping of. By J. C. (*Gard. Chron.* No. 927, p. 234, Oct. 1, 1904).—A good Holly hedge is perhaps the best hedge that can be grown; it is not, however, a very easy one to make unless the cultivator knows how to set to work. In this paper the writer gives very full and explicit directions as to how this matter should be carried out.—*G. S. S.*

Honesty, White. By S. W. Fitzherbert (*Garden,* No. 1697, p. 367; 28/5/1904).—The white-flowered Honesty is a very valuable plant, but as a rule only the type which bears magenta-purple flowers is to be seen. The white variety springs just as readily from seed and is quite as vigorous as the type, forming, where it has sufficient space, bushes 4 feet in height and 3 feet through. For rough spots and poor soil, where few other things will grow, the white variety of Honesty (*Lunaria annua alba*) is an excellent plant.—*E. T. C.*

Huckleberries. By F. W. Card (*U.S.A. Exp. Stn. Rhode Is., Rep.* 1903, pp. 216–222; 2 plates).—For many years attempts have been made to find some sure and speedy method of propagating the Blueberry (*Vaccinium corymbosum*). Various methods have been tried with but little success, but a fairly promising one seems to have been hit upon. A moderate bottom-heat, with moss (*Sphagnum*) in which is mould taken from about the plants, is the best to use. Root grafts are made, and these, with careful handling, root well. Cuttings usually fail.—*F. J. C.*

Huernia oculata.—By A. Berger (*Gard. Chron.* No. 921, p. 132, fig. 54, August 20, 1904).—The genus *Huernia* is very nearly allied to the genus *Stapelia*, and this species very much resembles plants of that genus. It was first introduced into this country in 1880, but it appears subsequently to have been lost. It was reintroduced into cultivation in 1901, and now flowers annually in Sir Thomas Hanbury's garden at La Mortola. It is a pretty little plant, bearing purple blossoms with white centres, which are produced upon very short pedicels; it is easily propagated, and flowers from August to October.—*G. S. S.*

Hunnemannia fumariæfolia. By S. Mottet (*Rev. Hort.* pp. 68–70, Feb. 1, 1904; 1 woodcut).—Introduced in 1827. Resembles outwardly *Eschscholtzia californica*, but differs materially physiologically, being herbaceous and with longer flowering period, while the flowers last several days, a point which M. Mottet considers entitles it to greater recognition for bouquet purposes. Native of Mexico, and easy of culture from seed in warm positions.—*C. T. D.*

Hydrangea hortensis rosea (*Gartenflora*, Dec. 1, 1904, p. 617; coloured plate).—This new variety has recently been imported from Japan. The colour of the flowers is of a much darker pink than that of the varieties hitherto introduced.—*R. C. R. N.*

Hypericum, East Asiatic Species. By R. Keller (*Engl. Bot. Jahrb.* xxxiii. March 1904, pp. 547–554).—An enumeration, with description of several novelties, of the species collected in China mainly by Giraldi, and in Japan by Faurie.—*A. B. R.*

Impatiens Holstii. By H. Conrad (*Die Gart.* No. 44, p. 523, July 30, 1904).—A new introduction from East Africa and somewhat allied to *I. Sultani*. The plant grows 50 centimetres high, and forms a bush with several deep red-coloured stems; dark green leaves with a red midrib. In flower it varies more than *I. Sultani*, and already five different colours are offered for sale by a Continental firm—carmine, orange, rose, scarlet, and dark red.—*G. R.*

Impatiens Oliveri. By A. O. (*Garden*, No. 1717, p. 266; 15/10/1904).—*Impatiens Olivieri*, introduced from Uganda last year, is of vigorous habit and flowers freely. Sir John Kirk found it growing in clumps at an elevation of 6,800 feet, about 300 miles up country, on volcanic rocks. It grows about 4 feet high, and branches freely from the base. The leaves vary in size from 4 to 8 inches in length and 1½ to 2 inches across, and are arranged in whorls. In its native habitat the flower is little more than 1½ inch across, under cultivation it is 2½ inches. Another curious point is the colour; in Uganda it is white, while at Kew it is pale lilac, with often a rosy tint. Had the plant been in cultivation for a few years this variation would have caused little comment, but occurring on plants raised from the seed collected in its native habitat the matter is interesting. Nat. ord. *Geraniaceæ*; tribe *Balsamineæ*. A glabrous herb, 4 feet high, with four to eight whorled oblong-lanceolate leaves.—*E. T. C.*

India, The Flora of British. By Sir J. D. Hooker (*Journ. Bot.* 500, pp. 221–227; 8/1904).—A chapter in the descriptive volume of "The Indian Empire" of the new edition of the "Imperial Gazetteer of India," giving in less than six octavo pages an admirable summary of the constituents of the flora and of their distribution. Of the 176 natural orders, comprising 17,000 species, the largest is *Orchideæ*, with more than 1,600 species, ten of which, from the Western Himalaya, are terrestrial British species.—*G. S. B.*

Inocybe, A Monograph of the Genus. By G. Massee (*Ann. Bot.* xviii. July 1904, pp. 459–502; 1 plate).—Of all the genera of the Agaricineæ, *Inocybe* is the most difficult to recognise in the field. A new system of classification is suggested by the author, based mainly on the characters of the epispore and the presence or absence of cystidia. A list and description of species follow, arranged according to the new system.
A. D. C.

Insecticides and Fungicides.—By A. B. Cordley (*U.S.A. Exp. Stn. Oregon, Bull.* No. 75, 1903, pp. 23–43).—This bulletin gives brief but useful directions for the preparation and use of various insecticides and fungicides; also methods of spraying, dusting, and fumigating. The various formulæ which have been used in this country have previously been notified in the Society's Journal.—*R. N.*

Insecticide Studies. By J. K. Haywood (*U.S.A. Dep. Agr. Bur. Chem., Bull.* 76, 1903, pp. 1–63).—This valuable contribution gives the result of a series of chemical analyses of a large number of miscellaneous insecticides, one of the most important results being the detection of lead chromate in Persian insect powder or Dalmatian insect powder. As lead chromate is known to be poisonous, it would appear that it is a very reprehensible practice to add it to pyrethrum powders, since they are often blown about living-rooms with bellows to kill insects, and are consequently inhaled by human beings. Besides this, pyrethrum is almost invariably claimed to be harmless to human beings, which it is when pure, but ceases to be so when it has been mixed with lead chromate or other yellow-coloured chromates.—*R. N.*

Insecticides for Orchard and Bush-fruit. By Cecil Warburton (*Jour. R.A.S.* vol. lxiii. 1902, figs. 1–12, pp. 115–134).—Some eighteen pests are dealt with, and the remedies for each are given. The ingredients of the most useful and readily prepared washes are given below :—

I.—Leaf poisoning Insecticides.

(*a*) Take half-a-pound of Paris (or emerald) green and stir well in a hundred gallons of water, adding a pound of lime. Distribute in a fine spray over the foliage, taking care to stir the mixture frequently, or the Paris green will sink to the bottom.

N.B.—Paris green is sold as a paste and as a powder. The paste is safer, not being so liable to blow about and be inhaled. If the powder is used, it should be pulverised before mixing, unless very fine in grain.

(*b*) Take six ounces of arsenate of soda, and dissolve in a little water, pouring the solution into a hundred gallons of soft water. Also dissolve eighteen ounces of acetate of lead ("sugar of lead") in a little water, and pour the solution into the hundred gallons containing the arsenate of soda. Stir frequently during use, and deliver as a fine spray. A little soft soap added to the mixture will help it to adhere to the leaves.

CAUTION.—The mixtures (*a*) and (*b*) are highly poisonous, and must not be left carelessly about, nor must the vessels in which they are mixed be used for other purposes without careful cleansing. Care must be taken not to inhale the arsenic powders. Fruit must not be sprayed within a few weeks of gathering.

II.—Direct Insecticides.

(*c*) Dissolve ½ lb. of soft soap in 1 gallon of soft water. Add this to 2 gallons of paraffin (kerosene) oil, and stir thoroughly. This gives a "kerosene emulsion," which must be diluted for use. The strength of the mixture will depend partly on the quality of the paraffin and partly on the nature of the object sprayed—whether tender or delicate leaves, strong and vigorous foliage, or bare winter branches. An average strength for foliage will be obtained by adding 15 gallons of soft water to the 3 gallons of emulsion, but it is as well to test its effects on the leaves. For winter use a much stronger mixture is permissible, 5 to 10 gallons of additional water being sufficient.

(*d*) Boil 12 lb. of quassia chips, and add the extract to 100 gallons of water. 6 or 7 lb. of soft soap may be advantageously added to the wash.

(*e*) A useful wash for winter use only, to kill hibernating insects and their eggs, or to clean tree-trunks smothered by Moss or Lichen, may be made thus: Dissolve separately in water, 1 lb. of caustic soda and 1 lb. of crude potash. Mix the solution, stirring up ¾ lb. of soft soap in the mixture. Add sufficient water to make 10 gallons. The best time for its application is the middle of February.

a or *b* is recommended for use against the caterpillars of the 'Winter Moth,' the 'March Moth,' and other allied leaf-feeding larvæ. They are also used for spraying for the Codlin Moth, "a week after the falling of the blossoms." *c* or *d* will be found useful in checking attacks of 'Red Spider.' "Sulphur, however, seems to be especially effective against mites, and a good wash is made by boiling 1 lb. of flowers of sulphur and 2 lb. of fresh lime in 4 gallons of water."

If it is inconvenient to boil the wash, the need for this may be avoided by using sulphuret of lime, 4 oz. of the sulphuret and 2 oz. of soft soap being mixed and added to a gallon of hot water. The spraying may be repeated.—*R. N.*

Insect Enemies and Fungous Diseases of Fruits and Spraying Calendar (*U.S.A. Agr. Exp. Stn. Michigan*, 1904, *Bull.* 216; a brief review of special bulletins, 24, 25, and 26).—*Apple.* No serious fungous injury to roots. Woolly aphis attacks roots, use tobacco dust or wood ashes, dip young trees either in water at 130° F., kerosene emulsion, or tobacco water before planting. The bark is attacked by oyster-shell bark-louse, eccentric scale, San José scale, scurfy bark-louse. Two borers affect the trunk of Apple and Pear, and one the Peach, remedied by a stiff pin, a knife, and a wash of soap or sal-soda. The branches are attacked by Apple scab, canker, black rot, twig blight, fire blight, buffalo tree-hopper, and Apple-twig borer. The leaves are attacked by three fungous diseases, and sixteen species of insects feed on them. The fruit is attacked by at least six different species of fungi, including bitter and ripe rot; three species attack the fruit. These fungoid and insect attacks are very largely avoided by early, frequent, and judicious spraying with Paris green and Bordeaux mixture.

Pear.—Six insects affect the bark, two the trunk, one the branches, seven the leaves, and three the fruit. The fungous diseases attack principally the leaves and fruit and newer and more tender twigs. The fruit suffers more keenly from disease than the Apple.

Quince.—Has some fungous diseases all its own, diseases very injurious if not fatal to the plant, but of a kind, with two exceptions, yielding readily to judicious spraying.

Peach.—Suffers most from the 'yellows' and 'little peach,' the nature of which is not understood and the remedy not forthcoming, therefore destroy every affected tree. The roots of the Peach are attacked by a fungus disease allied to the fungus, called Crown Gall, and by an insect which bores into the roots; then follow thirteen insects that attack bark, trunk, limbs; and leaves; the fungi that injure the leaf include the leaf-curl, mildew, shot-hole fungus, and leaf-spot. The fruit must be protected against the brown rot, scab, rust, mildew, brown spot, and even against codlin moth and Plum curculio.

Plum.—Has almost as many enemies as the Peach; shot-hole fungus affects its leaves, and the brown rot its fruit. It has some diseases of its own, as gummosis of the limbs, Plum pockets in the fruit and twigs, and the curculio and gouger in the fruit. Its leaves suffer from the tent caterpillar, canker-worm, bud moth caterpillar, and Rose chafer.

Cherry diseases are similar to those of other stone fruits, scale on bark, buprestid in trunk, black knot of the limbs, same diseases and insects on leaves and fruit, with the addition of Cherry-fruit fly and Cherry-leaf beetle and slug.

The *spraying calendar* tabulates, under the name of each fruit, the time to spray and what material to apply, giving full directions as to the preparation of the spraying combinations—*C. H. H.*

Insect Injuries to Forest Trees. By A. D. Hopkins (*U.S.A. Dep. Agr. Year Book*, 1903, p. 313; plates).—The characters of insect injuries to living forest trees are discussed under two heads: (1) Injuries which cause the death of the trees; (2) Injuries to the wood which do not materially affect the vitality of the trees. Under the first head are included injuries by bark-beetles and bark-boring grubs. The Hickory bark-beetle (*Scolytus 4-spinosus* Say) is a short, stout, shining black or reddish-brown beetle, averaging 0·14 inch in length. It appears on the wing from May to August, and attacks the base of the buds and leaves for food, afterwards depositing its eggs in the bark. Illustrations are given of the burrowings in the bark. The method recommended for combating the insect is the cutting and burning of the infected trees before the broods of the beetles commence to emerge.

Bark-beetle injuries to Oak trees are dealt with. This beetle (*Pityophthorus pruinosus* Eichh.) is an exceedingly small one, less than ·08 of an inch in length, which sometimes occurs in such vast numbers that large Oak trees are attacked and killed by it in a few weeks. The writer advocates the removal and burning of the infested bark and small branches in the winter.

Amongst the insect injuries to the wood of living trees mentioned, the pinhole injuries in Oak wood may be referred to. One of the most destructive of this class of enemies of hardwood forest trees is the Oak timber worm (*Eupsalis minuta*). This is a slender whitish worm, less than an inch long. The eggs are deposited in a wound in the tree, and the young larvæ bore the pinholes until they emerge the following spring as adults. It is suggested that all dead, standing and felled, Oak trees and old logs should be cleared away from living trees, and all unnecessary axe and other wounds avoided.—*V. J. M.*

Insectivorous Plants, Researches on the Anatomy, Development, and Biology of the Foliage-leaves and Glands of. By C. A. Fenner (*Flora*, xciii. 1904, pp. 335–434, vi.–xxi).—This deals with the following plants:—*Pinguicula vulgaris* L., *Sarracenia flava* L., *Nepenthes Rafflesiana* Jack, *Aldrovanda vesiculosa* L., *Byblis gigantea* Lindl., *Roridula gorgonias* Planch., *Drosera rotundifolia* L., *Drosophyllum lusitanicum* Lk. The most interesting novelty is the proof that *Sarracenia* secretes a digestive enzyme; and that at the base of the pitchers is a zone of absorbent cells, whose nuclei are fragmented and lie in niches separated by cellulose bars. The histology and histogenesis are treated exhaustively, and the physiological researches on *Drosera* are singularly interesting, showing that the secretion of the sessile glands is accelerated directly by the secreted substance of the stalked glands, and indirectly by the internal stimulus transmitted when the latter are stimulated. Plate ix. is lettered and placed as "t. xiii." and *vice versâ*.—*M. H.*

Insect Pests, Destruction of, by their Natural Foes. By G. T. Grignan (*Rev. Hort.* pp. 408–410, Sept. 1, 1904).—Some interesting remarks on the introduction of exotic foes to introduced exotic vermin in America. The San José scale (*Aspidiotus perniciosus*), for instance, being confronted with its enemy *Chilocorus similis*, discovered by

M. Marlatt in China and sent in quantity to Washington. All died *en route* but one couple, and these produced some 5,000 in one summer, and, being distributed, have survived and spread abundantly. A Cotton pest was similarly checked by an ant introduced from Guatemala.—*C. T. D.*

Insects attacking the Stems of Growing Wheat, Rye, Barley, and Oats. By F. M. Webster (*U.S.A. Dep. Agr. Div. Ent., Bull.* No. 42).—The insects mentioned in this bulletin are seven small Hymenoptera, belonging to the family *Chalcidæ* and the genus *Isosoma*, and three Dipterous flies. The members of the family *Chalcidæ* are nearly all parasitic, and for many years it was thought that the grubs of the Isosomas were parasitic on some other insect which was attacking the stems of corn and grasses, but it has been lately proved that they are the culprits. Feeding as they do inside the stems, they cause them to become distorted, and in consequence the "straw was inclined to fall before the grain had fully ripened . . . in some cases resulting in nearly a total loss of the crop." One of the two-winged flies (*Meromyza americana*) lays its eggs on the stems of Wheat and some grasses, so that the grubs when they are hatched can make their way into the upper joint, where they feed on the juices which go to nourish the young ears, which in consequence suffer. These grubs are known by the name of the "Greater Wheat stem Maggot." The other two-winged flies belong to the genus *Oscinis*, and are *O. carbonaria*, whose maggots are known by the name of the "Lesser Wheat-stem Maggot," and *O. soror*, the "American Frit-fly." The larvæ of both these flies injure the stems much in the same way as the "Greater Wheat-stem Maggot." The insects reported on in this bulletin are fully described and figured, and their life-histories, as far as they are known, given.—*G. S. S.*

Insects injurious to Fruits in Michigan. By R. H. Pettit (*U.S.A. Exp. Stn. Michigan, Bull.* 24; 2/04, 70 figs.).—This bulletin contains short and interesting notes concerning the pests of fruit trees and shrubs, with excellent figures of each. Appropriate remedies are quoted for each. Directions for preparing Paris green, arsenical poisons, the lime-sulphur-salt wash, kerosene emulsion, and other useful insecticides are given.—*F. J. C.*

Insects, Short Notes on Seeds, Fruits, and Woods inhabited by. By P. Bargagli (*Bull. R. Soc. Tosc. Ort.* 5, p. 136, May 1904).

Cereals: Andropogon Sorghum Brot. is excavated by one of the Tineas, which completely hollows out the seeds in the larval condition: it is closely allied in life-habits to *Sitotroga cerealella* Ol.

Vegetables: Some forms of Abyssinian French Bean with small white red-spotted seeds are attacked by a small beetle—*Mylabris* (*Bruchus*) *ornata* Bohm.—living as larva and nymph, usually one in each seed. But this species also infested seeds of Vetches with which poultry were fed on board one of the P. & O. steamships at Venice.

Fruit-trees: The Tinea infests the seeds of the drupe-fruit of *Spondias birrea* Rich., the pulp of which is used for fermenting drinks in Senegambia.

In the pulp of the fruit of *Zizyphus Spina-Christi* Willd. lived the larvæ of a beetle belonging to the *Curculionidæ.*

Industrial plants: The seeds of *Acacia spirocarpa?* a gum-producing plant, were bored by *Mylabris* (*Bruchus*) *albosparsa* Fahrs?

The wood of the gummiferous *Acacia Seyal* Del. contains a beetle of the *Curculionidæ*, which can live for several weeks.

The fruits, as large as an acorn of *Quercus Cerris* L., of *Balanites ægyptiaca* Del. were much destroyed by a Microlepidopterous insect.

The seeds of *Cassia occidentalis* L.? were inhabited throughout the summer by the beetle *Caryoborus pallidus* Ol. The insect went through its transformations inside curious little ovoid, whitish follicles, which were either isolated or attached to the seeds. Through these transparent follicles minute Acari could be seen rapidly running about over the bodies of both larva and nymph. The adult insect has a curious swelling on the hind femora resembling that of jumping insects; but it does not jump.

The seeds of *Cassia Tora* L. contain the cocoons of a Microlepidopterous insect.

In the epidermis of the gourd-like fruit of *Kigelia æthiopica* Decne. are a number of holes, each closed by a little lid, and giving entrance to a small silk-lined cavity or cell, inhabited by the chrysalis of some moth; but in June the inhabitant had already escaped.

The seeds of *Coffea arabica* L. are also injured by insects.

W. C. W.

Insects, The Principal, of 1903. By F. H. Chittenden (*U.S.A. Dep. Agr. Year Book*, 1903, p. 563).—An admirable report is given upon this important subject. As regards Apples, the Bucculatrix, the maggot, and the plant-lice are mentioned as having been very injurious. Also the Grape-berry moth, leaf-hoppers, and rootworms. As to the San José scale, it is said that, although still the subject of many remedial experiments, this scale appears to be gradually attracting less attention year by year, partly due to its becoming better known as a pest, and partly to the more general use of remedies; perhaps also to the fact that these remedies are having a material effect in reducing the numbers of this, one of the most troublesome of orchard pests.—*V. J. M.*

Iris Bismarckiana. By C. H. Wright (*Bot. Mag.* t. 7986).—Native of Palestine. Nat. ord. *Iridaceæ*; tribe, *Moræeæ*. A perennial herb 18 inches high. Scape 1-flowered; perianth segments, outer broadly ovate, 2½ inches long, yellowish, densely spotted with purple-brown; inner orbicular, 2½ inches diam., pale blue with lilac veins, spotted towards the margin.—*G. H.*

Iris Haynei. By G. B. M. (*Gard. Chron.* No. 904, p. 266, Supp. fig., April 23, 1904).—A very fine new species recently imported from Palestine, belonging to the *Oncocyclus* group. It has "leaves about a foot long, and stems 18 inches or 2 feet high, bearing magnificent silky-looking flowers, measuring 6 inches from the tip of the standard to the tips of the falls. All the petals are broad and wavy at the margins, the standards being coloured blue-purple and grey in various shades." "The falls are 3 inches across, shading from a deep brown colouring at the margins to the intense black patch in the centre as large as a florin."

G. S. S.

Iris Sofarana var. **magnifica.** By W. Siehe (*Gard. Chron.* No. 923, pp. 162, figs. 64 and 65; Sept. 3, 1904).—The original stock of this fine Iris, which grew between Damascus and Beirout, has been exterminated by collectors, but the author of this paper in company with Mr. Hartman, the original discoverer of the species, found the above-mentioned variety growing on the Lebanon at an altitude of 6,500 feet. He says: "The plant grows readily in limestone soil where in summer there is an absolute freedom from moisture. This condition must be duly noted by those who wish to cultivate any Irises of the *Oncocyclus* group successfully." In the English climate this plant can best be grown in large pots with good drainage, in which it can be kept perfectly dry during the summer.—*G. S. S.*

Iris (*Xiphion*) **warleyensis.** By C. H. Wright (*Bot. Mag.* t. 7956). Native of Bokhara. Nat. ord. *Irideæ*; tribe *Moræeæ*. Flowers with the outer segments pale purple bordered with white and having an orange patch above; inner segments violet.—*G. H.*

Irrigation: Current Wheels, their Use in Lifting Water for (*U.S.A. Dep. Agr. Office Exp. Stn., Bull.* 146; 1904).—The various types of current-driven wheels used for irrigation purposes are considered. Those having direct lifting power, chain and bucket gear, or arranged for driving pumps, all receive their share of attention. Several plates and figures illustrating plan, elevation, and construction are shown.

E. F. H.

Irrigation, Egyptian. By Clarence T. Johnson (*U.S.A. Dep. Agr. Office Exp. Stn., Bull.* 130; 1903).—The bulletin contains the result of a winter spent in Egypt in studying the various principles and practice of irrigation, as applied to agriculture generally, for a means of comparison with other methods now followed in the United States. The text is well illustrated by plates and figures, and is well worthy of consultation by those interested in irrigation as an aid to agriculture or horticulture.

E. F. H.

Irrigation in Northern Italy. Part 1. By Elwood Mead (*U.S.A. Dept. Agr. Office Exp. Stn., Bull.* 144; 1904).—A brief study of the system of irrigation carried out in Northern Italy by means of canals under the management of (*a*) Government, (*b*) modern corporation, (*c*) a farmers' association. The whole question of supply and distribution, including the measurement of water supplied to the various units, is set forth with interesting plates and figures, both general and constructive.

E. F. H.

Irrigation, Preparing Land for, and Methods of Applying Water (*U.S.A. Dep. Agr. Office Exp. Stn., Bull.* 145; 1904).—This bulletin gives a collaboration of the methods of preparing land and applying water now existing in many of the Western States, and is intended to provide advice to irrigators as to the best and most ready means for adaptation in their own districts.—*E. F. H.*

Inula grandiflora. By A. B. Rendle (*Journ. Bot.* 493, pp. 10–12; 1/1904.—*I. grandiflora* of Willdenow, from the Caucasus &c., is properly *I. orientalis* of Lamarck, whilst *I. grandiflora* of Hooker's "Flora of British India," from the Western Himalaya, is *I. barbata* of Wallich.
G. S. B.

Ivies, The Bush (*Garden*, No. 1722, p. 344; 19/11/1904).—It should be more widely recognised that in the finer varieties of the bush or tree Ivies we have some of the most perfect of evergreens. There are a freshness, cheeriness, and distinctness about these shrubs that commend them to all who wish for a permanent feature in the garden of an evergreen character without a fear of introducing a dull and monotonous effect. The day will come, and, let us hope, soon, when diverse forms of Ivy will be much sought for. We enjoy them as groups on the margin of the lawn, or in front of existing shrubberies; and it should be remembered that the green varieties are of the greatest use for planting under trees and in smoky towns.—*E. T. C.*

Jacaranda mimosæfolia. By W. H. Clarke (*Gard. Chron.* No. 926, p. 224; fig. Supp. Sept. 24, 1904).—This very handsome tree or shrub belongs to the order *Bignoniaceæ*; in the "Index Kewensis" it is referred to as *J. ovalifolia.* The foliage alone is said to be an object of beauty, growing from 18 inches to 2 feet long; the leaves are pinnate, and resemble those of some of the Acacias. The flowers are of a deep blue colour and grow in large panicles. The plant from which the figure was taken was 18 feet in height, but is said to "submit very well to the use of the knife, so can be kept within bounds." The writer says: "Considering with what ease this magnificent Brazilian tree may be grown, it is surprising that it is not more often met with in private gardens." It is grown by Mr. Clarke at the cool end of a conservatory.
G. S. S.

Japanese Vegetable Products. By J. R. Jackson (*Gard. Chron.* No. 896, p. 129, Feb. 27, 1904).—A very interesting account is given of certain vegetable products which are exported from Japan, the supply of which is likely to be much diminished on account of the war between that country and Russia. The manufacture of camphor is given in some detail.—*G. S. S.*

Jasminum primulinum. By W. B. H. (*Bot. Mag.* t. 7981).—Native of West. China. Nat. ord. *Oleaceæ*; tribe *Jasmineæ.* A rambling evergreen shrub. Flowers solitary, primrose-yellow, with a darker eye, 1½ to 2 inches across; corolla-lobes six, sometimes duplicated, with inner ones shorter.—*G. H.*

Juncaceæ, Development of. By M. Laurent (*Ann. Sc. Nat. Bot.* xix. pp. 97–192; 102 figs. on 8 plates, and 16 figs. in text; 1904).—The minute size of the embryos of *Juncus* and *Luzula* has prevented accurate observation of interesting points. The author has obtained new facts on pollination and fertilisation, on development of the embryo-sac, on embryo, seed, and germination, and on the development of the primary tissues. The perennial species of *Juncus* have an incomplete embryo, but the annual species of *Juncus* and the species of *Luzula* have a perfect embryo. An antipodal tissue is developed in *Luzula*. The primordial leaves are distinct from those of the mature plant in some species. The paper is well illustrated, and, as most of the figures are those of British species, will be found useful.—*W. G. S.*

Juniper, Hermaphrodite Flowers of the Common. By Otto Renner (*Flora*, xciii. 1904, pp. 297–300; 3 cuts).—These have 3–4 sterile whorls, 2–3 of leaves (stamens) bearing 2–4 pollen-sacs, a whorl of small sterile leaves sometimes absent, and a whorl of carpels. They are proterogynous. This is the second record of hermaphrodism in *Cupressineæ*, the first in the genus *Juniperus*.—*M. H.*

Kalanchoë Dyeri. By N. E. Brown (*Bot. Mag.* t. 7987).—Native of Nyasaland. Nat. ord. *Crassulaceæ*. This is 2 to 2½ feet high, with opposite spreading leaves, the blade being 4 to 7½ inches long. Inflorescence a corymbose cyme of pure-white tubular flowers.—*G. H.*

Kalanchoë Hybrid, A. By Sir William Thiselton-Dyer (*Ann. Bot.* vol. xvii. No. 66, p. 435; with plates 21–23).—The hybrid treated of in this note is the remarkable *K. kewensis*, raised by Mr. Watson, Curator at Kew, between *K. flammea* ♀ and *K. Bentii* ♂. It is remarkable because of its extreme unlikeness to either parent, and it is remarkable, apart from all the philosophy relating to hybrids, because of its striking features. Its leaves are pinnatisect, and are therefore widely divergent from the stiletto-shaped leaves of *K. Bentii*, and they are still more unlike the obovate leaves of *K. flammea*. The flowers are bright pink, those of *K. flammea* being orange, and of *K. Bentii* white.

The author writes: "When two distinct species are crossed, one would expect, *a priori*, the offspring to exhibit a 'blend' of the parental characters, and this appears to correspond largely with experience. Thus Darwin states: 'As a general rule, offsprings in the first generation are nearly intermediate between their parents' (*Variation of Plants and Animals*, ii. 48). Such cases occur in nature, and before their real origin was understood they were regarded as intermediate species. Thus *Geum intermedium* stands between *G. rivale* and *G. urbanum*. But Bell Salter, by crossing these two species, proved it to be a hybrid. The rule is, however, by no means invariable, and Romanes, writing in 1881, remarks: 'Until recently the interest attaching to hybridism was almost entirely of a practical nature, and arose from the fact, which is of considerable importance in horticulture, that hybrids are often found to present characters somewhat different from those of either parent or species' (*Encycl. Brit.* xii. 422). Darwin states the same fact: 'When two races or species are crossed, there is the strongest tendency to the reappearance in the offspring of long-lost characters possessed by neither parent nor immediate progenitor' (*loc. cit.* ii. 48)." Referring to the origin of the pinnatisect leaves, the author writes: "In the case of *K. Bentii* it occasionally, though rarely, happens that one of the rudimentary leaves is strongly two-toothed. It seems possible, therefore, that the extraordinary character of the foliage of the hybrids derives from the parent in which it was latent. . . . *K. laciniata*, which extends from Tropical Africa throughout India to Java, has deeply pinnatifid leaves with sometimes linear segments. The leaves of *K. Schweinfurthii*, from Abyssinia, are also similarly divided. The conclusion seems irresistible that we have in the case of the hybrid a reversion to an ancestral character which exists elsewhere in the genus, but is latent in both parents." With regard to the colour of the flowers, the author writes: "I must confess that I was completely at a loss to explain how a bright pink could arise from a cross between an orange and a white. The explanation, however, occurred to my friend, Dr. Lotsy, who, while staying at Kew, had been much interested in the hybrid. The orange colour of the flowers of *K. flammea* is due to deep yellow chromoplasts immersed in pink cell-sap. In *K. Bentii* both chromoplasts and cell-sap are colourless. The hybrid has inherited the white chromoplasts of one parent and the coloured cell-sap of the other." Whatever occurs is probably in accordance with an unknown law, for pink results in other cases from crossing white and orange, and in *Begonia weltoniensis* it arrives whichever way the respectively white and orange parents may be crossed. The cross reciprocal to that which produced *K. kewensis* was made, viz. "*K. Bentii* ♀ × *K. flammea* ♂. A number of seedlings were raised which at first differed in no appreciable character from seedlings of the same age of *K. Bentii*, as represented in plate xxii. All were exactly alike, and exhibited at first no trace of hybrid origin. But though raised at the same time and subjected to exactly the same treatment as the reverse cross described above . . . they at once showed a marked constitutional difference in the extreme slowness of their growth. When *K. kewensis* was three feet high, the plants of the reverse cross had only attained six inches. It is, however, interesting to note that after cultivation for two years and a half they have begun to develop the same pinnatisect leaves which are so characteristic a feature in *K. kewensis*. As none of the plants have yet flowered, what will happen then can only be a matter of conjecture. It is probable, however, that they will resemble those of *K. kewensis*, for, as Darwin observes, 'hybrids raised from reciprocal crosses . . . rarely differ in external character' (*Origin*, 6th edition, 244)."—*R. I. L.*

Kirengeshoma palmata.—By W. B. H. (*Bot. Mag.* t. 7944).—Native of Japan. Nat. ord. *Saxifragaceæ*; tribe *Hydrangeæ*. A compact herb, 2 feet high, at Kew, but 4 feet as a native; leaves palmately lobed; flowers yellow, campanulate, $1\frac{1}{2}$ to $1\frac{3}{4}$ inch diam.—*G. H.*

Koelreuteria paniculata. By O. Brand (*Die Gart.* No. 1, p. 10, October 12, 1904; with illustration).—One of our most interesting and beautiful of flowering trees or shrubs. It is slightly tender when young, and in a severe winter part of the year's growth is destroyed by frost. The flowers are produced in long racemes and are bright golden-yellow.

G. R.

Lælio-Cattleyas, Winter Flowering. By W. H. Young (*Gard. Mag.* 2627, p. 169, 5/3/04).—A detailed account of the numerous varieties of these hybrid Orchids that flower during the winter season.

The writer, a well-known Orchid-grower, gives clear practical hints upon their culture.

Illustrations of some of these hybrids accompany the article.—*W. G.*

Lantanas, The. By Angiolo Pucci (*Bull. R. Soc. Tosc. Ort.* 10, p. 313, Sept. 1904).—This is one of those old plants which have almost vanished from our gardens. It belongs to the *Verbenaceæ*, and constitutes a group of more or less robust and vigorous shrubs with deciduous leaves, and having a long resting period. During this latter they are put aside in a room, and kept dry like bulbs and tubers. At the proper season they are taken outside again and pruned and repotted. They can also be planted in the open ground, remaining there until far on in the autumn. When cultivated in pots they prefer full sun-exposure and can bear placing on a pavement or against a wall where the sun's heat is greatest. They prefer a soil in which clay predominates, to which old dung is added.

Soon after the leaves are on, flowering begins and continues well on into the autumn. The inflorescence is corymbose, and in many species the flowers composing it are of different colours. The typical Linnean species bears the name *Camara*, and is native in South America. This species has a very compact corymb, and the flowers are at first yellow and then rose-coloured. Numerous varieties have come from this species, of which the following are amongst the most remarkable and distinct:—Rongier-Chauvière, Solfatare, Miracle, Queen Victoria, Alba grandiflora, Brilliantissima, Pulcherrima, Victor Lemoine, Compacta, Triomphe, Fulva, Variegata, &c.

L. nivea, from Brazil, possesses pure white flowers; the vars. *grandiflora* and *mutabilis* come from it.

L. Sellowiana, from Brazil, bears reddish-violet flowers tinged with white, which are longer than those of any other species.

L. crocea differs little from *V. Camara*, having the tube of the flowers slightly more elongated.

L. odorata, from Trinidad, has pure rose-coloured flowers.

The propagation of the Lantanas is by cuttings, struck in a warm frame or in a box, and by seed. The plants produced from the latter flower the same year.—*W. C. W.*

Lathræa clandestina. Anon. (*Gard. Chron.* No. 906, p. 292, figs. 126, 127, May 7, 1904).—This curious parasitic plant was growing very freely on the roots of Beech and Willow in the gardens of the Royal Botanic Society in Regent's Park. It is a native of the south-western part of France, but has been introduced into many gardens in this country. It is very effective when growing in masses; the flowers are rosy-lilac, and the bracts ivory-white.—*G. S. S.*

Lawns, Garden. By Il Giardinaggio (*Bull. R. Soc. Tosc. Ort.* 3 p. 91, March 1904).—The grass most in use for their formation is the Ray-grass (*Lolium perenne*), which is sown in the ratio of a kilogram to 100 sq. metres; if sown along the sides of walks, one kilo. may be used for 80 to 100 metres' length. On little grassplots where the grass is required to be fine and close, 2–4 kilos. can go to 100 sq. metres; but the closer it is sown the less resistent is the grass to drought. Ray-grass is only fit for deep, moist ground. In dry, sandy, shallow soils a lawn can be made from a mixture of the following: *Bromus pratensis, Poa pratensis, Festuca duriuscula, F. ovina, F. tenuifolia, Cynosurus cristatus, Agrostis vulgaris, A. stolonifera, Anthoxanthum odoratum, Trifolium repens. Bromus pratensis* is well adapted for dry, calcareous soils where all other grasses die. Beneath trees with tall shoots whose tops are not too closely crowded good lawns can be made with *Festuca duriuscula, Anthoxanthum odoratum, Poa nemoralis*, and *P. angustifolia*. If the position was at once shaded and dry it would be advisable to add *Festuca heterophylla* and *F. tenuifolia*, which are more resistent than the three first named, but have the drawback of growing in isolated tufts.

Ground prepared for lawns should be broken up as much as possible, so as to render it permeable to air and moisture, and the surface levelled. It should be left fallow for some time before sowing, so as to have time to subside and rest.

Lawns can be sown either in spring or autumn, but for dry lawns it is best to sow towards the end of September; on small plots where the ground is good and can be watered, one can sow all the year round. When the seed is small in amount, or some difficulty is experienced in sowing it evenly, it is best to sow it mixed with fine sand or soil.

In order to keep the lawn in good condition the following must be adopted:—

1. *Weed* carefully at end of winter and summer, eradicate all grasses which are forming taproots and radical leaves adpressed to the ground, *e.g.* Medick Grass, Plantains, Sow-Thistles.
2. *Mow* or *cut* the grass so as to prevent the seed maturing.
3. *Roll*, and if possible *water*, after each mowing.
4. *Manure* from time to time according to fertility and soil, either with coarse stable manure in autumn, or with ash, or phosphatic manures.

In vineyard localities and in proximity to the sea *Cynodon Dactylon* can be used. At Naples and in Sicily lawns are planted with *Convallaria japonica* and *Mesembryanthemum acinaciforme*; but one cannot walk over them, as the leaves of the latter plant break under the tread. *Pyrethrum Tchihatchewii* makes very fine carpets of a dark green tint, and *Achillea Millefolium*, when sown thickly, gives the same appearance, but has the defect of growing rather too high.—*W. C. W.*

Laying-out of Home Grounds. By L. Cranefield (*U.S.A. Agr. Exp. Stn. Wisconsin, Bull.* 105).—Here again we have Mr. Cranefield at his best in his suggestions for laying-out and planting of home grounds—excellent advice clearly recorded. Apart from the æsthetic, there are other and more material reasons why grounds should be made restful and attractive, not the least being the additional pleasure derived from them and the increased value of the premises arising from such improvements.

Several illustrations are given showing the improvements that have been brought about in grounds and on bare buildings by the judicious planting of shrubs and trees.—*A. D. W.*

Leaf-cuttings, On. By P. Baccarini (*Bull. R. Soc. Tosc. Ort.* **11**, p. 329, October 1904).—This method is largely practised for the propagation of *Gesneriaceæ*, *Begonia*, and *Aroideæ*. Some plants strike more readily than others from leaf-cuttings: a species of *Aloë* only produced buds a year after the leaf was planted. The same with *Sansevieria guineensis* Willd. and *S. Ehrenbergii* Schwf., some leaves of which took several months to root after being planted in May 1903, and only last June did the young plants appear above ground. Others did not get beyond the rooting stage; others had only formed callus. But the slow sprouting of the leaves has its compensations if, as in the cases of *Begonia* and *Torenia asiatica*, the plants so produced flower earlier than under normal conditions, although the vegetative vigour of such plants may be less.

Lindemuth caused sixty-five species, belonging to thirty-three natural orders, to root, and from these he obtained individuals only from the following fifteen species: *Achyranthes Verschaffeltii*, *Antirrhinum majus*, *Brassica oleracea*, *Capsicum annuum*, *Coleus hybridus*, *Fuchsia hybrida*, *Iresine Lindeni*, *Ledenbergia roseo-ænea*, *Mimulus hybridus* var. *duplex*, *M. moschatus*, *Oxalis Deppei lilacina*, *Petunia hybrida*, *Pogostemon Patchouly*, *Raphanus sativus*, *Torenia asiatica*. The power of rooting varies according to the season and the condition of the plant; *e.g.* leaves of *Vitis vinifera*, planted on August 11, rooted very easily, but were no longer able to do so on September 11.

The present author experimented with over a hundred species and varieties from June to August, and obtained rooted leaves from the following:—

Achyranthes Verschaffeltii
Ægiphila martinicensis
Artanthe magnifica
Aster Novi-Belgii
Balsamina hortensis
Brassica oleracea
" *Rapa*
Cestrum Parqui
Codiæum Weissmanni
Coleus Verschaffeltii
Eupatorium petiolare
Ficus nymphææfolia
Fuchsia hybrida
Ginkgo biloba
Hibiscus Rosa-sinensis
Ixora coccinea
Ledenbergia roseo-ænea
Pachystachys carnea
Pelargonium diadematum
Pogostemon Patchouly
Primula sinensis
Ruellia macrantha
Vitis rupestris

Callus-formation was observed in: *Angiopteris evecta* var. *Teysmanniana*, *Citrus Limonum*, *Dichorisandra mosaica*, *Stephanotis floribunda*, *Vitis riparia*, *V. vinifera*.

The author was unable to root certain leaves with which Lindemuth was successful, and *vice versa*.

The author found that the rooted leaves are more robust than those attached to branches; in the case of *Coleus*, e.g., they tend to form roots along the midrib, even above the soil. In the case of *Eupatorium* *petiolare* the roots are so dense and abundant that they grow out of the soil and creep downwards along the outside of the pot to the sand below. A figure of this is given. Leaves of *Ginkgo*, which Lindemuth was unable to root, rooted freely, but never formed young plants, the leaves gradually yellowing and dying off.—*W. C. W.*

Lettuce and Tobacco Growing. By W. E. Embry (*U.S.A. Exp. Stn. Florida, Farmers' Ins. Bull.*, 1904).—Sheds are constructed, at a cost of $250 per acre, in which to grow Tobacco, and are found admirable in Florida for cultivating Lettuce and other vegetables. The coverings of the sheds are made of slats 1 inch by $\frac{5}{8}$ inch by 50 inches, interwoven with No. 22 wire, 650,000 being required to the acre, the slats being 1 inch apart. The sheds are supported by posts, 11 feet long, having 2 feet in the ground.—*F. J. C.*

Lichen Anatomy (Usnea). By Fritz Schult (Dortmund) (*Beih. Bot. Cent.* xviii. Abt. ii. pp. 1–22 ; 3 tables and 8 text figures).—Gives a very thorough description of the anatomy of this genus. The spiral course of the cells forming both the outer and the inner rind is specially interesting. The author discovered constantly ascogenous hyphæ from which the asci clearly originated, but never found either trichogynes or spermatia, and he holds that these ascogenous hyphæ are produced by vegetative growth of the aëration tissue. The paraphyses seem to be clearly traced from the hypothecium.

Barbatin acid, traced by solution of potassium bicarbonate, was found in *U. ceratina* and *U. longissima* only. Beautiful crystals are formed of this. Usnic acid is found only in some species, whilst calcium oxalate occurs in all the species examined.—*G. F. S.-E.*

Light, The Attraction of Organisms to. By Em. Radl (*Flora*, xciii. 1904, pp. 167–178).—The author, dissatisfied with current views on phototropism, relates experiments tending to show that a seedling hung by a silk filament like a magnet needle sets towards the light, and ascribes the result to the direct impulse of the light rays. [Probably a quartz filament would have given more trustworthy results.]—*M. H.*

Lightning, Trees stag-headed by. By K. von Tubeuf (*Nat. Zeit. Land-Forst.* i. pp. 1–9, 309–315, 367–372, 413–461 ; ii. pp. 6–62, 109–112 ; 54 figs. and 17 plates ; 1903–1904).—The first part of this research has already been referred to (see JOURN. R.H.S. xviii. p. 295). The later parts give details of the observations, and the numerous illustrations show that great care has been taken. The author establishes his view that one cause of stag-headedness of Conifers (Spruce, Larch, Pine, and Silver Fir) may be lightning. In most of the cases the trees were struck during the winter 1902–3, and apparently by continuous small discharges, because the damage differs distinctly from the well-known injuries caused by forked lightning. In every case the tree stood higher than its neighbours. The result is that a portion of the crown is completely killed, and death, accompanied by discoloration of the bast region, extends some distance down the living part of the tree. This discoloration is shown by several coloured plates, and is sufficient to diagnose the damage and its cause. Trees stag-headed from this cause were examined from all parts of Bavaria. The final part of the research is a striking confirmation of the theory. It describes the effects of discharges of electricity from an electrical machine on various Conifers. The resulting injury was exactly the same as that observed in the forest, both in external and internal features.—*W. G. S.*

Ligustrum Quihoui. By W. D. (*Garden*, No. 1719, p. 292; 29/10/1904).—More frequently ought this little-known Privet to be grown, as it flowers very late in the year, and is one of the most ornamental species. It was introduced from China nearly forty years ago. It forms a dense bush 6 feet to 8 feet high, made up of numerous wiry branchlets, which, when young, have a purplish tinge. The leaves are small and ovate. The flowers are white, borne in long, loose, terminal panicles during September and October, a time when flowering shrubs are few in number. For grouping in shrubberies it is an excellent plant, but it is doubtful whether it would be worth growing as a hedge plant, for when young it grows very slowly.—*E. T. C.*

Lilies, Cross-fertilisation of (*Rev. Hort.* p. 295, July 1, 1904).—*Lilium croceum* self-fertilised in Ghent yielded no seed; cross-fertilised with neighbouring plants, ovaries swelled but failed to perfect; but crossed with pollen from a distant locality (Bruges) all produced fruits and fertile seed.—*C. T. D.*

Lilium japonicum colchesterense. By G. B. M. (*Garden*, No. 1716, p. 244; 8/10/1904).—This beautiful Lily comes from Japan, and is generally known as *L. odorum*, a name its delicious fragrance has earned for it. It is closely allied to the well-known *L. Brownii*, but is even more vigorous. The bulbs are unusually suceptible to injury from damp and cold, hence the presence of low-growing shrubs around them is necessary to hold the balance of moisture at the root. The bulb formation, texture of the leaves, and the masses of roots that issue from the stems all indicate a habitat amid scrub, and the marvellous wealth of flowers is only possible when such intelligent association of Lilies with other garden plants is well carried out. The flowers of this Lily are exceedingly handsome, measuring 8 inches to 9 inches long and 6 inches across the richly cream-tinted funnel. A beautiful clear yellow suffuses the throat of the flower, and the outside is irregularly flushed with brown.—*E. T. C.*

Lilium monadelphum Szovitsianum. By E. Ryssel (*Die Gart.* No. 32, p. 377, May 7, 1904).—One of the most desirable species of the Martagon group of Lilies with large turban-shaped flowers, either pale or deep yellow, with brownish spots. Once as common on the slopes of the Caucasus as the common *L. Martagon* still is in some parts of Central and Southern Germany, but becoming much scarcer owing to its destruction by tiling and cattle.—*G. R.*

Lime, Seedless (*Bull. Bot. Dep. Trin.* xl. p. 617, October 1903).—This variety, producing fruits of the ordinary size and flavour, having been brought to the notice of the Department, is pronounced entirely seedless, and successful buddings have been made; and in the October number for 1904, p. 141, it is announced that a certain number will probably be ready for distribution among botanic gardens and stations early in the present year.—*E. A. B.*

Limonium Neumani. By C. E. Salmon (*Journ. Bot.* 504, pp. 361–3, pl. 466, 12/1904).—Description of the hybrid Sea-Lavender *L. humile* × *vulgare* from Bosham, Sussex, formerly placed under *Statice rariflora* or *S. bahusiensis.*—*G. S. B.*

Liverworts, Chemistry of. By C. E. Julius Lohmann (*Beih. Bot. Cent.* xv. pp. 215–256).—Gives a very elaborate analysis of the ash and oil-bodies in four species of Liverworts. Of the ash 24–60 per cent. potash, 7–22 per cent. lime, 5–8 per cent. phosphorus, 2–6 per cent. chlorine, 3-25 per cent. silica, and no iodine. The presence of alkaloids seems doubtful. The testing and chemical details of the oil are fully given, and the effect of the oil in preventing snails from eating the tissues (after Stahl) is fully confirmed, partly by experiment. From the ether extract the author does not consider that there is in Mosses a large amount of glycerin-holding fatty oil. A small quantity of a resinous body, much chlorophyll, carotin, and ethereal oils make up most of this extract.

G. F. S.-E.

Liverworts in Baden. By Karl Müller (Freiburg im Breisgau) (*Beih. Bot. Cent.* xvii. pp. 211–233).—Gives localities of 116 Liverworts found in 1902 and 1903 in Baden.—*G. F. S.-E.*

Loropetalum chinense. By W. B. H. (*Bot. Mag.* t. 7979).—Native of India and China. Nat. ord. *Hamamelidaceæ.* A densely branched shrub, 8 to 10 feet high. Leaves ovate-lanceolate; flowers pure white, greenish-white, or very pale yellow, 1 inch diam.—*G. H.*

Lonicera etrusca, var. **superba.** By C. H. Wright (*Bot. Mag.* t. 7977).—Native of the Mediterranean region. Nat. ord. *Caprifoliaceæ*; tribe *Lonicereæ.* A lofty, much-branched climber. Leaves ovate; flowers in 12-flowered heads. Corolla at first creamy-yellow, finally almost orange.—*G. H.*

Lonicera syringantha. By C. H. Wright (*Bot. Mag.* t. 7989).—Native of North-West China. Nat. ord. *Caprifoliaceæ*; tribe *Lonicereæ.* A much-branched shrub, 4 feet high. Flowers with corolla of a pale rose colour; berries red.—*G. H.*

Lonicera tragophylla. Anon. (*Gard. Chron.* No. 922, p. 151, Supp. plate; August 27, 1904).—This very fine species of Honeysuckle, which is new to cultivation, was introduced from China by Mr. Wilson and flowered this summer (1904) in Messrs. Veitch's Nursery at Coombe Wood. Its fine masses of yellow blossoms are set off by the glossy foliage: it is probably quite hardy, and should be a great addition to our hardy climbers. A technical description of the plant is given by Mr. W. B. Hemsley.—*G. S. S.*

Luxembourgiaceæ, The. By Ph. v. Tieghem (*Ann. Sc. Nat. Bot.* xix. pp. 1-96; 1904).—The author describes features of systematic interest for the genera of this order, and discusses their grouping, as well as the affinities of several doubtful genera.—*W. G. S.*

Lysichitum camtschatcense. By W. H. (*Gard. Chron.* No. 908, p. 322, figs. 140 and 141, May 21, 1904).—This remarkable Aroid is the only member of the genus, and has an extensive distribution, being found over a wide area in North-Eastern Asia and North-Western America. It has been grown for some years at Kew, but it flowered for the first time early in April 1903. It is a very effective plant; the spathe is of a bright yellow colour, and is from 4 to 6 inches in length. The spadix is from 3 to 6 inches long, and the flower grows on a footstalk about a foot in length. The flowers, when mature, emit a most fetid odour.—*G. S. S.*

Lysichitum camtschatcense. By W. B. H. (*Bot. Mag.* t. 7937).—Native of North-Eastern Asia and North-West America. Nat. ord. *Aroideæ*; tribe *Orontieæ.* This is a stout marsh herb, with a spadix 4 to 6 inches long, within a boat-shaped pale yellow spathe. The leaves are erect, 1–2½ feet long.—*G. H.*

Lysimachia Henryi. By W. B. H. (*Bot. Mag.* t. 7961).—Native of Western China. Nat. ord. *Primulaceæ*; tribe *Lysimachieæ.* A vigorous trailing perennial herb. Leaves lanceolate; flowers yellow, 1¼ inch diam.—*G. H.*

Madeira, R. Brown's List of Plants. By J. Britten (*Journ. Bot.* 493, pp. 1-8; 494, pp. 39-46; 498, pp. 175-182; and 499, pp. 197-200; 1/1904, 2/1904, 6/1904, and 7/1904).—A transcript, rearranged and with modern names added, of a manuscript list by Robert Brown, now in the Botanical Department of the British Museum, enumerating about 600 species from the collections of Banks, Solander, and Masson (1768-1785), most of which is given in Leopold von Buch's "Beschreibung der Canarischen Inseln" (1825), pp. 189-199. This is the earliest published attempt at a Madeiran Flora.—*G. S. B.*

Mammillaria elongata, Observations on. By O. V. Darbishire (*Ann. Bot.* xviii. July 1904, pp. 375-412; 2 plates).—The author's main results are as follows:—The set of spines by which the tubercles of *Mammillaria* are crowned form a structure which acts as a screen, protecting the underlying tissues of the tubercle from strong sunlight. Such organs are named *paraheliodes.* In *Mesembryanthemum stellatum* the set of hairs found at the top of the leaf also form a paraheliode.

The tubercle of *Mammillaria* represents morphologically the leaf-basis and possibly, in addition, a portion of the stem. The spines are modified portions of the leaf-blade. One axillary bud is found in connection with each tubercle or leaf. The guiding principle which underlies the adaptation of plants and the production of plant forms is physiological.

Mammillaria elongata was alone investigated, but the physiological results obtained may be made to include other members of the order.

A. D. C.

Manettia, The Cultivated Species of. By T. A. S. (*Gard. Chron.* No. 936, p. 384, fig. 169; Dec. 3, 1904).—Though there are between thirty and forty species included in this genus, there appear to be only five cultivated in Europe. Of each of these species the writer of the paper gives a short account, alluding particularly to their habitats and synonyms.—*G. S. S.*

Manganese in Plants. By Josef Görsl (Prague) (*Beih. Bot. Cent.* xviii. Abt. i. pp. 119–132).—Has investigated the occurrence of manganese, and finds that it is exceedingly common, especially in water and marsh plants, which contain more than those of dry ground. It can be distinguished from the other isomorphous double ammonium salts by treatment with $\frac{n}{10}$ $KMnO_4$. *Coniferæ* contain much manganese. By researches with fungi the author shows that it has a stimulating effect on growth and fructification, but not under all circumstances, for the concentration and character of the nutritive solution affect this.—*G. F. S.-E.*

Mangold and Beet: Investigations on the Physiological Basis of Cultivation. By C. Kraus (*Nat. Zeit. Land-Forst.* i. pp. 180–200, 220–237, 268–279, and 342–367, 1903; and ii. pp. 65–80, 1904).—The differences in the varieties of *Beta* (Beet and Mangold) are treated from a standpoint much more scientific than is general in agricultural researches; at first sight one may fail to see the practical bearing, but the research is really directed towards ascertaining essentials which underlie all practice. Starting with germination, it is shown that the differences in form, structure, and utility of varieties of *Beta* are traceable to the part taken by the taproot, hypocotyl, and epicotyl respectively in the formation of the swollen tuber, and the extent to which these contribute to growth in length and thickness. The internal structure—including number and breadth of the growth-zones—is also correlated with the mode of growth and external shape. The structure and growth also determine the maximum size attainable by any variety, and the manner in which it will respond to external conditions, either natural or artificial. Crop-production and nutritive value are also bound up with structural differences. The paper is an important one in regard to raising new varieties, which are too often the outcome of chance. The numerous experiments carried out include tests of the effects of earthing up the crowns, as against leaving them exposed. There is a good deal to be said both for and against the two systems, but a moderate earthing up improves the yield of most of the varieties.—*W. G. S.*

Mangroves, Excretion of Salt by. By Johs. Schmidt (*Flora*, xciii. 1904, pp. 260–1).—In *Ægiceras* alone is the excretion of NaCl by glands on the upper surface of the leaves. If this occurs in other Mangroves, which has yet to be proved, its method must be different.—*M. H.*

Manure, Town Stable. By B. Dyer (*Jour. Agr. Sc.* vol. i. part i., pp. 108–113, Jan. 1905).—Town manure is so largely used in gardens, especially for vegetable culture, that this article is a particularly useful one to gardeners. Samples were drawn from trucks consigned to Kent and the Midlands respectively. They yielded on analysis :—

Analyses of Representative Samples of Fresh London Stable Manure (Peat Manure and Straw Manure mixed), 1903.

	No. 1.	No. 2.	Average.
Moisture	76·09	61·98	69·04
Organic matter &c. (loss on ignition)	19·30	26·37	22·82
Phosphoric acid	0·33	0·45	0·39
Lime	0·55	1·28	0·92
Potash	0·45	0·58	0·51
Undetermined constituents	0·69	2·70	1·70
Silicious matter (mainly sand)	2·59	6·64	4·62
	100·00	100·00	100·00
Total nitrogen in above :—			
Soluble	0·08 } 0·54	0·08 } 0·70	0·08 } 0·62
Insoluble	0·46	0·62	0·54

There are also analyses of samples taken from large heaps which had been stored in the open from summer to spring, and comparison of the composition of these with the fresh shows that about 40 per cent. of the organic matter disappeared in the fermentation. As this organic matter is of such immense value as a physical ameliorator of the soil, the loss is a serious one, and this article will do great service in drawing attention to the fact. There is no comment on the advantages which are usually believed to accrue from such fermentation (apart from the practical convenience of placing in heaps ready for use) : *i.e.* the destruction of many objectionable seeds—Oats, weeds, &c.—also the formation of the valuable nitrate nitrogen if covered with layers of earth. There are several factors for the cultivator to consider, and this article draws attention to one about which little was known, but which must not be forgotten.

F. J. B.

Manures, Experiments with Artificial. By Dr. R. Otto (*Gartenflora,* Feb. 1, p. 58, and Oct. 15, 1904, p. 534).—May profitably be consulted by those who are interested in the scientific employment of artificial manures. These articles are reports of experiments which have actually been made with a view to testing the efficacy of different kinds of artificial manures. The experiments were carried out on plants cultivated in each case under the same conditions, one set of plants being manured with one kind of manure, another set of plants with another kind of manure, and, again, a third set of plants being left without any manure at all. At the conclusion of these experiments the results were carefully noted and are given in these articles.—*R. C. R. N.*

Manures, The Use of Artificial (*Jour. Bd. Agr.* vol. x., No. 4, 1903, pp. 433–446).—This article supplies practical information regarding the use of these substances, and is based upon a set of recently conducted experiments. It is claimed that the "basis of all systems of manuring should be dung. This does not mean that this substance should be applied concurrently with artificial manures, but merely that the land from which the crops are taken should periodically receive a fair dressing of this fertiliser." Although the supply of dung may alone maintain a farm in fair fertility, it seldom, if ever, happens that the home-made supplies suffice to produce maximum crops throughout rotation. For this reason it is found to be profitable to purchase artificials, which, however, should be regarded as a supplement, not as a substitute, for the natural fertiliser. Formulæ are given for cereals and roots, and also for Cabbages, Carrots, Parsnips, Beans, and Peas.—*R. N.*

Manurial Treatment of Poor Pastures: Soil Analysis as a Guide to. By T. B. Wood and R. A. Berry (*Jour. Agr. Sc.* vol. i. part i., pp. 114–121, Jan. 1905).—A record of some experimental work which shows the superiority of the citric-acid method of determining what manures are likely to give successful results, as compared with the determination of the percentages of "total" nitrogen, phosphoric acid, &c. If the citric acid test shows the "available" phosphoric acid to be below 0·02 per cent. on pastures, there is a probability of successful phosphoric manuring. Similarly, if there is less than 0·01 per cent. of "available" potash, there are likely to be distinct results from potash manuring. "Liming is not indicated as likely to be profitable unless the soil contains certainly less than 0·5 per cent. of chalk."

"That basic slag is nearly always a better source of phosphoric acid for pastures than superphosphate, unless, perhaps, when the soil contains an exceptionally high percentage of chalk."

"Determinations of citric acid, soluble phosphoric acid and potash, and of calcium carbonate, and mechanical analysis of the soil, together with careful observations of the herbage which the land in its unmanured condition is producing, may be expected to indicate clearly those soils which are likely to be improved for pasturage by manuring with phosphates and potash."—*F. J. B.*

Maple Leaves, Anatomy of. By Georg Warsow (*Beih. Bot. Cent.* xv. pp. 493–601; with four text figures).—Gives a thorough description of anatomical details in the leaves of 110 species of *Acer*. The character of the epidermis cells with presence or absence of papillæ and a wax layer, character of mesophyll, trichomes, crystals, laticiferous elements, &c. are fully detailed for each of those species, and a table of the distribution of the species and the more important results is appended. In twelve species the so-called "laticiferous" secretion has been found.—*G. F. S.-E.*

Maple Sap Flow (*U.S.A. Agr. Exp. Stn. Vermont, Bulls.* 103 and 105, December 1903, February 1904).—Two excellent reports on the practical and theoretical problems suggested by the Maple Sap Flow. The authors frankly state that "their observations on the Sugar Maple have raised more questions in their minds than they have answered"; but the bulletins are a model of clear and concise statement of *facts* determined, as well as of *theories* discussed. Commendable, too, is the plan of issuing the full reports in No. 103, and a condensed popular edition in No. 105 (containing summary, introduction, general structure and physiology, sap pressure and flow, sugar orchard problems); but those interested in the general physiological bearing of the subject should not neglect the fuller exposition.

1. *Whence comes the sugar? And what relation has the structure of the tree and its life functions to sugar formation?*—Maple sugar is

formed from starch in the late winter and early spring. This starch is stored in certain sapwood cells during the preceding summer, and is probably transformed into sugar through the action of enzymes. The starch is formed in the leaves under the influence of sunlight. A large leaf area and plenty of sunshine conduce to sugar-making. The reverse conditions hinder it.

2. *What is the cause of the sap flow ?*—The immediate cause of the flow from the tap-hole is sap movement under pressure towards the point of least resistance. The exciting cause of this flow seems to be temperature fluctuations over the 32° F. line, causing alternation of pressure and suction, a pump-like action. The ultimate and absolute cause can hardly be this or any other physical one. It probably is a function of the living cell.

3. *What relations to the sap flow are borne by weather changes, the water and gas contents of the tree, pressure and suction, and direction of sap movement ?*—The Maple trunk rapidly accumulates water during the late winter and early spring. It at all times contains much gas inclosed within the cell-walls of the woody tissues. The sap passes through these walls readily, gas scarcely at all. Temperature changes cause expansion or contraction of volume, and changes in pressure of the imprisoned gases. Increase of water-content and rising temperature produce pressure, pressure induces sap movement, and sap movement means sap flow. Alternations of temperature above and below freezing cause alternate conditions of pressure and suction, and bring about a pump-like action which accounts in some measure for the intermittent flow.

4. *What bearing has location of the tree and variations in tapping on the amount and character of the flow ?*—Trees in the open give more and richer sap than those further back in the bush, crowded and shaded, because of greater leaf expansion and sun exposure. No decided advantage arises from a too careful selection of any particular side for tapping. The sap obtained from the customary tapping height (4 feet) was found to be greater in quantity and better in quality than that from the root (at ground level), or higher on the tree (14 feet above the ground).

5. *What is the extent and cause of sap variation ?*—63 per cent. of the sap drops before noon. Its sugar-content slightly increases as the day goes on. As between orchards there are large variations—in five cases 2·08 and 3·44 per cent. In the same place in consecutive years the sugar-contents were 2·14 and 2·42 per cent., while the average sugar content in sap flowing from the experimental trees was 3·13 and 3·41 per cent.

6. *What draft does an average sugar-yield make upon the total sugar-content of a tree ?*—Provided 3 lb. of sugar be made to the tree, from 4–9 per cent., according to the size of the tree, is removed.

The average Maple-sugar crop of the United States approximates to 45,000,000 lb. The money value of the 1899 crop, which was below the average, is placed by the census returns at $2,636,711. No Maple sugar is made south of 35° latitude, or west of 95° longitude. Vermont furnishes from a quarter to a third of the gross yield, from a third to two-fifths of the sugar, and a tenth of the syrup. Maple sugar-making was established among the Indians prior to 1673. The early Vermont settlers learned the art from them, and depended almost entirely on the Maple for their domestic sugar supply. Maple goods are now, however, used as a delicacy, and command a relatively high price. Neither the sugar-making nor the tree from which the sweet sap flows has hitherto received close scientific study. But little is found in American literature, and practically nothing in European, while there are many obscure points in connection with the sap flow which seemed worth clearing up. Accordingly, in the winter of 1896–7, the Vermont Agricultural Station planned a study of the general problem.

The Maple trunk consists of a reddish-brown heartwood and yellowish-white sapwood. The sapwood is thicker than in many trees, averaging 6¼ inches. It contains the living cells, whereas the heartwood is lifeless and functionless. It consists of closed cells and vessels packed closely together, within which are held water, food substances, and gas.

The water enters the tree by its roots, and, unless the tree is wounded, its only avenue of escape is *via* the leaves. Its main service is as a tissue-builder and as a carrier of food, and it may comprise from 25–60 per cent. of the weight of the tree. It ascends the tree from the woody stem; how it does this is not clearly understood. Root pressure is perhaps the cause of the ascent in some species, but does not appear to be an important factor in the case of the Maple.

The starch is manufactured in the leaves under the influence of sunlight, and is later transformed into sugar, and the sugar-content of the sap depends upon the conditions of the preceding season as to sunlight, leaf development, and consequent starch storage. This has been proved in recent years, when the defoliation of the trees by the forest caterpillars was followed by seasons in which the sap carried much less sugar than usual. The relation of foliage development to sugar-content is a very close one. The variation in amount of sunshine at different periods during the preceding summer also influences the quality of the sap. The excess of these sugar-making foods gathered beyond immediate needs during the summer months is stored for use in the early growth of the following spring. This storage occurs chiefly in certain wood-cells, the starch being deposited in the outer cells first, and progressively inwards. In the spring this reserve food is drawn upon as sugar in the same order, disappearing from the outer cells first, and progressively inwards. Coincidently with the disappearance of the starch in the latter part of the winter, micro-chemical tests of the tissues have shown an increase in the amounts of the soluble carbohydrates, cane sugar, dextrin, and glucose. When a branch was cut in mid-winter and kept for some time in a warm room, these same changes were observed. It is safe to observe that in the Maple, as in other plants, these transformations are due to and controlled by the activities of the protoplasm, and that they are directly brought about by chemical ferments or enzymes, secreted by the living cells in which the starch is stored or by other cells closely adjacent to them. Maple sap averages over 3 per cent. of sugar, and also contains other constituents.

A "good sap day," or "a good run of sap," occurs only after the air temperature has remained below freezing for some time. If following this the temperature rises materially above that point, the sap flows. Alternate freezing and thawing, moderately warm days followed by freezing nights, are the ideal meteorological conditions that promote the flow. So long as the air temperatures remain constant, there is little or no sap flow.

Conclusions as to the Causes and Significance of Sap Pressure and Movement.—If temperature and pressure records are compared during the period of active sap flow, it is clear that although there is a general relationship between the two, it is not as constant or exact as would be the case if the cause were purely physical. One of the strongest arguments against reliance on a physical examination is found in the sudden cessation of the sap flow at the end of the sugar season, when there are not only wide temperature variations, but also the highest water-content found in the trunk during the whole year.

Sachs pointed out another kind of bleeding phenomenon, associated with the activities of living cells, viz. the tendency of certain roots and other living plant tissues to exude sap under certain circumstances independently of corresponding temperature changes. Wieler found that a great variety of plants show active bleeding phenomena, and that this bleeding is a function of living cells, and controlled by their activities. The process is more especially a function of certain cells of the xylem, or woody tissues, and there is a general tendency of these plants to bleed excessively in the early spring. Wieler concludes that this exudation must be due to permanent differences in the character and activities of the protoplasm on the opposite sides of the living cells concerned, possibly associated with local differences in the cell-wall or other factors as contributing causes, but that in any case the activities of the living protoplasm are the dominant factors.

It seems to the authors of the bulletins that most of the phenomena of sap pressure and flow which are observed in the Sugar Maple can be understood only by such an appeal to the activities of living cells, which activities are, of course, highly sensitive to physical and chemical modifications in the environment of the protoplasm.

Accordingly, they assume that strong sap pressures and resultant movements are undoubtedly occurring in the untapped Maple tree at the season when the farmer by tapping secures the sap, *i.e.* the untapped tree "bleeds internally." What is the significance of this in the life of the tree? Since there seems to be no adequate foundation for the view that bleeding is a mechanical aid to the opening of buds by increased sap pressure, it seems more likely that the object is to secure the fullest injection possible of the plant tissues with water, in preparation for the large demand for water associated with leaf expansion and excessive transpiration. The especial liability of the Maple to "leaf scorch" or "tip burn" in the hot dry winds of spring indicates that in this tree transpiration evidently exceeds root absorption to a dangerous degree, whenever atmospheric conditions especially accelerate the former.

F. A. W.

Marchantia, Spermatogenesis of. By Professor S. Ikeno (*Beih. Bot. Cent.* xv. pp. 65–88; with one plate and one figure in text).—Traces the development of the spermatozoid of *Marchantia*. The spermatozoid mother-cells each form two spermatozoids. Under certain circumstances the spermatozoids again divide. Centrosomes were found to occur regularly in all stages of antheridial cells except the last stage of cell-division. They also occur throughout the formation of the spermatozoids, and appear to pass into the tip of the pear-shaped spermatozoid and take part in the formation of cilia. The author figures these centrosomes as originating in the nucleus and passing through the nuclear membrane into the cell-protoplasm. Another peculiar body was found near the nucleus. The author considers blepharoplasts as true centrosomes, but for further details as to the blepharoplast theory the paper itself should be consulted.

G. F. S.-E.

Marsdenia Imthurnii. By W. B. H. (*Bot. Mag.* t. 7953).—Native of British Guiana. Nat. ord. *Asclepiadaceæ*; tribe *Marsdenieæ*. A vigorous climber, with *Hoya*-like flowers of a purple colour, forming globular cymes.—*G. H.*

Meconopsis integrifolia (*Gard. Chron.* No. 927, p. 240, fig. 97, and Supp., Oct. 1, 1904).—The first time that this beautiful plant was seen in flower in Europe was in the course of September 1904, when it blossomed in the nurseries of Messrs. Bee and Co. and of Messrs J. Veitch and Sons. The former obtained the seeds from which the plants were grown from an expedition sent by the Russian Government to Central Asia. Messrs. Veitch and Sons grew theirs from seeds sent home by their collector, Mr. Wilson, who found the plant growing in great abundance on the mountains on the eastern side of Tibet at an altitude of from 11,000 to 16,000 feet above the sea-level. He says: "I have found it in millions. The dried material in herbaria gives no real idea of the magnificent flowers this plant has. The flowers are often 8 to 10 inches in diameter, of a lovely bright yellow colour. I have seen on one plant as many as fifteen flowers expanded at one time; this, however, was exceptional. The usual number is from four to six. It is a common sight to see a thousand or more in full flower together." Alluding to its cultivation, Mr. Wilson says: "Treat it as a hardy, moisture-loving plant; give it a place in peaty or leafy soil, and I believe you will succeed. Whatever you do, do not coddle the plants or you will kill them." A botanical description of the plant is given.—*G. S. S.*

Meconopsis punicea (*Gard. Chron.* No. 930, p. 282, fig. 130, Oct. 26, 1904).—This is another very fine species introduced into cultivation by Messrs. J. Veitch and Sons, who obtained it from their collector, Mr. Wilson, who found it growing in "damp meadows, amid grass and low shrubs, shaded from the direct rays of the sun, and at an altitude of 11,500 to 12,500 feet, in the north-west corner of Szechuen." This is a very handsome species. The flowers are of a dark scarlet colour, and when pressed flat measure over 6 inches in diameter: they are solitary and nodding, borne on scapes 18 inches or 2 feet in length. The leaves are entire; they, the ovary and scape, are covered with shining yellow hairs. It is expected that in this species we have a very fine addition to our hardy annuals and alpine plants.—*G. S. S.*

Medeola asparagoides var. **myrtifolia.** By H. Kohlmannslehner (*Die Gart.* No. 14, p. 157, January 2, 1904).—An accidental variety raised by Geb. Meyer, Hannover, about six years ago. It has all the good qualities of the type, and the whole plant is more graceful, with small myrtle-like leaves.—*G. R.*

Medicine, Weeds used in. By Alice Henkel (*U.S.A. Dep. Agr., Farmers' Bull.* 188, 1904; illustrated).—A most interesting pamphlet on the medicinal properties of certain weeds which are widely spread in the United States, and the methods of collecting them. The author considers that farmers might combine a slight profit with the necessary process of exterminating these weeds, and gives the weight in pounds annually imported from Europe and the price generally paid in the trade, to show that there is a certain demand for these plants. The weeds described are: Burdock, Dandelion, Couch-grass, the Docks and Pokeweed (*Phytolacca americana* L.) (principally root-drugs), Foxglove, Mullein, Tansy, Lobelia, Gum Plant (*Grindelia robusta* Nutt.), Scaly Grindelia, Boneset (*Eupatorium perfoliatum* L.), Catnip (*Nepeta Cataria* L.), Horehound, Yarrow, Fleabane, Blessed Thistle (*Carbenia benedicta* syn. *Cnicus benedictus* L.), Jimson Weed (*Datura Stramonium* L.), and Poison Hemlock (of all of which the leaves, flowers, or seed are used in medicine); and lastly Wormseed (*Chenopodium ambrosioides* L.), and black and white Mustard (of which only the seeds are used).—*C. H. C.*

Megaclinium platyrhachis. By W. B. H. (*Bot. Mag.* t. 7946). Native of British Central Africa. Nat. ord. *Orchidaceæ*; tribe *Epidendreæ*. This Orchid in floral structure offers no constant difference from *Bulbophyllum*, but is easily recognised by the flattened greenish-yellow axis of the inflorescence, bearing flowers in one row on each side. Flowers yellowish-green, ½ in. diam. spotted with purple-brown.—*G. H.*

Melaleuca uncinata. By J. D. H. (*Bot. Mag.* t. 7941).—Native of Temperate Australia. Nat. ord. *Myrtaceæ*; tribe *Leptospermeæ*. A dwarf, erect shrub. Leaves 1 to 4 inches long, terete, with recurved hard and sharp tips; flowers minute, pale yellow.—*G. H.*

Mexico, New, Native Ornamental Plants of. By E. O. Wooton (*U.S.A. Exp. Stn. New Mexico, Bull.* No. 51, May 1904; plates).—This bulletin draws a designedly dreary picture of the sort of place which many men are content to call home in a new and still wild country, where the tradition of semi-nomadic life yet lingers. "Dobe" huts, board shanties, or log cabins set down with hardly a thought for convenience, and certainly none for either comfort or beauty, seem to have been enough for the early pioneers in New Mexico, and to be the prevailing style of ranch-house even now.

This paper is an attempt to emphasise the importance, to a man, of beauty and privacy in his home, and dwells on the mere money value to the New Mexican of shade, shelter for his beasts, and protection against wind and dust.

Legislation is apparently needed in the direction of improving land-tenure in the State; but this is a matter which is receiving attention, and the population tends already to become more stationary, so that there is more inducement to men to devote care and trouble to what they may look forward to enjoying themselves. The inhabitants of New Mexico consist chiefly of men from more humid regions, who naturally think first of surrounding themselves with the vegetation to which they were accustomed at home, but the local conditions are described as being peculiarly severe.

Very dry atmosphere, extreme daily variation in temperature, late spring frosts, very high summer temperature, and very intense light are among those enumerated, added to which the soil is extremely dry and largely alkaline.

It is therefore strongly urged that it is wiser not to attempt discouraging experiments with plants which are most unlikely to flourish, but to make use of the large class of beautiful native trees and shrubs which exist within easy reach, and can in most cases be made available by dint of the mere trouble of transplanting. The index gives the names of thirty-seven sorts of desirable trees, shrubs, plants, and climbers which are all to be found in the State, and reproductions are given of photographs of trees; also hints on transplanting and propagating, and simply worded descriptions of most of the species mentioned, which should enable them to be easily recognised by the amateur, however completely unlearned in the language of botany.—*M. L. H.*

Mignonette 'Reseda Machet Perle Blanche.' By Max Garnier (*Rev. Hort.* p. 71, Feb. 1, 1904; 1 illustration).—A very fine and robust form of white Mignonette raised by Pape and Bergmann, Quedlinburg, Germany.—*C. T. D.*

Millipedes injurious to Plants. By F. Thomas (*Nat. Zeit. Land-Forst.* ii. pp. 287–292, 1904; 1 fig.).—Notes on *Blaniulus guttulatus*, Gerv. (*Julus guttulatus*, Bosc). Cucumbers were destroyed near the surface of the soil, and the injury was traced to this species. Other cases of injury to cultivated plants are given. The author believes that injury by these millipedes is most likely to occur during moist weather, whereas when the surface soil is dry the millipedes live deeper down. Earthworms killed by hot water were found to attract numerous millipedes, and the author recommends this as a method of trapping them. He also observed, in the case of Cucumbers, the above species was alone injurious, while other species found in his garden did not take part in the attack. The paper refers to numerous works on millipedes, but we fail to find any reference to those of John Curtis and Miss E. Ormerod, in which much of the information given by Dr. Thomas has long been available to English readers.—*W. G. S.*

Miltonia Karwinskii. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 298). History and descriptive references are given of this plant, the genus *Miltonia* being divided into three geographical groups.—*H. J. C.*

Mnium cuspidatum, The Archegonium of. By G. M. Holferty (*Bot. Gaz.* xxxvii. No. 2, p. 106; with 2 plates).—This is a careful investigation into the anatomy and development of the organ described. It commences with an historical account, and deals with "The Early Stages of the Archegonium," "The Division of the Central Cell," "The Peripheral Cells," "The Homology of the Archegonia and Antheridia," "The Origin of the Archegonium," and concludes with a summary.—*G. H.*

Monocotyledons, Evolution of. By E. Sargant (*Bot. Gaz.* xxxvii. No. 5, p. 325 ; with 6 figs.).—The author deals with this question under "The Evidence of the Primitive Monocotyledon," "Evidence for the Primitive Dicotyledon," and regards the single cotyledon of the former as due to fusion rather than to an aquatic habit arresting one cotyledon.
G. H.

Moræa Thomsoni. By W. B. H. (*Bot. Mag.* t. 7976).—Native of East Tropical Africa. Nat. ord. *Iridaceæ* ; tribe *Moræeæ*. Herb with a rush-like habit. Leaves terete ; flowers in fascicles, pale lilac, the base yellow within.—*G. H.*

Morus alba pendula. By Chas. Grosdemange (*Rev. Hort.* pp. 446–7, Sept. 16, 1904).—By the description an extremely handsome Weeping Mulberry. Originated in America.—*C. T. D.*

Mosses, New, European and Exotic. By C. Warnstorf (Neuruppin) (*Beih. Bot. Cent.* xvi. pp. 237–252 ; with 2 plates).—Describes the following new species :—*Riccia subbifurca* (France), *Pottia Fleischeri* (Corsica), *Didymodon angustifolius* (Neuruppin), *Tortula Pontresinæ* (Switzerland), *Pohlia Lindbergi* (Sweden), *Pohlia Ramannii* (Finland), *Pohlia grandiretis* (Röm), *Bryum anomalum* (Pomerania), *B. arvense* (Germany), *B. pallidum* (Germany), *B. Jaapianum* (Germany), *B. Rothii* (Hesse), *Sphagnum pseudomolle* (Japan), *S. roseum* (Brazil), *S. Dielsianum* and *S. otagoense* (New Zealand), and *S. Harperi* (North America).—*G. F. S.-E.*

Mosses, New, from Corea. By Jules Cardot (*Beih. Bot. Cent.* xvii. pp. 1–44 ; with 27 figures).—The author has named and described the new species (see below) in a collection of 98 species (147 numbers) obtained by M. l'Abbé Faurie. Fifty species are common to Japan and Corea. There are also a few North American types which are found in Corea.

The new species are *Sphagnum microporum* Warnst., *Anœctangium coreense, Dicranoweisia Fauriei, Trematodon flaccidisetus, Theriotia lorifolia, Macromitrum consanguineun, M. bathyodontum, Physcomitrium eurystomoides, P. macrophyllum, Bartramia stenophylla, Webera seoulensis, Mnium subintegrum, Pterogonium coreense, Leucodon coreensis, Papillaria helmintocladula, Thuidium submicropteris, T. strictulum, Pseudoleskea laticuspis, Brachythecium brachydictyon, Eurhynchium latifolium, Trichosteleum subtile, Isopterygium alternans, Amblystegium pseudo-radicale, A. connexum, Hypnum Fauriei, H. platycladum.*
G. F. S.-E.

Mosses of North America, New or Unrecorded, II. (for No. I. see *Bot. Gaz* ; 30/12/1900). By J. Cardot and I. Thériot (*Bot. Gaz.* xxxvii. No. 5, p. 363).—The authors describe some two dozen plants, with ten plates of illustrations.—*G. H.*

Mucuna sempervirens. By W. B. H. (*Bot. Mag.* t. 7978).—Native of China. Nat. ord. *Leguminosæ*; subord. *Papilionaceæ*. A very tall, rambling, evergreen shrub; young parts clothed with stinging hairs. Leaves trifoliate; flowers dark purple, shading off to white at the base, 2½ inches long. Pod woody, about 1 foot long, 1½ inch broad; seeds purple-brown.—*G. H.*

Musa Holstii. By H. Conrad (*Die Gart.* No. 40, p. 471, July 2, 1904).—A new introduction by Dr. Engler, of the Botanic Garden, Berlin. The plant resembles the old *Musa Ensete*, but grows much taller, and the middle nerve is not red but green, and the leaves beneath are darker coloured. Dr. Engler found it in West Usambara, near Sakaré, 1,200 to 1,300 metres alt.—*G. R.*

Mushrooms, The Cultivation of. By B. M. Duggar (*U.S.A. Dep. Agr., Farmers' Bull.* 204, 1904; illustrated).—The interest in Mushroom cultivation in the United States having largely increased during the last few years, this pamphlet has been issued to assist growers, some of whom have failed to secure good crops.

Among likely causes of failure are: (1) The use of poor spawn, or of spawn which has been killed by improper storage. (2) Spawning at an injuriously high temperature. (3) The use of too much water, either at time of spawning or later. (4) Unfavourable temperature during the growing period.

The principles and practice of successful cultivation are carefully reviewed, and illustrations show the best forms of beds for growing, and methods of packing when grown.—*C. H. C.*

Mushrooms, Notes on Enemies of, and on Experiments with Remedies. By August Busck (*U.S.A. Dep. Agr. Div. Ent., Bull.* No. 38, n.s. 1902, pp. 32–35).—The enemies or pests treated of are snails, cockroaches, maggots, or larvæ of some undetermined Diptera, and mites. Against the snails was used with perfect success the old remedy of trapping them under loose boards. The cockroaches were temporarily driven away by the application of pyrethrum powder and bisulphide of carbon. The pernicious and highly destructive mite *Tyroglyphus Lintneri*, which attacks the fruit-bodies in all stages, and also the mycelium were destroyed by pouring boiling water on the bed, using enough to reach the bottom and soak the bed thoroughly. Bisulphide of carbon, hydrocyanic acid gas, vapours of sulphur, and other noxious gases and insecticides proved ineffectual against this pest. "One thing was ascertained through these experiments; namely, the mushroom mycelium is not injured by the treatment with vapours of bisulphide of carbon; in fact the growth seemed rather stimulated if affected at all; and such beds, when not ultimately killed by the mites, produced as good a crop as those not treated. The fruit bodies above ground, however, cannot stand the treatment, but disintegrate very soon, for which reason all should be plucked before the application."—*R. N.*

Mushrooms of Michigan. By B. O. Longyear (*U.S.A. Exp. Stn. Michigan, Bull.* 208, April, 1903; 21 figs.).—Gives descriptions and figures of some of the edible fungi of the State, with notes on the best modes of cooking. *Morchella bispora*, **M. semilibera*, *M. angusticeps*, **M. conica*, **M. esculenta* (Morels), **Bovista plumbea*, **B. gigantea*, *Lycoperdon separans*, *L. cyathiforme*, **L. cælatum*, and **L. gemmatum* are described. [Those marked * are British.]—*F. J. C.*

Mycorhiza. A Mycorhiza from the Lower Coal Measures. By F. E. Weiss (*Ann. Bot.* xviii. April 1904, pp. 255–265; 2 plates).—A fungus invading the tissues of an unknown fossil root or rhizome is described. The hyphæ are mostly intracellular and are present in the exo- and medio-cortex. The characters of the mycorhiza in *Thismia* and *Neottia* are compared with those of the present case. The name *Mycorhizonium* is suggested for this mycorhiza.—*A. D. C.*

Mycorhiza of Liverworts. By Dr. Anton J. M. Garjeanne (Hilversum) (*Beih. Bot. Cent.* xv. pp. 471–482; with 10 figures in text).—Gives a full acount of the mycorhiza in many species of Liverworts. Spores in connection with the fungus filaments were discovered, and it is suggested that the fungus is *Paryphydria Heimerlii* (a half-lichen after Zukal). A strong development of the fungus is very common, and it is found on bark Liverworts also, chiefly in the rhizoids. It is not so constant and uniform as in the higher plants, and has more of a parasitic character.
G. F. S.-E.

Mycorhiza of a Liverwort. By B. Němec (*Beih. Bot. Cent.* xvi. pp. 253–268; with 1 plate).—Gives a description of the way in which the mycorhiza of the fungus infects *Calypogeia trichomanis.* The fungus attacks the ends of the rhizoids, and later the leaf or stem cells. Its behaviour is not the same when the plant is grown on different substrata. Sometimes the fungus threads break into cells, which become swollen rounded bodies often nearly filling the cell. Sometimes branches of the fungus penetrate the cell-walls. The author seems to consider that it is not quite certain that the fungus is anything but a harmless parasite.—*G. F. S.-E.*

Mystacidium, The Genus. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 46).—Particulars of this and its allied genus afford information to those interested in botanically interesting Orchids.—*H. J. C.*

Names, Plant-, Suggestion for extending. By F. Noll (*Beih. Bot. Cent.* xiv. pp. 374–380).—Suggests that, when quoting any foreign plant's name, a contraction of its order's name should be given before the genus, as, e.g., *Spadi-Syngonium* for the genus *Syngonium* of the order *Spadicifloræ.* At present it is often impossible, unless by consulting books, to tell whether the plant is a Lichen or a Conifer, a Moss or a Palm.
G. F. S.-E.

Nectaries, Extra-Floral: Of Hevea brasiliensis, Müll. Arg. (the Para Rubber Tree), an Example of Bud Scales serving as Nectaries. By John Parkin (*Ann. Bot.* xviii. April 1904, pp. 217–225; 1 plate).—*Hevea brasiliensis* possesses two kinds of floral nectaries:

(*a*) small inconspicuous glands situated on the upper surface of the foliage leaves, where the three leaflets join the petiole; and (*b*) large conspicuous glands borne on vestigial foliar structures—"bud scales"—which are situated on the shoot below the foliage leaves.

The morphological characters are discussed, and also the anatomical structure of the nectaries. Extra-floral nectaries are usually regarded as attracting ants to keep off insects injurious to the young foliage.

A. D. C.

Nemalion, Cytological Studies on. By J. J. Wolfe (*Ann. Bot.* xviii. October, 1904, pp. 609-627; 2 plates, 1 fig.).—A detailed cytological study of *Nemalion multifidum.* The most important results are those concerning the reproductive processes. The so-called spermatium is proved to be an antheridium, which gives rise to two male cells. The conclusion is reached that *Nemalion* presents the essentials of an antithetic alternation of generations, and that the cystocarp is, therefore, the homologue of the sporophyte in higher plants. Approximately 16 chromosomes are present in the cells of the cystocarp up to spore formation, the reduction division (to 8) being intimately associated with the production of carpospores.

A. D. C.

Neomoorea irrorata (*Orch. Rev.* vol. xii. p. 356; fig.).—Historical and descriptive particulars of this rare plant are given.—*H. J. C.*

Nerine Bowdeni. By W. Watson (*Gard. Chron.* No. 935, p. 365, fig. 164; Nov. 26, 1904). — A very ornamental *Nerine* has lately been recognised as a new species which a few years ago was sent from South Africa by a Mr. Cornish-Bowden to his mother, who grew and flowered it for some years, and then sent some of the flowers to Kew, where it was assumed that they were the blossoms of *N. lucida*; but later on, when the bulbs which had been distributed were flowered at Kew and by others, it was found that the plant was a distinct species, nearly allied to *N. flexuosa*, but with much larger flowers. The scape is 18 inches long and carries from six to twelve blossoms, which are larger than those of any other species in cultivation. They are of a pale rose colour, with a darker line down the middle of each segment, which is 3 inches in length and recurved at the tips. The stamens are as long as the segments.—*G. S. S.*

New European Plants. By Dr. F. Höck (Luckenwalde) (*Beih. Bot. Cent.* xvii. pp. 195–210).—Records further immigrations and a whole series of new localities for those previously recorded. *Anthoxanthum aristatum* is greatly increasing its range, as also *Bromus brizæformis, B. unioloides, Hordeum jubatum, Azolla caroliniana*, &c.—*G. F. S.-E.*

New Plants in Europe. By Dr. F. Höck (*Beih. Bot. Cent.* xv. pp. 387–407).—Continues his list of foreign introductions. Twenty new species are mentioned, including the Californian *Lonicera Ledebourii, Helianthus rigidus* and *Salpichroa rhomboidea.* A number of new habitats are also given for those previously reported. *Amaranthus caudatus, A. albus,* and *A. paniculatus* are recorded from twelve new habitats; *Polygonum cuspidatum* and *P. orientale* from ten and twelve new localities respectively; *Sisyrinchium anceps* in eleven new places. This paper is No. viii. of the list, and would be much improved if a short description of the exact meaning of the locality letters had been given. There is no reference to the previous papers.—*G. F. S.-E.*

Nicandra physaloides, Races of. By Georg Bitter (*Beih. Bot. Cent.* xiv. pp. 145–176; with 6 plates).—Gives a description of the varieties of this plant. Three characters are of importance: Colour of stems, either (*a*) green or (*b*) violet; honey guides (spots) on the petals. *Immaculatæ, maculatæ, integristellatæ* (star on petals). A third character is the distance along the stem at which forking of the axis begins. In "High-forkers" (Hochgabler) forking begins at 40 cm. to 130 cm. above the ground. "Medium-forkers" at from 20 to 40 cm. "Low-forkers" (Tiefgabler) at from 7 to 25 cm. Of the possible 18 races by combinations of these characters, the author has 8 in cultivation, and has obtained 9 as hybrids which he hopes to establish. Another has been in existence, but has died out. Possibly late-flowering varieties and others with much divided leaves and laciniate sepals are also mentioned. A full description is also given of the following other races.

N. parvimaculata. Green, forking at 8–20 cm. with small conspicuous dark-blue spots on the petals. Calyx 3 cm. in diameter, with hornlike curved ends at the base.

N. macrocalyx. Green, forking at 15–38 cm., small petal spots. Leaf-blade distinctly limited, and not passing gradually into the stem. Calyx in fruit about $3\frac{1}{2}$ cm. long and 4 cm. wide, without marked continuation points at the base.

N. nebulosa. Green, forking at 26–55 cm., spots on petals misty pale blue. White hairs on filaments. Calyx smaller than the last. Berries at first violet-red, but becoming a pale green.

N. nana. Green, forking at $3\frac{1}{2}$–8 cm.; calyx with sharp straight points at base.

N. brevicorollata. Violet, forking at 37–60 cm. Leaves often like those of a Datura. Calyx in fruit 3–$3\frac{1}{2}$ cm. broad. Corolla short, 3 cm., 1 cm. longer than calyx. Star of five dark blue rays on petals.—*G. F. S.-E.*

Nitrification, Notes on. By H. H. Cousins (*Bull. Dep. Agr. Jam.* ii. pt. 1, p. 1).—The swiftness of decay and regeneration in the tropics is attributed to nitrification. The most valuable commercial form of nitrogenous fertilisers for use in a tropical country of free rainfall is sulphate of ammonia. After giving a brief history of the discovery of nitrification of ammonia by bacteria and a description of these organisms, the following represents the changes undergone:—

$$\underset{\text{Ammonia}}{2NH_3} + \underset{\text{Oxygen}}{3O_2} + \underset{\text{Chalk}}{CaCO_3} = \underset{\text{Calcium Nitrite}}{Ca(NO_2)_2} + \underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{3H_2O}$$

This change *only goes on in the dark*, and is independent of all organic matter. To obtain C the organisms avail themselves of CO_2. The "nitroso" bacteria obtain their energy for the elimination of carbon from the CO_2 by the supply they derive from the oxidation of ammonia to nitrite. The amount of ammonia they are forced to oxidise in order to gain a small supply of vital carbon is enormous. The further stage into nitrate is as follows :—

$$\underset{\text{Nitrite of lime}}{Ca(NO_2)_2} + \underset{\text{Oxygen}}{O_2} = \underset{\text{Nitrate of lime}}{Ca(NO_3)_2}$$

In the absence of chalk, sulphate of ammonia cannot be nitrified. When soil is dust-dry, nitrification ceases. Schloesing found the following results :—

Percentage of moisture in soils .	9·3	14·6	16·0	20·0
Pounds of nitric acid per acre in 13 months	157	172	397	478

The most favourable temperature for nitrification is 100° F. It is then ten times as active as at 57° F. (Schloesing).

The processes are as follows :—

1. Sulphate of ammonia gives up its acid to the chalk in the soil.
2. The ammonia is absorbed by the soil.
3. The ammonia is then converted first into nitrite and then into nitrate by bacteria.—*G. H.*

Nitrogen-accumulation by Root-tubercles of Alder and Elaeagnaceæ. By F. Nobbe and L. Hiltner (*Nat. Zeit. Land-Forst.* ii. pp. 366–369 ; 2 figs. ; 1904).—The beneficial effect of the root-tubercles in rendering atmospheric nitrogen available for these plants is strikingly shown by photographs. Three Alders, four years old, are shown in nitrogen-free water cultures ; two, which have been infected with the tubercle organism, have many tubercles and are four feet high ; the third, which was not infected, is a stunted plant not a foot high. An equal contrast is presented by *Elaeagnus angustifolia*, four years old, grown in nitrogen-free sand ; the infected plant is four feet high, whereas the uninfected one is barely a foot high, with tiny leaves. Similar results with cultures of *Shepherdia canadensis* (*Elaeagnaceæ*) are also described.

W. G. S.

Nitrogen in the Ocean, The Supply of. By K. Brandt (*Beih. Bot. Cent.* xvi. pp. 383–402).—Criticises Reinke's contribution to this discussion, and shows, by estimating the supply of nitrogen by European rivers, that in 10,000,000 years the sea would contain 300 g. of nitrogen per cubic metre. But in the sea there are denitrifying bacteria which return free nitrogen to the atmosphere. Samples from the Baltic Sea and North Sea (presumably containing such bacteria) were found to denitrify culture solutions. From surface water of the Baltic Sea 100 per cent. of the culture tubes were denitrified, 70 per cent. from water at a depth of 40–73 metres. In the North Sea 37 per cent. surface samples and 8 per cent. from 30–230 metres' depth were denitrified.

The author's suggestion that warmer parts of the sea contain a less percentage of combined nitrogen is confirmed. The author finds the probable average contents of albuminous nitrogen in one cubic metre of sea-water in the Gulf of Kiel to be only 0·03 g., whereas the amount of inorganic nitrogen may reach 0·208 g. But the water of the sea is always in motion, so that algæ will be brought in contact with ample supplied of nitrogen, phosphoric acid, and silica. *Azotobakter chroococcum* and *Clostridium Pasteurianum* occur in sea-water, and can utilise free nitrogen; but it is not proved that they can hand on their superfluous formation to other plants. The author supposes that the rich animal flora of Algal beds and the bacteria of decomposition which attack their waste products will greatly influence the nitrogen supply of the Algæ.

G. F. S.-E.

Nitrogen to Plants, Sources of. By MM. Laurent and Marchal ("Recherches sur la Synthèse des Substances Albuminoides par les Végétaux" (*Bull. Dep. Agr. Jam.* ii. pt. 3, p. 59). — Quoted from *Nature*:—"While nitrates are of chief importance, there are many plants, forest trees, and the vegetation of marshes that must depend entirely on compound of ammonia for the supply of nitrogen. The lower plants, devoid of chlorophyll, can manufacture albuminoids in the dark, the necessary energy in this case being derived from the decomposition of organic compounds."—*G. H.*

Nucleolus and Nuclear Division in the Root Apex of Phaseolus, The. By Harold Wager (*Ann. Bot.* xviii. Jan. 1904, pp. 29–55; 1 plate).—A technical paper, being a study of the root apex from a cytological standpoint. The author believes the nucleolus to be intimately connected with the nuclear reticulum, and to contain nearly all the chromatin of the nucleus. The chromatin is transferred, previous to division, into the nuclear thread; in the reconstruction of the daughter nuclei, the chromosomes become fused into a number of more or less spherical or irregular masses which unite to form the daughter nucleoli.—*A. D. C.*

Nymphæa orientalis. By E. Jahn (*Die Gart.* No. 15, p. 172, January 9, 1904).—A Japanese miniature Water-lily. The seeds were received from the Botanic Garden of Tokio. It produced flowers four months after sowing. The small flowers, 35–40 mm. diameter, are snow-white, having 10 petals, and the buds are quadrangular in shape. The leaves are ovate, $1\frac{1}{2}$ to $8\frac{1}{2}$ centimetres. A most desirable plant for small aquaria.—*G. R.*

Oak Tortrix, The. By Cecil Warburton (*Jour. R.A.S.* vol. 63, 1903, p. 303).—At a meeting of the Royal Agricultural Society held on May 22, 1902, Sir William Vincent and H.R.H. Prince Christian referred to the depredations of this pest in Windsor Great Park. A report was subsequently submitted setting forth the life-history of the pest and the nature of the attack. The natural enemies which are said to prey upon the caterpillars are rooks, jackdaws, sparrows, tits, and woodpeckers. Their insect parasites are also numerous, but their operations do not prevent the immediate ill effects of the attack. Spraying is dismissed as impracticable.—*R. N.*

Oaks, A Leaf-curl Disease of. By E. Mead Wilcox, Ph. D. (*U.S.A. Dep. Agr. Exp. Stn. Alabama, Bull.* 126, Oct. 1903; one plate and three figs.).—After enumerating the six species of Oak of the chief importance in this State, the bulletin proceeds to give the symptoms of the disease, which makes its appearance early in the spring before the new leaves are mature. A number of grey or bluish spots appear on the leaf, with the surface concave on one side and convex on the other. These depressions vary from 0·25 to 1 cm. in diameter, and are isolated or confluent. The rapid spread from one leaf to another may lead to a partial or complete defoliation in early summer.

The fungus causing this disease is one of the ascomycetes, and is closely related to the Peach-curl, Pear-leaf blister, and Poplar blister, under the name of *Exoascus* or *Taphrina*. In some species the spots occur on the lower surface of the leaves, and in others on both the lower and upper surfaces.

The species implicated in this disease is stated to be that which was described by Desmazières in 1848 under the name of *Ascomyces cærulescens*, of which it is affirmed that *Ascomyces quercus* (Cooke) and *Ascomyces alutaceus* (Thüm.) are only synonyms.

A tree of *Quercus nigra* was selected and sprayed with the ordinary Bordeaux mixture about ten days before the buds opened, and then at intervals of ten days for three times. Although the sprayed tree was in close proximity to unsprayed trees which were badly infected, the sprayed tree was only very slightly affected by the disease.—*M. C. C.*

Oaks of Iowa. By Prof. B. Shimek (*U.S.A. Hort. Soc. Iowa, Rep.* 1902, pp. 228–232; 10 figs.).—Contains notes on the Oaks of Iowa, with a key to the species.—*F. J. C.*

Oat Smut and its Prevention. By R. A. Moore (*U.S.A. Agr. Exp. Stn. Wisconsin, Bull.* No. 111, March 1904; 2 plates).—Oat smut is prevalent throughout the State. During the past three years the destruction of the Oat crop of Wisconsin farmers by smut amounted to twelve and a half million dollars. The support of the rural public schools in the State has cost for three years eleven and a half million dollars, or two millions less than the estimated value of Oats destroyed by smut.

Where farmers have used the formaldehyde treatment, or secured seed Oats from farmers who have used the treatment, the crop was free from smut, or only a trace could be found, and the smut in the State has thus been appreciably lessened.

The increase of smut checked and retarded during wet seasons. This is especially true where Oats lodge and subsequent rains wash the immature smut spores on the ground. When Oats lodge before maturity the vitality of the grain is greatly impaired, and if retained for seed will usually result in producing only a partial crop.

Barley smut can be eradicated by submerging the seed grain for ten minutes in a solution made by using one pint of formaldehyde to twenty gallons of water.

By constant vigilance it seems that smut can be practically controlled by the farmer.—*M. C. C.*

Ochnaceæ, The. By Ph. van Tieghem (*Ann. Sc. Nat., Bot.* xviii. 1903, pp. 1–60).—This is a supplement to the monograph already noticed (Journ. R.H.S. xxviii. p. 276).—Four new genera and eight species are described, and their systematic position in the group discussed.—*W. G. S.*

Odontioda × Vuylstekeæ. By W. B. H. (*Bot. Mag.* t. 7990).—Of garden origin. Nat. ord. *Orchidaceæ*; tribe *Vandeæ*. This is a bigener between *Odontoglossum nobile* and *Cochlioda Noetzliana*. It is about a foot high. Flowers $2\frac{1}{2}$ in. across. Crimson at the base, white above the middle, spotted with red and pink round the margin.—*G. H.*

Odontioda × Vuylstekeæ (*Orch. Rev.* vol. xii. p. 209; fig.).—The illustration of this hybrid, with the generic species used in its production, is well reproduced. Interesting notes are also appended. *H. J. C.*

Odontoglossum × Brandtii. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 240).—Descriptive characteristics and the history of this natural hybrid are included.—*H. J. C.*

Odontoglossum apterum 'Gurney Wilson' (*Orch. Rev.* vol. xii. p. 233, fig.).—Particulars of the history of the species, better known in gardens as *O. nebulosum*, and a figure of Mr. Wilson's variety are given. *H. J. C.*

Odontoglossum crispum, Hybrids of (*Orch. Rev.* vol. xii. p. 8; figs.).—Historical and interesting particulars of both natural and garden-reared hybrids, with illustrations of *O.* × *Andersonianum Bogaerdeanum*, *O.* × (*Wilckeanum*) *Denisoniæ Chestertoni*, *O.* × (*W.*, *D.* 'Golden Queen,' *O. Coradinei mirabile*, *O.* × *Adrianæ* 'Victoria Regina' and *O.* × *Armainvillierense ardentissimum* and *O.* × *waltonense*. Continued again p. 80, with illustration of *O. bellatulum* and *O.* × *merificum*. *H. J. C.*

Odontoglossum facetum. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 70).—Some interesting comparisons are given from the original description, throwing a doubt on the origin of this rare plant.—*H. J. C.*

Odontoglossum flavescens. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 92).—Particulars of its introduction and the descriptive characteristics are given.—*H. J. C.*

Œdogonium, Some Points in the Structure of a Young. By F. E. Fritsch (*Ann. Bot.* xviii. Oct. 1904, pp. 648–653).—Describes the mode of attachment, the basal cell is spherical or oval, a dense mucilaginous mass is present, enveloping the lower surface of the basal cells. In some species the apical cell is provided with a longer or shorter cap of stratified cell-wall substance with square corners, so that the apex of the filament has a rectangular appearance. This was found to be the result of repeated formation of cellulose thickenings, unaccompanied by the usual subsequent stretching.—*A. D. C.*

Oldenburgia Arbuscula. By W. B. H. (*Bot. Mag.* t. 7942).—Native of South Africa. Nat. ord. *Compositæ*; tribe *Mutisiaceæ*. A tree-like shrub, 3 to 6 feet high. Leaves very thick, coriaceous, woolly; flower-heads large, purple and white; flowers white.—*G. H.*

Olives: Sur une Maladie des Olives due au Macrophoma dalmatica (*Thüm.*). Par M. A. Maublanc (*Bull. Soc. Myc. France*

(1904), xx. p. 229 ; with fig.).—After stating that the fungus here alluded to under the name of *Macrophoma dalmatica* (Berl.) was originally described by Thümen as *Phyllosticta dalmatica*, and afterwards classed by Saccardo as *Phoma dalmatica*, to be subsequently claimed by Berlese as *Macrophoma dalmatica*, it proceeds to record its occurrence in spots of yellow-brown colour with a raised margin, on the immature fruits of the Olive, in the neighbourhood of Seville (Spain).

The fungus and its mode of attack are fully described. The perithecia being found upon the spots, black, spherical, a little flattened, 180 to 230 μ diam. and from 100 to 200 μ high. The sporules are ovoid, then elongated, sometimes rather fusiform, hyaline, 22–26 × 6–7 μ, at first on basidia about 15 μ long. Ultimately the spores are expelled in a mucilaginous mass as a whitish tendril.

The germination of the sporules in water was accomplished readily ; their division by 1–3, rarely 4 or 5 septa, first taking place, the germinating filament usually proceeding from the end of the sporule. It was ascertained that a solution of sulphate of copper retarded the germination of the sporules.—*M. C. C.*

Onions, Bacterial Rot (*Jour. Imp. Dep. Agr. W.I.* vol. v. pt. 2, 1904, pp. 124–139).—During the past season planters of Onions in Barbados have been considerably troubled by a rot which attacked one or more of the inner scales of the bulb, being observed after the Onions had been gathered and stored, the outer scales being usually sound. On examination of the diseased bulbs it was found that the affected scales were swarming with motile bacteria. No fungus hyphæ were found in the tissues. It seemed probable that the bacteria were the immediate cause of the rot, and that their growth was favoured by the exceptionally wet season. A similar disease has been recorded as affecting Onions in the United States. Experiments which have been made seem to indicate that one important point in the prevention of this rot is to keep the Onions dry.—*M. C. C.*

Onion Thrips. By W. E. Britton (*U.S.A. Exp. Stn. Conn., Rep.* 1903, pp. 266-268 ; 2 figs.).—This insect (*Thrips tabaci* Lindem.) causes great injury to Onions, sometimes destroying the whole crop. The following describes the attack :—"The white blast of Onions is the most serious disease to which Onions in the field have been subjected this year, and has been reported from numerous localities and observed in all the Onion districts which have been visited. The injury gives the field a whitish appearance, which starts in one or more spots and spreads in all directions. The Onions themselves become stunted in their growth, while the leaves are more or less completely dying, according to the severity of the attack, becoming water-soaked at the base if the weather be at all wet, inducing decay and generally injuring the keeping quality of the bulbs."—*F. J. C.*

Ophioglossum simplex, Ridley. By F. O. Bower (*Ann. Bot.* xviii. April 1904, pp. 205-215 ; 1 plate).—*Ophioglossum simplex* is a new species collected by H. N. Ridley in Sumatra in 1897.

The fertile fronds are solitary or two together, slender, flattened, with a blunt apex, 4 to 6 inches long, one-eighth inch wide, sterile division represented by a very small lateral process, or quite absent. The paper deals mainly with the anatomical structure.—*A. D. C.*

Orchid Cultivation, The History of (*Orch. Rev.* vol. xii. p. 33).—A continuation of interesting information from *Orch. Rev.* vol. xi. p. 325.
H. J. C.

Orchids, Leaf-mould for. By J. Wilson Potter (*Orch. Rev.* vol. xii. p. 106).—A thoroughly practical, useful, and interesting article, well worthy the attention, and should be read by all Orchid cultivators.
H. J. C.

Osier-growing. "The Basket Willow." By W. F. Hubbard (*U.S.A. Dep. Agr. Bur. For., Bull.* 46, 1904; 7 plates, 10 figs.).—The Willows mostly grown for basket-making are *Salix viminalis*, *S. amygdalina*, *S. pruinosa*, and *S. purpurea*, the second being the best as a rule. The author points out that to grow flexible, tough, and little-branched rods, moist, rich, well-drained bottom land is the best; in any case, the drainage must be well looked after. A map shows the distribution of the Willow-growing industry in the States. Advice is given on the position of the ground and its preparation for the Willow, planting, weeding and cultivating, cutting, drafting (or grading), and peeling. A perfect Willow rod is extremely tough, elastic, has a level, smooth, and brilliant white surface after peeling, is of good splitting quality, is free from branches, has little pith, and is of great length in proportion to diameter. The bulletin gives a summary of the methods of cultivation &c. in Europe, pointing out how scientific methods are ousting the older haphazard ones. An account is given of the making of Willow-ware in America, and some suggestions derived from this country and the Continent as to an increase in the articles manufactured are put forward.—*F. J. C.*

Ovule, The Structure and Morphology of the: An Historical Sketch. By W. C. Worsdell (*Ann. Bot.* xviii. Jan. 1904, pp. 57–86).—The author brings together a large number of facts and presents the various views held by leading botanists as to the morphology of the ovule. He sums up the three principal theories as follows:—

Axial Theory.—The nucellus is of the nature of a bud bearing the two integuments as lateral appendages.

"*Sui Generis*" *Theory.*—The ovule does not (necessarily) belong to any of the morphological categories, but is an independent structure borne on stem, or foliar organs.

Foliolar Theory.—The ovule belongs morphologically to the category of the phyllome. It is the homologue of a (usually) three-lobed leaflet, or segment of the carpel.—*A. D. C.*

Oxalises, Hardy. By S. Arnott (*Gard. Mag.* 2626, p. 148; 27/2/04).—These somewhat uncommon plants are described, and useful hints are given upon their culture, which, with the exception of one or two species, is simple.

The writer describes nine species as hardy; but such species as *O. rosea*, *lasiandra*, *Bowieana* can scarcely be termed hardy in the usual sense in which hardiness is understood.—*W. G.*

Oxydases and Nitrites. By K. Asō (Tokyo) (*Beih. Bot. Cent.* xv. pp. 208–214).—The oxidising agencies in plant juices are not necessarily organic peroxids, and these latter do not necessarily liberate iodine from potassium iodide. This liberation of iodine is not parallel to the guaiacum reaction and is not produced by oxydases. But traces of nitrites found in the buds of *Sagittaria* bulbs liberated iodine from potassium iodide. Unfortunately, certain benzene compounds prevent the reaction of Griess upon nitrites. This appears to be the first time that nitrites have been detected in plants.—*G. F. S.-E.*

Oxydases in Plants. By T. Porodko (*Beih. Bot. Cent.* xvi. pp. 1–10).—The author found that the guaiacum reaction for the presence of oxydases fails in the absence of oxygen, and that the reaction depends upon the oxidation of the guaiacum resin. The author also finds that the guaiacum reaction occurs when there are no oxydases present. The author tried to find out by direct experiment if oxydases, and only oxydases, can oxidise the glucoses in vegetable extracts. From five researches he concludes that oxydases scarcely play any part in respiration.—*G. F. S.-E.*

Paulownia imperialis. By S. W. Fitzherbert (*Garden*, No. 1697, p. 370; 28/5/1904).—This handsome flowering tree is not often seen in perfect bloom in this country, for, the buds being formed in the autumn, winter frosts, and more especially those that occur in the spring when the buds are swelling, have a disastrous effect on the subsequent flowering, the buds being so injured that but few of them are able to expand, and, instead of the long, upright racemes holding ten or a dozen large, lavender-blue, Gloxinia-like blossoms, but one or two expand on each flower-spike, this paucity of bloom detracting greatly from the effect of the tree. A sheltered site absolutely protected from the north and east winds should therefore be selected for planting the Paulownia, and in such a situation the flowering has the greatest chance of being satisfactory, though even in such an ideal spot a bitter winter will often leave its mark in a poor display of blossom.—*E. T. C.*

Patagonium campestre and P. glanduliferum. By A. B Rendle (*Journ. Bot.* 503, pp. 332–3, pl. 465B; 11/1904).—Descriptions of two new species, collected by Mr. Hesketh Prichard in Patagonia. The first-named, from nitrate pampas, belongs to the section *Dasycarpum*, and is a spinescent gorse-like shrub with obovate-cuneate leaflets to the paripinnate leaves and racemes of orange flowers, having their standard petals striated with a purplish-brown in the centre. The second, from high mountain slopes on the Burmeister Peninsula, is more herbaceous, belonging to the section *Ptilocarpum*, resembling *Adesmia conferta* in habit.—*G. S. B.*

Patagonia, Plants of. By A. B. Rendle (*Journ. Bot.* 503 pp. 321–334, and 504, pp. 367–378, with pl. 465; 11/1904 and 12/1904).—A detailed account of the plants collected in Patagonia by Mr. Hesketh Prichard, and presented by him to the National Herbarium.

G. S. B.

Passiflora vitifolia. By W. B. H. (*Bot. Mag.* t. 7936).—Native of Tropical America. Nat. ord. *Passifloraceæ*; tribe *Passifloreæ*. The leaves are deeply 3-lobed, and the flowers crimson.—*G. H.*

Parasitism in Fungi, On the Origin of. By G. Massee (*Ann. Bot.* xviii. April 1904, p. 319-320).—The full paper on this important subject is found in the *Phil. Trans. Royal Society* B. cxcvii. 1904, p. 32. The reference quoted above gives the author's abstract of his paper. Up to the present no definite explanation has been offered as to why a given parasitic fungus is often only capable of infecting one particular species of plant. This, however, is well known to be the case; for although the spores of fungus-parasites germinate freely on the surface of any plant when moist, infection takes place only when the spores germinate on the particular species of plant on which the fungus is known to be parasitic. The author considers this apparently selective power on the part of the fungus to be due to chemotaxis.

This conclusion was arrived at from the results of a number of experiments conducted with various species of fungi, including saprophytes, facultative parasites, and obligate parasites. The chemotactic properties of substances occurring normally in cell-sap were alone tested; amongst these were saccharose, glucose, asparagin, malic acid, oxalic acid, and pectase. In those cases where the specified substance or combination of substances in the cell-sap, assumed to be chemotactic, could not be procured, the expressed juice of the plant was used.

The experiments proved that saprophytes and facultative parasites are positively chemotactic to saccharose, and this substance alone is sufficient in most cases to enable the germ-tubes of facultative parasites to penetrate the tissues of a plant, unless prevented by the presence of a more potent negatively chemotactic or repellent substance in the cell-sap.

Immune specimens of plants belonging to species that are attacked by some obligative parasite owe their immunity to the absence of the substance chemotactic to the parasite.

In the full paper the results are given in tabulated form.—*A. D. C.*

Parichnos in recent Plants, On the presence of a. By T. G. Hill (*Ann. Bot.* xviii. October 1904, p. 654). (Abstract of a paper read before Section K at the Cambridge meeting of the British Association.)—Notes the presence of degenerating tissue and resulting mucilage canals in the leaf of *Isoëtes Hystrix.* It is suggested that the canals represent the parichnos occurring in *Lepidodendron* and other fossils.—*A. D. C.*

Palisota Schweinfurthii (syn. *Dichorisandra Thysiana*). By H. Conrad (*Die Gart.* No. 47, p. 553, August 20, 1904).—M. Charles Pynaert described this plant in 1902 in the "Revue de l'Horticulture belge" as *Dichorisandra thysiana,* but seemed to have his doubts about the naming. Since the plant has flowered in cultivation it has turned out to be *Palisota Schweinfurthii.* A grand foliage plant with white flowers.

G. R.

Palæozoic Seed Lagenostoma Lomaxi, On the Structure of the. with a statement of the evidence upon which it is referred to Lyginodendron. By F. W. Oliver and D. H. Scott (*Ann. Bot.* xviii.

April 1904, pp. 321–322).—An abstract reprinted from the "Proceedings" of the Royal Society. The seed is borne on a short pedicel and inclosed in a cupule; both pedicel and cupule are studded with capitate glands. The anatomy of this fossil seed agrees closely with that of *Lyginodendron*, to which fossil genus it is probably related.

A new group is formed and named *Pteridospermæ*, into which the families *Lyginodendreæ* and *Medulloseæ* have been placed.—*A. D. C.*

Pæonies, Planting herbaceous. By E. H. Jenkins (*Garden*, No. 1719, p. 288; 29/10/1904).—For planting the herbaceous Pæony early autumn is the best time, and the earlier the better; and it is the more desirable that the planting should be done at the right moment, because these Pæonies do not require to be planted or replanted each year. Far better, indeed, that the plants should be left alone for years, provided that the work of first planting was properly carried out. The chief reason why the Pæony should always be planted in early autumn is the production of the main roots at this season, and, as one set of these is produced each year, it is desirable that the planting should precede the period of the issue of these roots.—*E. T. C.*

Pea-nuts (*Arachis hypogæa*). By W. G. Freeman (*Qu. Agr. Journ.* xiii. p. 519, Dec. 1903; with fig.).—This communication is suggestive of the introduction of Ground-nuts for cultivation in Queensland, and after describing the plant proceeds to give information as to the cultivation, soil, harvesting, yield, cost, and uses of Pea-nuts; ending with details as to their value commercially and their prospects as an article of export.

M. C. C.

Pea-nuts. By C. L. Newman (*Agr. Exp. Stn. Arkansas, Bull.* 84, 1904).—The Pea-nut, especially the Spanish variety, is a useful crop for stock food, as it will succeed on worn and infertile sandy soils, and produce a heavier yield of both grain and forage than Corn in a shorter time.

Like Alfalfa and other legumes, it leaves the soil richer in nitrogen, and is decidedly drought-resisting, producing profitable crops when Corn would fail.

Cattle, horses, poultry, and especially hogs do well on Pea-nuts. They require a certain amount of lime in the soil, which can either be present naturally or applied artificially; but the Spanish variety requires less than those Pea-nuts used for confectionery and parching purposes.

As with many other crops, seed-testing is recommended to avoid disappointment and loss of time, as the Pea-nut often loses its vitality through heating or moulding while on the vine or in bulk.

Planting must only be done when warm weather has set in, as even a slight frost damages or destroys the plant. Cultivation such as is given to Corn, Cotton, &c. is suitable, and harvesting varies according to whether the Pea-nuts are to be marketed as such, or used as stock food.

The principal use of the Pea-nut is for roasting. It is used in candy and chocolates. In Europe, oil, of which Pea-nuts contain 40 to 50 per cent., is extracted from them, and is a good substitute for olive oil. Meal made from them has been tried in Germany as an army ration. It is said that parched Pea-nuts make an excellent substitute for coffee, and are far more nutritious, and that bread made from the meal has a high nutritive value.—*C. H. C.*

Peas: Sur une Maladie des Pois causée par le Cladosporium herbarum. Par M. E. Lasnier (*Bull. Soc. Myc. France* (1904), xx. p. 236; pl. 12).—This communication refers to a disease of cultivated Peas observed in Italy in 1891, and afterwards the parasite was described by Briosi and Cavara (Funghi Paras. Plantes cult. Fasc. x. No. 241) under the name of *Cladosporium pisi.* It then records the appearance of a similar disease in France, which was caused by *Cladosporium herbarum*, and hints that the parasite may be the same. The mould produced brown spots on the stems, leaves, and fruits of the cultivated Pea. Artificial infection showed that the *Cladosporium* was the cause of the disease in living plants. G rmination of the conidia produced the form *Hormodendron.* It was observed that germination was either retarded or prevented in a solution of sulphate of copper. It is remarked that it is of interest to have discovered that a mould hitherto considered as a mere saprophyte should under certain conditions be proved to be a veritable parasite.—*M. C. C.*

Peas, Swelling of canned. By H. A. Harding and J. F. Nicholson (*U.S.A. Agr. Exp. Stn. Geneva, N.Y., Bull.* 249, March 1904).—The value of Peas canned in New York State in 1900 was estimated at $1,473,912. Swelling of the canned Peas is the occasion of much loss. This is brought about by certain species of bacteria, of which the spores have survived the heating process. On this occasion an outbreak occurred in a large factory. The cans were bulged, in some cases the side seams gave way, in others the tops were blown off, scattering the contents, whilst the Peas emitted a disagreeable stench tinged with the odour of hydrogen sulphide. A microscopical examination showed that there were large numbers of bacteria present in the juice. A plump rod-like form, having swollen ends, was in many cases the only form to be found in the swelled cans. In the outbreak studied, 240° F. for thirty minutes was found to be sufficient to destroy this germ when present in the cans in large numbers. The temperature has since been used by the factory with great success. Except under unusual conditions this amount of heating does not injure the commercial value of the Peas.—*M. C. C.*

Peach Diseases. By A. D. Selby (*U.S.A. Dep. Agr. Exp. Stn. Ohio, Bull.* No. 148; Feb. 1904; 7 plates).—The facts are here recorded concerning a series of leaf-curl outbreaks for the past eleven years in Northern Ohio, and proceeds to set forth the weather conditions with respect to temperature and rainfall. The prevalence of leaf-curl has been associated with low temperatures and rainy days during April, May, and June. When these months have been warm and fairly bright the amount of leaf-curl has been reduced to almost nothing.

One spraying of Bordeaux mixture in the spring, before the opening of the blossoms, continues to prove effective in the prevention of leaf-curl. In the light of eight years' experience orchardists are again warned that neglect to spray is liable to be followed by total loss of crop, and injury to trees by leaf-curl attack.

Seven years' study of the prevalence of and injuries from scab fungus (*Cladosporium carpophilum*) confirms the opinion that this fungus is influenced in its development by the amount of rainy weather during the late summer and early autumn.

The losses from the cracking and rotting induced by the attacks of the scab fungus were very large in the fall of 1902. That these losses may be largely prevented by spraying the foliage is again confirmed. In addition to one spraying before blossoming, there is need of two applications of weak Bordeaux mixture on the foliage about the middle of June and four weeks later.—*M. C. C.*

Peach Orchards, Fertilisers for. By E. H. Jenkins (*U.S.A. Exp. Stn. Conn., Rep.* 1903; pp. 428–431).—The following results have been obtained :—

Manure Applied	Crop									
	1899		1900		1901		1902		1903†	
	Trees in Bearing	Av. Yield in Baskets	Trees in Bearing	Av. Yield in Baskets	Trees in Bearing	Av. Yield in Baskets	Trees in Bearing	Av. Yield in Baskets	Trees in Bearing	Av. Yield in Baskets
A. 65 lb. muriate of potash; 160 lb. acid phosphate	20	3·2	25	5·6	20	3·3	31	1·6	33	2·2
B. Same as A + 170 lb. cotton seed meal	31	3·8	35	6·3	30	3·3	33	3·6	32	2·0
C. Same as A + nitrogen *	23	3·5	29	5·2	26	2·8	31	2·1	30	1·4
D. 130 lb. muriate of potash; 160 lb. acid phosphate; Nitrogen *	27	4·1	33	5·8	31	3·6	31	2·2	30	1·4
E. 260 lb. muriate of potash; 160 lb. acid phosphate; Nitrogen *	36	4·3	44	6·3	40	4·2	33	3·8	34	1·6
F. 260 lb. high-grade sulphate of potash; 160 lb. acid phosphate; Nitrogen *	30	4·7	40	6·1	37	4·6	35	2·3	36	1·1

* Nitrogen applied in form of clover sown in August and ploughed in in May 1896-1901.
† Crop much damaged by storm.

Each plot contains 48 trees, and is about $\frac{1}{3}$ acre in extent.

The experiment has been carried on since 1896.

A proportion of the trees died every winter, and were replaced by young ones.

Thus on Plot A 42 died during the period of the experiment; on B, 21; on C, 25; on D, 20; on E, 7; on F, 5. A half of each plot was limed, and each year since 1900 some trees have been affected by Peach "yellows," usually on the unlimed plots.—*F. J. C.*

Peach-growing in Arkansas. By Ernest Walker (*U.S.A. Agr. Exp. Stn. Arkansas, Bull.* 79).—Treats of :—Location, tree and crop, site, aspect, soils, location with reference to transportation, varieties for home market and for shipping, fertilisers and preparation of the land ("worn-out" Cotton fields suited to the deeper-rooting Peach), ploughing in leguminous crops or manuring with bone meal, acid phosphate, and muriate of potash, equal parts of each at the rate of 400 to 600 lb. per acre. Stable manure as a rule is undesirable in Peach orchards.

Land for Peach growing should be subsoiled, if not all over, for strips 6 or 8 ft. wide where the rows are to run. The trees to set, pruning the young tree, distance for planting orchards, planting the orchard, pruning of bearing trees, cultivation, thinning the fruit, gathering the crop, the outlook, are each dealt with. "The problem of over-production may be left to the man who produces the poorest fruit in the biggest quantities."

C. H. H.

Peach "Sneed" (earliest of all). By F. Morel (*Rev. Hort.* pp. 594–5, Dec. 16, 1904; coloured plate).—Highly recommended as justifying its synonym. American origin (Tennessee). Fine flavour.

C. T. D.

Peach, the Honey Group. By F. C. Reimer (*U.S.A. Exp. Stn. Florida, Bull.* No. 73, 1904; figs.).—The Peaches grown in the State of Florida belong to six distinct groups, of which three are best suited to the climate and conditions.

These are the Peen-to Peaches, which have already been made the subject of an official bulletin, the Spanish, and the Honey. This last group originated in some stones of a Chinese Peach, which were sent to America from Canton in 1846, and resulted in the parent variety "Honey," so called from the strong flavour of honey in the fruit. The same variety was known in France from 1852; M. Montigny, the then French Consul at Shanghai, having sent over some stones to the Jardin des Plantes. From there it came over to England in 1862, and it has sometimes been erroneously supposed that the name of Honey Peach was originally given to it here. The group in Florida consists of many valuable Peaches, all of native production, which have now quite superseded the parent 'Honey.' It includes the following:—'Climax,' 'Colon,' 'Early Cream,' 'Ferdinand,' 'Florida Gem,' 'Hastings,' 'Imperial,' 'Kite,' 'Kite's Honey,' 'Oviedo,' 'Pallas,' 'Sangmel,' 'Stanley,' 'Taber,' 'Triana,' and 'Townsend.'

The fruit is of a characteristic shape, rounded, oblong, with a peculiar long conical apex, more or less recurved, and possesses a distinct flavour of honey. Being late bloomers, the group are, in Florida, in little danger from late frosts, and their ripening season being after that of the Peen-to group makes them useful commercially.—*M. L. H.*

Peach-tree Borer, The (*Sannina exitiosa*, Say). By C. L. Marlatt (*U.S.A. Dep. Agr. Div. Ent., Cir.* No. 54).—This insect is one of the Clear-winged Moths, and is nearly allied to the 'Currant Clear-wing' (*Sesia tipuliformis*), which is often the cause of injury to our Currant bushes by the caterpillars boring into the shoots. This insect injures Peach trees in the same manner. Details are given of the best preventive and remedial measures. A figure is given showing the insect in its various stages of life.—*G. S. S.*

Pear Psylla. By W. E. Britton (*U.S.A. Exp. Stn. Conn., Rep.* 1903, pp. 262–266; 3 figs.).—This insect is abundant in Connecticut as well as in England, and injures the Pear tree by sucking the sap from the young leaves and branches. It also excretes honeydew, upon which a mould (*Fumago*) makes its appearance. The eggs are laid in crevices of the bark, and below the buds, in April, and hatch in about three weeks, the larva becoming adult about one month after hatching. There are several broods (four?) in a year. The mature insect is yellow, then reddish with black markings: it hibernates in cracks in the bark of the Pear tree. It is preyed upon by the lace-wing fly and the two-spotted ladybird. The latter part of April is the best time to spray either with kerosene emulsion or with a solution of 1 lb. of soap in 4 gallons of water.—*F. J. C.*

Pear Trees, Barren, Inducement of Fruit-bud Formation. By Geo. Bellair (*Rev. Hort.* pp. 42-43, Jan. 16, 1904; 1 woodcut).—An interesting article on inducing the formation of fruit-buds by successive suppression of other buds and consequent concentration of sap vigour. Woodcuts illustrate process.—*C. T. D.*

Pentstemon, Nectaries of. By Prof. Dr. E. Loew (Berlin) (*Beih. Bot. Cent.* xvii. pp. 85-88).—The formation of nectaries is not the same in the different species of *Pentstemon*, for in those species of the group *Fruticosi* examined there are no honey glands on the filaments, whilst in others they are on the bases of the upper filaments. The staminode in the former assists in the protection of the honey.—*G. E. S.-E.*

Phaius Blumei Bernaysii. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 91).—Introductory and historical particulars are appended of this distinct yellow-flowered variety of the species.—*H. J. C.*

Photographs taken in the Dark. By Dr. Russell (*Gard. Chron.* No. 935, p. 370, figs. 165 and 166; Nov. 26, 1904).—At a recent meeting of the Scientific Committee of the Royal Horticultural Society Dr. Russell exhibited some photographs of sections of wood which he had taken in the dark, showing that almost all woods have the property of acting on a photographic plate in the dark. Some woods, however, require a much longer time to produce a good picture than others; the time varies from half an hour to eighteen hours. The definition of the rings and structure of the wood in the photographs are most charming. Apparently it is only the light-coloured rings in the Scotch Fir that act on the plate, the dark ones having no action. In the Larch, on the contrary, the dark rings are the most active.—*G. S. S.*

Phototaxis and Culture Drops, Physical Properties of. By V. Chmielevsky (*Beih. Bot. Cent.* xvi. pp. 53-66, with one plate).—Discusses the manner in which light is reflected in the drops used for hanging-drop cultures, and points out that the results in such cultures, as regards phototaxis, are entirely contrary to what most authors have supposed, the supposed negative phototaxis being really positive phototaxis.
G. F. S.-E.

Phrygilanthus aphyllus (Loranthaceæ), Structure and Biology of. By K. Reiche (*Flora*, xciii. 1904, pp. 271-297; t. v. and 9 cuts).—This interesting parasite occurs in Chile, Peru, and Argentina: it infests *Cereus chiloënsis* and other species of the genus, from the sides of which it projects to form a tuft of branches, brilliant red at the young apex. The characters of the stem, flower, ovule, and seed are given. Despite the fiery-red colour of the elongated perianth, it is doubtful whether it is (as hitherto supposed) fertilised by humming-birds; since the pollen is abundant and dusty, the stigma exposed, and anemophily possible, while no bird visits have been observed, and the flowers protected by netting set seed. The fruit is eaten by a thrush-like songbird, which wipes off the viscid seed on the spines of the Cactus, or possibly passes it in its excrement. The germ grows out like a thread by the radicular end from the endosperm, and forms an enlargement, which flattens against the epiderm of the Cactus, and finally grows into its fundamental tissue, where it produces mycelium-like strands, which, however, contain bundles. As the primitive germ-filament withers away it is almost certain that the tufts of parasite are produced by the final outgrowth of these strands. *Cuscuta chilensis* is itself parasitic on *Phrygilanthus*.—*M. H.*

Phylloclades of Asparageæ. By J. Velenovský (*Beih. Bot. Cent.* xv. pp. 257–268; with one plate).—The author has investigated the phylloclades of this group and comes to the conclusion that the flower of *Danaë* has a bract attached to it. The flat leaf-like organs in the axil of the stem bract is a terminal leaf which ends a short branch, and resembles the basal leaves. The flowering "cladodium" of *Ruscus* consists of a terminal inflorescence, whose first flower resembles that of *Danaë* and of two median bracts. One is large and decurrent on the inflorescence stalk. The other is below the inflorescence. The sterile cladodium of *Ruscus* is a terminal leaf which ends an axillary short shoot. Each of the many inflorescences of *Semele* corresponds to one of *Ruscus*. *Myrsiphyllum* has a leaf-like cladode. *Asparagus* has needle-like cladodes. The flowers are in the axil of two side bracts, of which each becomes abortive.—*G. F. S.-E.*

Phyllotaxis, The Principles of. By Arthur H. Church (*Ann. Bot.* xviii. April 1904, pp. 227–243, 7 figs.).—The conventional method of describing and interpreting the phenomena of phyllotaxis is based upon a mathematical system elaborated by Schimper in 1830. The mathematical conception applied only to adult shoots and adult members of equal volume arranged in spiral sequence.

The author criticises the present method and states that as the nature of plant apex is graduated, not cylindrical, the fractional expressions do not present an accurate statement of facts.

The principles of phyllotaxis are then discussed in the light of modern science; the author suggests the logarithmic spiral theory, and that the nature of the intersection is orthogonal. Various secondary factors come into play: these and other points are dealt with in the remainder of the paper.—*A. D. C.*

Phylloxera, A Sketch of the Position of Viticulture in Europe with Respect to. By M. Blunno (*Agr. Gaz. N.S.W.* pp. 250–256, March 1904; and pp. 445–470, May 1904).—The phylloxera question, although some thirty-six years old, is still a burning and vexed one, and, like a myrmidon army, phylloxera baffles all the tremendous efforts that science and a long-organised mobilisation can put forward: its progress continues, although somewhat abated. This document, therefore, which details experiments that have been carried out from time to time by various experts in different parts of the continent of Europe and in the United States, must be exceedingly valuable to those connected in any way with viticulture.

The article in the May issue gives an account of the writer's two months' visit to Italy, where he concerned himself principally with viticultural subjects other than phylloxera and phylloxera-resistent vines. Attention is directed to resistent stocks and the quality of wine; tendency to raise the standard again; reconstruction of vineyards in the Cognac district; chlorose or yellow disease; sulphate of iron as curative of chlorose; attempts with curative methods in Charente; the *Vitis Berlanderi* and the reconstruction of vineyards in the Charente; the success of hybridised vines as stocks; phylloxera-resistent stocks in Champagne.

H. G. C.

Phylloxera-resistent Stocks, Reconstruction of Phylloxera-infested Vineyards on. By M. Blunno (*Agr. Gaz. N.S.W.* pp. 364–382, April 1904).—A cursory survey of the attempts made to reconstruct phylloxera-infested vineyards on phylloxera-resistent stocks, starting with the importation into Europe of American vines to get substitutes for the European varieties, hoping to find among the former vines that would stand phylloxera and would bear good Grapes. The idea of grafting on them followed afterwards. In their wild state, however, and with their full wild breed, they would have been of relatively little assistance. America supplied the species and many of their types, besides some natural hybrids; Europe, with France in the forefront, selected among them the most suitable and propagated them; also artificially created hybrids to suit special environments in which they were to live. The question is dealt with under the following headings:—New Forms issued from America; Species and their Selection made in Europe; Hybrid Vines as Stocks; Hybrid Vines as Direct Bearers; The Ideal Hybrid Vine; Caution required in accepting an Europæo-American Hybrid Vine. The article concludes with a descriptive account of the writer's visit to Sicily to inspect the various vineyards of the country. It is noted that before phylloxera broke out there were 715,562 acres under vines in Sicily, yielding 204,683,400 gallons of wine. At present phylloxera has more or less destroyed 475,080 acres, with a fall of 146,246,152 gallons in the production of wine. The article is illustrated with a series of illustrations reproduced from photographs of the resistent vines growing in the State vineyard of mother stocks of Lupanello—*H. G. C.*

Physiology and Anatomy of Plant Life in Sweden. By Henrik Hesselman (Stockholm) (*Beih. Bot. Cent.* xvii. pp. 311–460; with 5 tables and 29 figures in the text).—The author has given a very important and interesting account of the peculiar parklike-meadow associations which are widely spread in the coast districts and round the great lakes of Sweden, but which once extended much farther north. They develop on new land produced by elevation or through the action of plants. On the whole, these park-like meadows greatly resemble many of the British plant-associations which are intermediate between the deciduous woods and the meadow-associations. The paper is thus extremely interesting to British botanists of the new school. But it is specially remarkable for the manner in which the author has studied the plants of various habitats by physiological experiments &c. The transpiration, amount of starch formed in assimilation, respiration, &c. are recorded in a series of researches which allow of the following conclusions :—Temperature is on an average from 1–1°·5 higher in open meadows as compared with Ash and Hazel woods. Absolute humidity varies with temperature. Relative humidity differs but little in the various associations. The author does not hold that this is due to the insular climate. The author has repeated Wiesner's observations on the relative light-needs of the various trees (Ash $\frac{1}{5}$ or $\frac{1}{6}$, Mountain Ash $\frac{1}{5}$ to $\frac{1}{8}$, Poplar $\frac{1}{8 \cdot 8}$, Juniper, $\frac{1}{19}$ to $\frac{1}{21}$, Hazel $\frac{1}{18}$ to $\frac{1}{20}$, Oak $\frac{1}{19}$ to $\frac{1}{21}$, *Picea excelsa* $\frac{1}{28}$ to $\frac{1}{33}$). Dying off of inner branches begins whilst innermost leaves are still actively assimilating in cases of Ash, Birch, and Mountain Ash. The Hazel and Oak differ from these. The need for light varies with the nourishment conditions, as is shown by the orthotropous shoots of the Hazel. The light available in sunny meadows being taken as 1, that in leafless Ash woods is $\frac{1}{1 \cdot 2}$ to $\frac{1}{2 \cdot 8}$, and when the trees are in foliage $\frac{1}{14}$ to $\frac{1}{17}$, in leafless Hazel thickets $\frac{1}{1 \cdot 5}$ to $\frac{1}{3}$, and in full foliage from $\frac{1}{27}$ to $\frac{1}{65}$. In Juniper woods the available light is from $\frac{1}{17}$ to $\frac{1}{20}$, in Fir woods $\frac{1}{25}$ to $\frac{1}{30}$, and in young Fir woods as little as $\frac{1}{50}$. There is a strong assimilation by plants in the spring in leafless woods which becomes almost totally suppressed later on when the foliage is formed. If the maximum starch observed be represented by 5, and 4, 3, 2, 1, represent diminishing amounts of starch observed after the day's work, *Dentaria bulbifera* gave 5 on June 12 ; on the 25th only 3 (Hazel leaves not fully out), and later only 1 (when the Hazel was in full foliage). Shade-plants assimilate much less than sun-forms of the same species. Starch does not wholly disappear during the short nights of summer in the case of meadow-plants. Respiration is less active in shade-plants than in the same species grown in open meadows.

Assimilation tissue is far less developed in the leaves of shade-plants as compared with sun-plants of the same species. If, however, the leaves are in sunlight during spring, there is not much difference. Transpiration is far less in thickets of Hazel than in sunny open meadows, especially on warm days. Well-developed palisade tissue involves stronger transpiration. Detailed researches are given on all these points. There is a good bibliography, and both the figures of leaf sections and photographs of the associations are excellent.—*G. F. S.-E.*

Phyteuma comosum. By B. Othmer (*Die Gart.* No. 50, p. 596, September 10, 1904 ; with illustration).—One of the prettiest and most interesting of high alpines, not always easily managed under cultivation. The best plants, certain to succeed, are not collected specimens, but seedlings raised under cultivation. They should be planted in fissures of the rockery exposed to the sun. The flowers are white and violet.—*G. R.*

Pigmentation in Fusarium, The Determination of. By E. A. Bessey (*Flora,* xciii. 1904, pp. 301–334).—The species *F.* (*Neocosmospora*) *vasinfecta* (4 forms) and *F. culmorum* were examined. Three of the forms of *Neocosmospora* form a red acid pigment, soluble in alcohol and many other media: its salts are usually violet, insoluble in the solvents of the acid, but soluble in solutions of certain organic salts. Under the influence of the blue rays of light these moulds produce, in presence of free oxygen only, an orange-yellow substance, which is not a lipochrome. The production of the red or violet pigment requires the presence of oxygen, and is independent of the culture-medium, save that a colourless mycelium grown on an acid substratum turns violet in a very weak alkaline one, but if grown in the latter does not become coloured when transferred to an acid one. The optimum temperature for growth and pigmentation is identical. The colouring matter of *F. culmorum* has a red acid form sparingly soluble in alcohol or water, and a violet alkaline form soluble in dilute alcoholic or watery alkaline solutions.

An orange pigment is in all cases developed in the Neocosmosporas under the influence of blue light in presence of free oxygen.—*M. H.*

Pineapple Culture. By Albert H. Benson, M.R.A.C. (*Qu. Agr. Journ.* xiv. pt. 5, May 1904, p. 341).—This is the sixth of a series of articles on the cultivation of the Pineapple, as specially adapted to Queensland, and is devoted principally to the varieties generally cultivated, and, more fully, to the diseases to which the plant is liable.

Subsequently (xv. pt. 1, July 1904) is given a full account of the "Pineapple Disease."—*M. C. C.*

Pineapples, Cultivation of. By Charles Eugene Smith (*Jour. Imp. Dep. Agr. W.I.* vol. iv. No. 2, pp. 110–119).—Treats first of the soil, with records of two analyses, preparation of the land, propagation, planting, cultivation, gathering and packing, insects and diseases, and also of the varieties, of which eighteen are enumerated; but only a few are known in general cultivation in the West Indies, and of these the prominent features are given so as to facilitate selection.—*M. C. C.*

Pines, Abnormal Leaf-arrangement. By K. v. Tubeuf (*Nat. Zeit. Land-Forst.* ii. pp. 212–216; 3 figs.; 1904).—Attention is drawn to a figure in *Gardeners' Chronicle* (Oct. 31, 1903, p. 298) showing the leaves of Scots Pine in distinct whorls separated by bare lengths of twig without leaves. Two similar cases have been recorded in Germany on *Pinus montana*, and in one case a new variety, *equisetiformis*, was created. Tubeuf, after examining specimens obtained from the observers in the above cases, states that the whorls of needles occupy the apex of a year's growth, while the bare twig between each whorl is due to the annual production of numerous staminate flowers. The so-called variety is thus not a special growth form, but simply male trees, producing each year numerous staminate flowers, which soon fall off and leave only whorls of needles.—*W. G. S.*

Pinks, Growing the Alpine. By W. Irving (*Garden*, No. 1705, p. 55; 23/7/1904).—Comparatively easy to grow are the greater number of the wild Pinks, requiring only a little care and attention during the early stages of their existence. A few of the rarer species, like the alpine and glacier Pinks, are more difficult to manage, and require special attention in order to grow them successfully and get them to flower freely. Some of the smaller ones, again, suffer very much from damp in winter, and fine plants which have taken years to reach a respectable size are often lost in this way. Seed is the easiest method by which a stock of plants may be obtained, but, owing to the facility with which the various kinds hybridise, they are not to be relied on to come true, except in a few cases and where the plant to be increased in that way is isolated from all others. Cuttings taken just after the plants have done flowering root readily inserted in small pots in a mixture of loam and plenty of sand. The pots should be plunged in a shady frame and kept close for a time until the cuttings are rooted, when they may be potted off singly. Division of the plants in the spring may also be effected with many of the smaller tufted species.—*E. T. C.*

Pinus Cone, A Proliferous. By Sir W. T. Thiselton-Dyer (*Ann. Bot.* vol. xvii. No. 68, p. 779; with plate xl.).—We are informed by the author that he has failed to find any record of terminal proliferation in a *Pinus* cone, and that Dr. Masters, F.R.S., who is the accepted authority on the *Coniferæ*, knows of none. In *Larix*, he says, proliferation of the female cones is not uncommon, but the passage from cone to shoot is not, as in the present case, abrupt, but gradual. "The specimen described in this note has perhaps a little more than a scientific interest. It was brought from Spain by the late H.R.H. the Comte de Paris in 1894, and sent by him to me not many months before his death, which took place on September 8 of that year." Its history is given in letters from the Comte de Paris, here printed. "It was picked up in a large *Pinar* or Pine forest which I own in this neighbourhood, by one of my keepers, a day I was out shooting. The young tree was then about six inches long. . . . I took the cone home and left it alone on a table, about the middle of February. It went on growing for a month, made a stem more than a foot long with three branches, and even threw out new shoots. About the end of March, although it was watered, it ceased to grow and died, although the needles did not fall and preserved colour." The author gives the total length of the specimen as 19½ inches. "The cones belong to the 'Stone Pine' (*Pinus Pinea* L.). As is well known, the seeds are edible; hence the Comte de Paris writes of them as Almonds; strung together they are sold in the market at Lisbon. Examples may be seen in the Kew Museum, where the specimen is also preserved. Normal cones of *Pinus Pinea* are usually about six inches long. That now described is only 3½ inches. It is therefore a small cone. But as the apex of the largest scales measures an inch across—which is the normal size—the smallness of the cone is due to its having fewer scales and not to its being immature. The morphological interpretation of the female cone in the *Abietineæ* is a subject upon which the most divergent views have been held. As is well known, a cone is composed of seminiferous scales (which become greatly enlarged in *Pinus*), and these are apparently axillary structures subtended by the primary reduced leaves of the axis of the cone, the so-called bract-scales. In *Larix* proliferation of the female cones is not uncommon. But the passage from cone to shoot is not, as in the present case, abrupt, but gradual. Masters has shown conclusively (*Gard. Chron.* N.S. xvii. pp. 112, 113) that in such cases the bract-scales pass into ordinary foliage leaves with which they are serially continuous. The fact admits of no dispute, and the interpretation is generally accepted. So far we seem to be on solid ground; whatever be the explanation of the seminiferous scale, it is at any rate 'subtended' by the bract-scale, which is undoubtedly a modified foliar organ and is not seminiferous." The author then contrasts this bract-scale of the *Coniferæ* with the seminiferous scale of the *Cycadeæ*. He points out that they are homologous, and, after remarks on the Gymnosperms in relation to Cryptogams and Phanerogams gives an acceptable *résumé* of the different views that have been held by chief authorities as to the nature of the seminiferous scale. The author, returning to the specimen, among other remarks says: "I have already noticed that the cone now described is below the normal size. It may be supposed that the food-supply directed towards it was in excess of its needs. The growing point was therefore started into activity. That this was not, however, accomplished without a struggle is proved by the deep constriction between the shoot and the cone. The passive tension of the apex of the cone prevented any increase in the diameter of the shoot till it was entirely free from it."—*R. I. L.*

Pinus Nelsoni. By G. R. Shaw (*Gard. Chron.* No. 921, p. 122, fig. 49, August 20, 1904).—This Pine was collected by Mr. E. W. Nelson, of the United States Biological Survey, in 1898, on a mountain in North-Eastern Mexico. The scales of the cones are not provided, as those of most Pines are, with hygroscopic dorsal plates; the leaves are 2 in. long, in threes, their margins serrated and their ventral surfaces cemented together in this specimen, so that the fascicles appear to be monophyllous; basal sheaths persistent; the cones are borne on very long, stout, curved footstalks. The structure of the cone, the extraordinary persistency of the basal sheath in a Pine of such affiliations, all combine to establish *P. Nelsoni* as a new and very curious species.—*G. S. S.*

Pitcairnia spathacea. By C. H. Wright (*Bot. Mag.* t. 7966).—Native of Argentina. Nat. ord. *Bromeliaceæ*; tribe *Pitcairnieæ*. A stemless plant. Leaves patent or recurved, 16 inches long; panicle 2 feet long; sepals pale rose, petals dull blue.—*G. H.*

Placoneis: A new Diatomaceous Genus. By C. Mereschowsky (*Beih. Bot. Cent.* xv. pp. 1–30).—Proposes a new genus to embrace those species of *Navicula* which have one and not two endochrome plates. There are 14 text figures and 1 plate. The paper is interesting as giving an excellent account of the complex foldings of endochrome and other details in the softer parts of diatoms; but it is doubtful whether *Placoneis*, the new genus, will be accepted by other diatomists, as it would be quite impossible to use the ordinary methods for distinguishing species if details of this sort are to be considered. All the species of *Placoneis*, or rather of those of *Navicula* which have this structure, and also of *Staurophora*, are considered.—*G. F. S.-E.*

Plant Associations in Bohemia. By Karl Domin (*Beih. Bot. Cent.* xvi. pp. 301–346, with 2 plates and 1 fig., and pp. 415–455).—Gives a detailed account of the plant associations of the tertiary basin of Veseli, Wittingau, and Gratzen in Bohemia, which is of much interest to British botanists. The district is a richly watered plateau at an altitude of about 450 metres. The following associations are recognised and described :—

1. Heathmoors, of which the (*a*) Moss type, with Sphagnum and other Mosses and Liverworts, *Drosera, Comarum, Viola palustris, Andromeda Polifolia*, &c. is the basal type. Other varieties are (*b*) the Ericaceous Heathmoors, with *Ledum palustre*, Blaeberries, and *Oxycoccos* ; (*c*) *Calluna* type, with *Hieracium Pilosella*, Tormentil, and *Nardus stricta* ; (*d*) *Eriophorum vaginatum*, Heathmoors with Carices ; (*e*) *Pinus uncinata*.

2. *Cyperaceæ* (open vegetation), *Carex filiformis, stricta, vulgaris, teretiuscula*, &c.

3. Meadowmoors, which are not, like the Heathmoors, developed above water, but are due to the filling up of swamps by vegetation (infra-aquatic in origin) with *Gymnadenia conopsea*, Bogbean, *Comarum, Parnassia, Equisetum palustre, Carex vesicaria, ampullacea*, &c., *Pedicularis palustris*, and others.

4. Alderbrakes, with *Prunus Padus, Salix* spp., Raspberry, &c. A very rich undergrowth and bark flora, including Mosses and Ferns, are found in them.

5. Water-plants' association with Lemnas, Potamogetons, *Isolepis setacea*, Utricularias, and Water-lilies.

6. Reed association with such forms as *Scirpus lacustris, Sparganium*, Bogbean, *Equisetum limosum*, Bulrushes, and *Glyceria fluitans*.

7. Bank plants, on river banks, ditches, &c., including, besides *Salix* sp., many herbaceous forms such as *Heracleum Sphondylium, Angelica, Stachys sylvatica*, and others.

8. Naked marsh soil-formation, with *Peplis, Limosella, Eleocharis acicularis, Juncus supinus*, &c.

9. Sandy soil association, *Teesdalia nudicaulis, Dianthus deltoides, Corynephorus canescens, Trifolium arvense*, &c.

10. Heaths : (*a*) *Calluna*, (*b*) Grass-heaths with Festucas, *Aira flexuosa, Nardus stricta*, &c. Sometimes Vaccinia are very abundant, and sometimes *Arnica montana* with *Achillea Ptarmica, Antennaria dioica*.

11. Meadows, often with remains of the previous meadow moor plants as well as *Geum rivale, Phyteuma nigrum*, and others.

12. Wood formation : (*a*) Pinewoods with Bracken, *Vaccinium*, and Bramblebrakes ; (*b*) Firwoods with *Prunus Padus*, Raspberry, *Lactuca muralis*, and *Blechnum Spicant*.

13. Cultivated land.

A list of adventive plants is given, and also special descriptions of several localities. The chief interest to British botanists lies in the very close resemblance of many of the formations to what is found in Britain, though of course there are many species mentioned which are not British. The classification of the associations is very interesting, especially as the author is clearly well acquainted with the modern Continental systems of ecology.—*G. F. S.-E.*

Plant Associations, Bohemian (*Beih. Bot. Cent.* xvii. pp. 234–240).—Dr. J. Podpěra (Olmütz) points out that the warmth-loving plants of the cretaceous rocks near Prague occur also on basaltic rocks, but not on granites, in North Bohemia. The mosses of the cretaceous rocks (meridional association) are not found on these latter. A large number of sub-alpine species also occur on basalts &c. in the Bohemian "Mittelgebirge," especially on the rock summits, whilst in the Moldau valley they are in more sheltered places. The thermophilous flora consists of elements (1) of meridional character, (2) Western, (3) Steppe (north-easterly). The occurrence of these steppe plants on basalt is due to the high annual temperature, small rainfall, the position of these rocks near marshes and open water, to the diathermic and heat-absorbing characters of these open rocks, and of the stony subsoils.

G. F. S.-E.

Plant-breeding. By — Fruwirth (*Nat. Zeit. Land-Forst.* i. pp. 397–404; ii. pp. 18–47, 241–253; 1903–1904).—Results of observations made to obtain information on selection and hybridisation of agricultural plants. Little is known regarding the plants chosen, viz. Rape, Turnips, Cabbage, Mustard, Poppy, Flax, Sunflower, and *Camelina sativa.* The effects of self-pollination were tested by inclosing single flowers, flowering branches, or single plants in covering of gauze or parchment. Artificial pollination was effected with pollen from the same flower, from another flower on the same plant, and from a flower on a different plant. The fruits and seeds thus obtained were examined as to size, number, and weight of seeds &c. The seeds were afterwards grown to test the merits of the resulting plants. Some of the principal results are as follows: (1) Rape and Turnip: Self-pollination produced seed, but the results were inferior to those from cross-pollination. Hybrids were raised between Rape and Turnip. Seed resulted from the application of pollen from Cabbage on Rape and Turnip, but no mature seed was produced with pollination of Cabbage from the other two. (2) Cabbage: Flowers isolated by covering gave only a few fruits and no seed; artificially self-pollinated flowers gave only a few poor seeds. Flowering branches covered up gave fewer fruits and seeds than those left uncovered, but the seeds formed were heavier. (3) Mustard: cross-pollination gave the best results; protected flowers gave seed, but this was inferior to that obtained from unprotected flowers. (4) Flax: inclosing flowers gave results nearly as good as leaving them uncovered. (5) Sunflower: Protected heads formed fruits, but these were barren. Hybridisation of black and white-seeded varieties had no effect; the seed colour of the mother parent was not influenced. (6) Poppy (*Papaver somniferum*): Capsules are always produced even when the stigma has received no pollen. Protected flowers produced capsules, but only about half of these gave seed. Artificial self-pollination gave better results. Cross-pollination gives the best yield of seed, and heavier seeds. The heaviest capsule on a plant is that on the main axis, and it gives the heaviest seeds; the capsules of the lower lateral flowers decrease in weight from above downwards, and their seeds are lighter. Crossing takes place between plants growing together, and produces variations in the colour of flower and seed. If single flowers are inclosed in gauze to obtain pure seed, this must be done on many flowers, because so many of the capsules thus treated do not produce seed; the seed obtained, however, produces strong plants. The formation of flowers with split or fringed petals may occur suddenly amongst seedlings either from protected or unprotected flowers; the progeny may either have petals with entire edges, or with fringed. Attempts to fix the fringed petal type of flower were not successful: occasionally one generation came fringed, yet reversion to the entire petal occurred in later generations. Crossing experiments produced progeny in the first and later generations, according to Mendel's ratio, and several pages are devoted to illustrating this principle.

W. G. S.

Plant Portraits: Mexican and Central American Plants. By J. N. Rose (*U.S.A. Contrib. from Nat. Herb.* vol. viii. pt. 1).—The following are illustrated and described :—*Malvaviscus lanceolatus* Rose; *Neotreleasea brevifolia* Rose (syn. *Treleasea brevifolia* Rose); *Potentilla madrensis* Rose; *P. Rydbergiana* Rose; *Cologania capitata* Rose; *Crotalaria viminalis* Rose; *Indigofera platycarpa* Rose; *Lupinus submontanus* Rose; *Phaseolus oaxacanus* Rose; *P. pedatus* Rose; *Saurauja Pringlei* Rose. A large number of species of various genera are described, and revisions of some important genera like *Polianthes*, *Manfreda*, and *Cologania* are included.—*F. J. C.*

Platyclinis filiformis. By W. H. W. (*Orch. Rev.* vol. xii. p. 239).—Cultural remarks on this and other species of the genus should be exceedingly useful to growers of this most interesting class of Orchids.

H. J. C.

Plumeria, a summer-flowering Shrub. By Angiolo Pucci (*Bull. R. Soc. Tosc. Ort.* 8, p. 244, July 1904).—It is a long-cultivated plant, but much neglected. It requires the dry heat of a stove. It is a laticiferous plant belonging to the *Apocynaceæ*, with fleshy branches; the alternate leaves are formed at the beginning of summer. When placed outside at the end of July in the full sunshine, the flowers begin to appear and keep on opening out for a long time: they are corymbosely grouped, large, with a powerful and very pleasing odour. The corolla has an elongated tube, with a five-lobed limb, of a rose-colour, and white, with a broad discoloured spot around the throat of the tube, which is usually a more or less dark-toned yellow. It inhabits tropical America, where it is wild, although cultivated in the Old World. Only the following are cultivated in gardens :—

P. acutifolia Poiret; cultivated in Southern Asia, where it is probably wild.

P. alba L.; Antilles; the latex is used by the natives for curing warts, malignant ulcers, and certain skin diseases.

P. bicolor Ruiz. & Pav.; cultivated in Peruvian gardens.

P. carinata Ruiz. & Pav.; ditto.

P. Lambertiana Lindl. ; appears to be a native of Mexico.

P. lutea Ruiz. & Pav.; cultivated in Peru; has also been cultivated in Europe.

P. purpurea Ruiz & Pav.

P. rubra L.; one of the most commonly cultivated in Europe.

P. tricolor Ruiz. & Pav.; cultivated in Peru.

P. tuberculata Lodd.; wild in rocky or sandy places, exposed to sun, in various countries.

Propagated by seeds, or cuttings in autumn, placed in pure sand in the stove.—*W. C. W.*

Plums as Bushes. By Alger Petts (*Garden*, No. 1704, p. 42; 16/7/1904).—When properly managed this is one of the most satisfactory of all methods of growing Plums. Standard trees produce enormous crops sometimes, but as a rule they bear only once in three years, in what are known as good Plum years; for the blossom is destroyed by frost at least one year in three, while another year is used in recuperating after the production of a heavy crop. They do well for market purposes when well established, but for private gardens the bush presents great advantages—the fruit is not blown off by the wind, insect pests can be kept in check, protection can be afforded from the frost, a crop can be reckoned upon almost every year, they are easy to prune, the fruit is much finer both in size and quality, whilst four bushes can be grown in the space occupied by one standard, the four being different varieties, and so providing a succession of fruit, instead of an enormous quantity of the same sort.—*E. T. C.*

Polypodium, Certain Mexican and Guatemalan Species. By W. R. Maxon (*U.S.A. Contr. from Nat. Herb.* vol. viii. 3, 1903; 2 plates). Notes on the following species are given:—*P. subpetiolatum* Hook (=*P. biserratum* Mart. & Gal.); *P. legionarium* Baker; *P. fraternum* Cham. & Schlecht. The following new species are described:—*P. æquale, P. Teresæ, P. firmulum, P. fissidens, P. adelphum*; and figures of the pinnæ are given.—*F. J. C.*

Pomelo, Anthracnose of the. By H. Harold Hume (*U.S.A. Agr. Exp. Stn. Florida, Bull.* No. 74, August 1904; 4 plates).—This disease has appeared on the fruit during 1903 and 1904, which on examination has been proved to be due to the attacks of *Colletotrichum glœosporoides* (Penzig), the same fungus which produces leaf-spot, and occurs also on the Lemon and Orange. The disease starts at the outside of the fruit, and works inward as well as around it. It is confined to the rind for a considerable period. Ultimately the flavour of the whole fruit is altered. When placed in a moist chamber the disease soon embraces the whole fruit, and the rind becomes very dark in colour. As a rule, all fruits attacked drop soon after the fungus has well started.

The conditions favouring the disease are the starved condition of the tree, abrasions caused by wind, injuries by frost, the presence of other forms of disease, such as die-back, foot-rot, &c., attacks of insects, and bruises or abrasions, however caused.

All diseased fruit should be removed, collected from the ground, and buried deeply or burned. Cut out and burn all dead and diseased branches, rake up and burn all leaves lying about, and under affected trees. Trees on which diseased leaves appear should be sprayed with

Bordeaux mixture early in the season. If spraying is needful as the fruit nears maturity, spray with ammoniacal solution of copper carbonate. Three or four applications at intervals of ten days may be necessary.

M. C. C.

Poor Pastures, Improvement of. By T. H. Middleton (*Jour. Agr. Sc.* vol. i. part i. pp. 122–145, Jan. 1905).—An account of experimental work on the best means of rendering poor land, which has been put down to grass, more productive, and to unlock the "inherent capabilities" of the soil. Carefully arranged experiments gave some extremely important results, some of which are shown in a summary at the end of this immensely instructive article. From among many items we select the following:—

"Phosphatic manures stimulate into rapid growth such *Leguminosæ* as White Clover (*Trifolium repens*), Suckling Clover (*T. minus*), and Medick (*Medicago lupulina*), which are almost everywhere present in a starved, undeveloped state in barren pastures. These soon cover the soil and in many ways improve its quality. In the third or fourth year *Gramineæ* begin to spread rapidly in the improved soil, the *Leguminosæ* at the same time diminish, and the pasture assumes a mixed character. The presence of lime greatly assists the spread of grasses. For the first few years the available potash of a clay soil appears to supply the needs of the *Leguminosæ*. After a time, possibly in from four to six years on ordinary poor pastures, potash manures become necessary."

Specific directions for the treatment of poor pastures are given. These directions are based on the following considerations, among others: "(1) The greater the development of the *Leguminosæ* during the first three years, the greater will be the ultimate improvement. (2) The growth of clovers is much hindered by competition with grasses; therefore any treatment likely to stimulate grasses must be avoided for the first two years." (6) "Cases of the failure of phosphatic manures on soils are considered, and it is shown that failures may be due to (i.) absence of *Leguminosæ*; (ii.) absence of conditions suitable for the active growth and full development of *Leguminosæ*, such as insufficient supply of moisture, injury to runners and roots through cracking of the surface soil, competition with the grasses of the old turf, or lack of available potash."—*F. J. B.*

Potatos. By Taft and Dean (*Agr. Exp. Stn. Michigan, Bull.* 214).—For the trials the crop was very free from Potato scab owing to the seed being treated with corrosive sublimate (one ounce in 16 gallons of water) for about forty minutes before planting: 150 varieties were grown, using 2 lb. for each sort, making 25 sets planted in rows 3½ feet apart. Each variety was given forty feet of space in the rows; the seed was covered about five inches deep, each medium-sized tuber giving four pieces; one piece was used for each hill of the heaviest croppers. 'Columbia' yielded at the rate of 285 bushels of the best quality tubers, and 'Prize Market' 355 bushels.—*C. H. H.*

Potatos, Abnormal. By R. A. Thallmayer (*Nat. Zeit. Land-Forst.* ii. pp. 1–18; 2 figs.; 1904).—The abnormality is common, and consists in the tuber being made up of two swollen ends joined by a constricted part; in less marked cases the tubers are abnormally elongated. The author ascribes this to "Durchwachsen," literally "through-growth," a kind of proliferation. The through-growth is due to the parent tuber, after having completed its normal growth, growing again at the crown end, with the result that a new tuber is formed attached to the old one. At the same time the plant may produce new tuber-bearing branches, of a later growth. The result is that the crop from certain varieties consists of three kinds of tubers, viz. mature, immature, and through-grown which are partly mature and partly young. The through-grown new crown end is frequently produced at the expense of the heel-end, which becomes shrivelled. The varieties under experiment were German ones, with names unfamiliar in Britain. Early and middle-late varieties rarely produce through-grown tubers, but some late varieties are liable to do so. Mature tubers are richer in starch, and cook better than immature. Through-grown tubers with shrunken basal ends are more watery and less palatable than mature tubers. After keeping over winter, immature and through-grown tubers showed a much higher percentage of rotten tubers than was found when tubers stored were fully mature. Through-grown tubers used as "seed" produce weaker plants. They are thus generally defective, and the author recommends growers to avoid varieties which produce many through-grown tubers. It is also an abnormality to be avoided in selecting new varieties.—*W. G. S.*

Potatos, Cork-formation on wounded. By Lauritz Olufsen (*Beih. Bot. Cent.* xv. pp. 269–308; with four text figures).—An investigation into the manner in which wounds on Potatos are healed over. He finds that unripe tubers react more quickly than usual to the stimulus of the wound, whereas dead and thickened tissue parts are unable to transfer the stimulus. The cells immediately below the ordinary skin show very little sensitiveness.

Cork-formation follows on all sorts of wounds. If the cork skin only is removed, the place heals over by the continual action of the cork cambium. If a pea-root enters a Potato, the wound becomes healed in the ordinary way; though corrosion of the starch occurs, no cellulose- or starch-dissolving ferments are given off by the root. Lenticels may appear under water and only become healed over under very dry conditions. The cork cambium is produced deep below the surface over pith and cortex, but close to the surface over the vascular bundle. The formation of the wound cork is accompanied by the disappearance of starch in the cells. The starch between the wound and the cork cambium is thus saved to the plant. The wound cork is even better adapted to protect against micro-organisms than the original skin. Light does not markedly affect the healing process, but the presence of oxygen is a necessary factor. The wound cork is best produced under moderately wet conditions, but is not impossible under water. Transpiration is not proved to be the exciting cause of cork formation. Poisonous solutions do not entirely prevent cork formation, though mercury vapour, iodine, and ethylic ether vapours are injurious, and may even prevent it in strong doses.

G. F. S.-E.

Potato Crop, Influence of Tree Shade on. By E. Oven (*Nat. Zeit. Land-Forst.* ii. pp. 469–484 ; 1904).—Potatos, Turnips, and Cereals grown under the shade of trees give reduced crops. The author has experimented with Potatos, and gives numerous examples which prove that shade is injurious to the crop-yield. The chief factors which bring this about are temperature, moisture-content of the soil, and light. Temperature is shown to be lower in shade than in the open ; statistics given show that the average temperature under a large Cherry tree during ten days was about 3° C. lower. This in itself is not considered enough to account for the reduction of the crop in shade. In regard to soil moisture, it is shown that Potatos grow best in a soil containing 80 per cent. of the water capacity of the soil, while Barley is best with 50 per cent. The author's experiments indicate that the soil moisture under shade of trees is slightly less than in the open, chiefly because the tree-roots use it; this was also found to be the case where many weeds were allowed to grow. The author considers the loss of light under trees to be the most important factor. His results and others cited indicate that shaded Potatos give a smaller weight of tubers, which contain less starch and other dry material, but more water. For example, plants grown in the open gave four times the weight of tubers given by those under trees : this was tested under trees, and confirmed by artificial shading. Testing the loss of light under trees, he found that if the intensity of the light in the open be put as 1, then under Apple and Pear it is 0·233, and under Cherry 0·345. These results apply with greater force in Northern countries than in Southern Europe, where sunlight is much stronger and more constant.—*W. G. S.*

Potato Culture. By F. W. Rane and H. F. Hall (*U.S.A. Exp. Stn. New Hampshire, Bull.* 111 ; 4/1904 ; 8 figs.).—The results of a series of ten experiments on Potato culture with various manures and varieties are given here. It was found that it was much more economical to mix manures at home than to buy them ready mixed. A comparison was made between the manures used in New Hampshire and those in New York, slightly in favour of the latter as regards yield, the New Hampshire mixture being 150 lb. nitrate of soda, $112\frac{1}{2}$ lb. sulphate of ammonia (=3 per cent. nitrogen), $565\frac{1}{2}$ lb. bone black (=6 per cent. phosphoric acid), and 300 lb. muriate of potash (=10 per cent. potash) per acre, while the New York mixture cost $5.33 more per acre, and yielded $8\frac{2}{3}$ bushels per acre more ; it was 150 lb. nitrate of soda, 180 lb. sulphate of ammonia (=3·9 per cent. nitrogen), 750 lb. bone black (=8 per cent. phosphoric acid), and 300 lb. muriate of potash (=10 per cent. potash). The addition of potash gave increased yields according to the amount of potash used, while the addition of farmyard manure invariably gave a greater yield whatever other applications were made in addition. The method of sowing the manure, either all in the "hills" or broadcast, seems to have very little influence on the yield. Much better results were obtained when the farmyard manure was ploughed in than when it was harrowed in, the yield being about 15 bushels per acre of marketable Potatos better in the former case ; while when the artificial manures were sown above the seed instead of below, as is usually done, the yield was 18 bushels per acre better both when farmyard manure was used and when commercial fertilisers were used alone.

Of the numbers of varieties tried 'Early Rose' gives the most uniform good results as to yield and earliness, while of the main crop varieties 'Green Mountain' and 'Delaware' are recommended. The reputed insecticide and fungicide called "Bug Death" has been tried, but with comparatively little success.—*F. J. C.*

Potato Disease, A. By Wendell Paddock (*U.S.A. Exp. Stn. Colorado, Bull.* 92, Oct. 1904; illustrated).—An illustrated account of a particular Potato disease, very prevalent in Colorado, appearing to grow there naturally, and attacking other plants besides the Potato, both cultivated and wild.

This fungus (*Corticium vagum*, B. & C., var. *solani*, Burt.) persists in the diseased seed and affects the plant in different ways.

The halm produced is often poor, sometimes withers prematurely; collar-rot appears in a black ring around the stem; often no tubers are produced, even when the vine succeeds in growing, and when there are tubers they are frequently small, few in number, and "run-out," *i.e.* pointed or much elongated.

As the soil of Colorado seems to be more or less generally infected, the best hope of remedy lies in careful selection of seed, by which means a disease-resisting strain may finally be produced. Strict rotation is also helpful, Alfalfa two years, Potatos one or two years, and Wheat one year, having been proved satisfactory. Good drainage is essential, and where irrigation is practised the furrows should be deep enough to conduct the water to the roots below the level at which the tubers are produced.

C. H. C.

Potato, Diseases of the. By G. Massee (*Gard. Mag.* 2625, p. 135; 20/2/04).—An important article upon the subject by the recognised authority on fungoid disease of plants. Mr. Massee describes the diseases in a clear way, and suggests remedies and preventive measures. The account is well illustrated.

The article appears in what is the "Potato Number" of the *Gard. Mag.*, and contains much that is of interest to Potato-growers.—*W. G.*

Potato Diseases in Vermont (*U.S.A. Dep. Agr. Exp. Stn. Vermont, Bull.* No. 106, pp. 230–235; 5 plates).—This general report gives the result of spraying Potatos in 1902, chiefly with Bordeaux mixture, and from this we learn that the average gain of merchantable Potatos was 124 bushels per acre. From tables given, which extend from 1891 to 1903, we may see the loss and gain on unsprayed and sprayed lands during the whole period.

Experiments were also undertaken to preserve Potatos from scab during the year 1903. Without going into details, it may be said that the conclusion arrived at is that formaldehyde gas is the most promising candidate for favour.—*M. C. C.*

Potatos, The Dry Rot of (due to *Fusarium oxysporum*). By E. F. Smith and D. B. Swingle (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.*

No. 55, February, 1904; 8 plates).—This bulletin deals with a Potato disease common over a considerable portion of the United States, and also known in Europe. It is variously known as bundle blackening, stem rot, dry end rot, and dry rot. Bundle blackening and dry end rot, of the tuber, are two stages of the same disease. This begins in the field in the underground stems and roots. A fungus is always present in the darkened vascular bundles of the tubers, which has been shown to be a *Fusarium*.

The above-ground symptoms are slow change of colour, dwarfing, more or less rolling or curling of the leaves, and finally a wilt of the foliage and the falling down of the stems. The first symptoms in the tuber are nearly always at the stem end, in the form of browned or blackened vascular bundles. During this stage the tubers are sound externally. The dark stain may extend to the eye end of the tuber, the parenchyma remaining sound, or becoming yellowish, or finally shrivelled and greyish-brown, or else breaking down with mixed infections, including bacterial rot.

The fungus grows readily in a great variety of culture media. It varies considerably in form, colour, and sporification according to the environment. Under varying conditions various colours were obtained—purple, violet, lilac, pink, rose, yellow, cream, salmon, cinnamon, grey, and green. Macroconidia were more abundant in some media than in others, and in certain media only were chlamydospores produced.

The fungus attacks the plant from the soil, and winters over in the earth. In land frequently planted with Potatos it can probably maintain itself indefinitely. A copious use of fertilisers did not enable the plants to overcome the disease.

The disease continues in stored Potatos, and if they are kept in warm rooms the loss during the winter is likely to be large. Those stored in a cool place keep much better. Diseased tubers should therefore be stored in cool, dry rooms, and used early in the season.

Infected lands should be planted with other crops for a series of years, but excluding Tomatos, Egg plants, and similar plants. Care should be taken not to infect healthy land by planting diseased tubers. Diseased tubers should not be thrown on the manure heap.

The following is a summary of details regarding the fungus. Three kinds of spores are produced: microconidia, macroconidia, and chlamydospores.

Microconidia are thus produced: The end of a long hypha, or a lateral branch, is cut off from the remaining portion by a wide constriction furrow. As soon as one of these microconidia is cut off, the hypha begins to elongate, which continues until the point has advanced even to the further end of the first conidium; but even before this growth is complete a similar constriction furrow begins to cut off a second conidium. This process continues until sometimes six or eight microconidia are formed from one branch and lie side by side in a little group. These microconidia are oval or elliptical, thin-walled, one-celled, uninucleate, and slightly curved. They vary in length from $5\frac{1}{2}$ to 16 μ and in diameter from 2 μ to $2\frac{1}{2}$ μ, the most common size being about $9\frac{1}{2} \times 3$ μ. These conidia were observed to germinate in distilled water in from six to eight hours.

They first swell a little and become thick in proportion to their length, then at one end a germ-tube is pushed out, and later on another at the opposite end.

Macroconidia.—This is the kind of spore by which the form genus *Fusarium* is commonly distinguished. They vary much in form and shape according to the culture media used. In one case, which may be considered typical, they were from 10 to 36 μ long and from $2\frac{1}{2}$ to 6 μ in diameter, $28 \times 4\frac{1}{2}$ μ being the most usual size. In this case they were from one to five septate, usually three, slightly constricted, not sharp pointed, varying from straight to very much curved, thin walled, and with a nucleus in each cell. When first formed they are usually smaller and less pointed than when mature, and generally without septa. The formation is somewhat similar to that of the microconidia. In this case also the time of germination varies much with the different culture media. In distilled water the germination began in three hours, and in seven hours practically all were germinating. The end cells usually germinate first; sometimes every cell in the spore germinates, but often one or two near the middle fail to do so.

Chlamydospores are produced as swellings of the mycelium either on long, comparatively straight hyphæ, or on short lateral branches. Sometimes there are several on the same hypha, close together like a string of beads. The walls are relatively thick when mature, and seem to be made up of two layers. They are smooth and light brown in colour. The size varies from $5\frac{1}{2}$ to 13 μ, about 10 μ being the usual size. All are one-celled, and contain at one time a single nucleus. They seem to be more resistent to unfavourable conditions than the two other kinds of spores, but are scarcely to be regarded as resting-spores, since they will germinate in cultures a month old in a very short time.

On some media small masses of green sclerotia are produced, not more than 5 mm. in diameter. Their true significance has not been determined.

Some attention has been given in this bulletin to the species of fungus concerned, and the conclusion arrived at that it should be called *Fusarium oxysporum* (Schl.), but that it is identical with the *Fusarium solani* of many authors; and here no fewer than ten species, or names, are given which should be accepted as more or less synonymous, and it is strongly hinted that the fungus of the sleeping disease of Tomatos, *Fusarium lycopersici* (Sacc.), is probably in reality the same fungus under a different name. These questions of identity will have to be settled hereafter.

As to remedial measures, little hope is entertained of spraying with Bordeaux mixture or other fungicides. Adding chemicals to the soil as fertilisers has not hitherto been attended with success. Planting on soil free from disease, with sound tubers, obtained from localities where the disease does not occur, is certainly to be recommended. When Potatos are harvested the extent of the disease is usually comparatively slight. It is while they are in storage that the greater amount of destruction and consequent loss takes place. Hence it is urged :—

Plant only sound tubers on uninfected land.

Reject badly diseased tubers, and store slightly diseased ones in a cool dry place (35°–40° F.).

If rejection and storage cannot be carried out as recommended, sell soon after digging.

When there is any suspicion, buyers should always keep the Potatos in cold storage.

Stake the soundest, best looking plants on diseased fields, and save the tubers from such plants for further experiment in the hope of originating resistent strains.—*M. C. C.*

Potato, Early Blight (in *Nat. Zeit. Land-Forst.* ii.; 1904).—This disease is well known in America and Europe under the names of early blight or leaf-curl. The symptoms somewhat resemble the better known epidemic (*Phytophthora*), but the way in which the leaves dry up is distinct, and the fungus causing the latter disease is absent. Professor Tubeuf, in a short paper (pp. 264–269) with six illustrations, shows four leaf diseases of Potato recognised in America, viz. epidemic, early blight, leaf-spot (due to spraying with arsenic compounds), and leaf-curl (due to excessive heat or drought). In regard to early blight, mycologists have agreed that it is caused by a fungus, but have not agreed as to the precise nature of that fungus. Species of *Macrosporium*, *Sporidesmium*, *Alternaria*, *Cladosporium*, and others have been blamed. Professor J. Vanha (pp. 113–127) investigated the fungus, and states that it passes through several phases in its life-history; if this be confirmed it will go far to clear up confusion. The fungus (*Sporidesmium solani varians*, n. sp.) may reproduce itself by: (1) macrospores, which resemble *Macrosporium* or *Alternaria*; (2) conidia, the *Cladosporium* stage; (3) pycnidia, *Phoma* or *Septoria* stage. Four plates containing 150 drawings show these stages clearly, and an excellent photograph shows a diseased leaf. As a severe attack of early blight results in small tubers, poor in starch, the disease is a serious one. Spraying with 1 per cent. Bordeaux mixture at intervals of two or three weeks has been found effective. It is also recommended to burn all haulms after harvest, to plough the field deeply, and to avoid Potatos as a crop in the field for several years.—*W. G. S.*

Potato Rosette. By A. D. Selby (*U.S.A. Dep. Agr. Exp. Stn. Ohio, Bull.* No. 145, Nov. 1903; 4 figs.).—Further investigations are here undertaken on the rosette disease of the Potato attributed to the sterile fungus *Rhizoctonia.* It has disclosed that the prevalence of the disease may be regarded as universal in the State. Experiments during the season of 1903 show that treatment of the seed tubers with formalin and sodium sulphide, by an immersion of two hours before planting, has yielded profitable returns. This has been secured in soil previously infected by the fungus of the disease, but has been found nearly twice as great when applied to seed tubers planted in soil free from disease. The treatment has had the effect of increasing the average size of the tubers harvested.

It is recommended that seed Potatos be treated before planting by immersion for two hours in a solution of formalin containing one pound of formalin in thirty gallons of water, since this is an efficient means of rosette prevention and is easily applied.

An analogous disease of Tomatos has been studied, and designated as "Tomato rosette."

A similar disease on forcing House Lettuce is being studied. The analogy in symptoms exhibited to those described for Potatos is so striking that almost anyone who has studied the Potato trouble would designate this "rosette in Lettuce."—*M. C. C.*

Potato-spraying experiments in 1903. By F. C. Stewart, H. J. Eustace, and F. A. Sirrine (*U.S.A. Agr. Exp. Stn. Geneva, N.Y., Bull.* 241, Dec. 1903; with 12 plates).—This bulletin gives the result of the second year's work on the ten-year Potato-spraying experiments begun in 1902, also an account of six business experiments conducted by farmers.

At Geneva the rows sprayed three times yielded at the rate of 262, those sprayed five times 292, and those not sprayed 174. Thus three sprayings increased the yield 88 bushels per acre, and five sprayings 118 bushels.

The farmer's business experiments were designed to determine the actual profit in spraying Potatos under ordinary farm conditions. The increase in yield was determined, and an account kept of all expense. On the total area of 61¼ acres sprayed in the six experiments there was a total increase in yield of 3,746 bushels, or an average of 61·24 bushels per acre. At 50 cents per bushel this increase was worth 1,873 dollars. Subtracting from this the total expense of the spraying, 296·49 dollars, there is a remainder of 1,576·51 dollars, which is the total net profit. This is at the rate of 25·77 dollars per acre.

It is estimated that the loss from Potato blight in New York in 1903 was fifty bushels per acre on the average. The area devoted to Potatos in the State is 396,000 acres. Hence the total loss sustained by New York farmers in a single season was nearly ten million dollars.

The spraying was done with Bordeaux mixture.—*M. C. C.*

Potato Spraying Experiments. By F. C. Stewart, H. J. Eustace, and F. A. Sirrine (*U.S.A. Exp. Stn. New York, Bull.* No. 221, 1902, pp. 235–263).—The station has undertaken to determine how much the yield of Potatos may be increased, on the average, by spraying the plants with Bordeaux mixture for ten consecutive seasons; also, which is more profitable, to spray every two weeks throughout the growing season, or to make but three applications. The experiments are to be carried on in two localities, viz. on the station farm at Geneva and on Long Island. At each place the area of the experiment fields is to be three-tenths of an acre each season. Each year, or as often as advisable, there will be published a bulletin giving the results up to date; also other information on the spraying of Potatos. The present bulletin gives the results of the first year's work. At Geneva the rows sprayed three times yielded at the rate of 317½ bushels per acre; those sprayed seven times 342½; and those not sprayed, 219. Thus three sprayings increased the yield 98½ bushels per acre, and seven sprayings 123½ bushels. The increased yield on sprayed rows was due chiefly to the prevention of late blight.

On Long Island the rows sprayed three times yielded at the rate of 295⅓ bushels per acre, those sprayed seven times 312½, and those not sprayed 267⅔. The increased yield due to three sprayings was 27⅔ bushels per acre, while that due to seven sprayings amounted to 45 bushels per acre. There being no damage from blight or "bugs," the increased yield on the sprayed rows in the Long Island experiment must have been largely due to better protection against flea-beetles.

"The bordeaux was made according to the 1 to 8 formula; that is, one pound of copper sulphate was used in each eight gallons of bordeaux, or six pounds to the barrel. This is the formula usually recommended for spraying Potatos. The amount of lime required was determined by the yellow prussiate of potash test."

The bordeaux was applied by means of a knapsack sprayer.

The directions given for spraying are that the plants should receive the first application when they are 6–8 inches high, and that the treatment should be repeated at intervals of about two weeks, so long as the plants continue to grow. Usually six applications will be required. The Bordeaux mixture should contain six pounds of copper sulphate to each fifty gallons of water.—*R. N.*

Privet Disease (*U.S.A. Exp. Stn. Oklahoma, Ann. Rep.* xiii. 1904). An "anthracnose" of privet attacking the stem, which is killed at the point of attack, the leaves above that point dying, is described. The specific fungus is not named. The spore-bearing spots (? perithecia) appear on the bark after the death of the shoot. It is recommended to remove badly infected hedges and burn them, not replanting on the same spot, and to spray with Bordeaux mixture those that are in danger of infection. Spring, just as the buds are bursting, is the time to spray.

F. J. C.

Proteaceæ: Anatomy of the Fruit and Seed. By Justin Schwarzbart (Windsheim) (*Beih. Bot. Cent.* xviii. Abt. ii. pp. 27–78; 11 text figures).—Gives a detailed account of the anatomy of the fruits and seeds in fourteen genera and fifty-three species of this order. *Persoonia* has stone fruits; *Isopogon*, *Petrophila*, *Conospermum*, and *Leucadendron* nuts. The *Grevilloideæ* (*Folliculares*) have winged seeds which in many respects closely resemble Coniferous seeds. The radicle is generally very short and the cotyledons fleshy (in *Persoonia* 2–6 cotyledons). A peculiar feature is the presence of a "ruminated" layer in the fruit shell of all the species (except *Petrophila* and *Conospermum*) examined. This consists of prismatic cells with the radial and inner walls strongly sclerotic, but with irregular anastomosing canals. This thickening material gives the wood-reaction. The cells of this layer usually contain crystals. The seeds contain compressed and scanty remains of albumen, and in a few species protein grains occur in the albumen. The embryo has fatty oil and albumen, but no starch. *Macadamia* is quite erroneously described in recent systematic works. The supposed endocarp belongs to the testa, which has in this genus extraordinary thickness. *Stenocarpus* also has a very peculiar structure. *Banksia* and *Dryandra* have peculiar dissepiments.—*G. F. S.-E.*

Proteases: The Proteases of Plants. By S. H. Vines (*Ann. Bot.* xviii. April 1904, pp. 289–316).—An account of the author's researches on

the ferments of the Yeast plant and the common Mushroom. In both cases a peptolysing enzyme is found to be present, and also a peptonising enzyme capable of digesting fibrin. At the conclusion of the work the author endeavours to discover if both these processes are effected by one and the same protease. It is probable there are two enzymes present: one exclusively peptolytic, readily soluble in water; the other peptonising, less soluble in water, but readily soluble in 2 per cent. NaCl solution.
A. D. C.

Prostanthera denticulata. By W. B. H. (*Bot. Mag.* t. 7934).—Native of Eastern Australia. Nat. ord. *Labiatæ*; tribe *Prostanthereæ*. This is a much-branched hispid shrub, a few feet high, with stiff, linear-lanceolate leaves and purple flowers.—*G. H.*

Psilotum, On a Prothallus provisionally referred to. By William H. Lang (*Ann. Bot.* xviii. Oct. 1904, pp. 571–577; 1 plate).—A description of a prothallus found by the writer in the Malay Peninsula. On account of its growing in close proximity to some *Psilotum* plants it has been provisionally referred to that genus.

The general morphological and anatomical features are very similar to those of the prothallia of some Lycopodiums; no trace of assimilating lobes was present.—*A. D. C.*

Psilotum, On the Occurrence of Secondary Xylem in. By L. A. Boodle (*Ann. Bot.* xviii. July 1904, pp. 505–516; 1 plate, 7 text figs.).—Besides the ordinary solid mass of xylem in the underground parts of *Psilotum*, the author describes tracheides which he regards as secondary. These are within the ring of sieve tubes, but outside the ordinary xylem. The secondary tracheides are scalariform or irregularly pitted.

The new facts discovered strengthen the view of the affinity of the *Psilotaceæ* with the *Sphenophyllaceæ*.—*A. D. C.*

Psilotum triquetrum, The Anatomy of. By Sibille O. Ford (*Ann. Bot.* xviii. October 1904, pp. 589–603; 1 plate).—An examination of the anatomy of this plant showed it to be monostelic throughout. A protostele is found at the base of the aërial stem, and this is often succeeded by a medullated stage. The phloëm is poorly developed. The authoress regards *Psilotum* as a reduced form, which may have retained some primitive characters; on anatomical grounds it appears to be closely related with the *Sphenophyllales*.—*A. D. C.*

Pteris aquilina (*Die Gart.* No. 48, p. 573, August 27, 1904).—This common British Fern is also found almost everywhere in the temperate region. In Japan the young shoots are collected and used as a vegetable. In the autumn, when the plant has died down, starch is extracted from the rhizomes, and is mixed with flour for baking. This starch is also used for paper-making and for waterproof clothing.—*G. R.*

Pteroglossaspis ecristata. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 136).—Some interesting points are here contained, on this little-known genus, both as to habitat and confusion of its identity among botanists.
H. J. C.

Pyrethrum Powder as Insecticide. By Ed. André (*Rev. Hort.* pp. 457–8, Oct. 1, 1904).—Found to be peculiarly efficacious against aphis, scale, woolly aphis, red spider, and crickets, when applied dry by air blasts. The proper source is *Chrysanthemum cinerariæfolium*, since *P. roseum* is largely inert ; must be kept from the air (p. 508).—*C. T. D.*

Pyrus Malus Scheideckeri (*Gartenflora*, Aug. 15, 1904, p. 417; coloured plate).—The parentage of this beautiful flowering Crab is here given as being *Pyrus Malus floribunda* × *Pyrus Malus prunifolia*.
R. C. R. N.

Pyrus Niedzwetzkyana. By W. B. H. (*Bot. Mag.* t. 7975).—Native of Central Asia. Nat. ord. *Rosaceæ* ; tribe *Pomeæ*. This is regarded as an Apple, collected in South-West Siberia ; it is both wild and cultivated. Excepting leaves, all parts of the tree are red. Flowers deep rose-purple, $1\frac{3}{4}$ inch across. Fruit conical, 1 to 2 inches long, crimson-purple without, with rose-purple flesh.—*G. H.*

Queensland, Tropical Plants suitable for North. By Howard Newport, Manager, State Nursery, Cairns (*Qu. Agr. Journ.* xiv. pt. 5, May 1904, p. 358).—This communication is in the form of a table setting forth the common name, botanic name, form of growth, how propagated, seasons to propagate, time of bearing, remarks concerning 120 tropical plants of economic value which are already introduced, or might be introduced successfully into the colony.—*M. C. C.*

Quince, The Serbian, 'Wranjska Dunja.'—By H. Breitschwerdt (*Die Gart.* No. 19, p. 218, February 6, 1904).—The fruit is Pear-shaped, and when well grown is frequently 2 lb. to 3 lb. in weight, rarely less than 2 lb. The finest fruit is usually obtained from young pyramids (all grafted on the ordinary variety) and grown in good loamy soil, which should not be too dry.—*G. R.*

Regeneration and its Connection with the Injury-stimulus (Traumatropism). By G. P. Burns (*Beih. Bot. Cent.* xviii. Abt. i. pp. 159–164 ; with 4 images in the text).—The experiments tend to show that roots will continue to form the (traumatropic) curve due to injury so long as wounded tissue is found, that the wounded tissue forms a constant irritant, and that this irritant is removed when regeneration is complete. The experiments with plaster casts led to the conclusion that the latent period is not prolonged by mechanical means, and that the influence of the stimulus is not conducted to the elongating zone and there held from one to eight days. Pea and Bean seedlings were employed.
G. F. S.-E.

Regeneration in the Case of Plants. By E. Küster (*Beih. Bot. Cent.* xiv. pp. 316–326, with 6 text figures ; also xv. pp. 421–426).—The author found that adventitious shoots were developed from the hypocotyl of *Anagallis cærulea* when the seedling was decapitated below the insertion of the cotyledons. These showed irregularities such as unequal leaves, bulbil-like appearances, &c. The same was found to be the case with *Linaria Cymbalaria*. If the upper part of the seedling (cotyledons, plumule, and upper hypocotyl) be cut off and laid on wet sand, then tender roots arise from the lower part of the hypocotyl. The author gives a list of plants in which cut-off leaves can throw out roots. He found that a great many cotyledons, when separated, can produce roots, and that in *Cucumis*, *Cucurbita*, and *Luffa* shoots may be formed. The roots arise above the wound on either side of the cotyledon, but the buds are always on the upper side. Galls of *Salix* can also produce adventitious roots. In the second paper the author considers the inequalities of the leaves (anisophylly) of these adventitious shoots produced from leaves, and shows that the small leaf is almost always uppermost. Adventitious leaves are also recorded.—*G. F. S.-E.*

Regeneration in Utricularia [and other Plants]. By K. Goebel (*Flora*, xciii. 1904, pp. 98–126; 17 cuts).—The leaves of many *Lentibulariaceæ* produce adventitious roots; in *Pinguicula* at the base of the leaves; in *Utricularia* diffused or limited to certain regions, *i.e.* the forks, the stalk of the bladders, the leaf-base. They may be formed on isolated leaves, or on attached leaves when the normal shoot-apices are removed. They may be produced in the same species, or even the same leaf, from embryonic or from adult tissue. In the species with prolonged apical growth of the leaf the regeneration takes place at the apical scar if the point is removed. Regeneration is influenced by the distribution of the bundles, and by the provision of reserves available for growth. Thus in *Cuscuta* adventitious buds appear on the stem near the haustoria. Additional facts are given on regeneration in *Begonia*, *Cardamine*, *Torenia*, &c.—*M. H.*

Resin-flow, On the so-called. By A. Tschirsch (*Flora*, xciii. 1904, pp. 179–198; 5 cuts).—The flow of resin after injury may be distinguished into primary and secondary. The primary flow from normally present resin channels can only take place in plants which possess these, and even so is limited. The secondary flow is due to the pathological formation on the inner side of the cambium of wood, chiefly consisting of parenchyma with numerous resin channels, at first schizogenous, afterwards lysigenous. As the effect of the wound passes off a zone of new wood free from these is produced, and the flow is arrested. Such pathological resiniferous wood is produced in plants which have normally resin canals in the cortex only, as in the Spruce ('Tanne'), or in the young wood only (*Toluifera*), or none at all (*Styracaceæ*). Resin galls are produced by the overgrowth and final inclosure of the resin by the new wood at the margin of the wound.—*M. H.*

Rhamneæ, Anatomy of. By Theodor Herzog (München) (*Beih. Bot. Cent.* xv. pp. 95–207).—Gives a thorough description of the anatomical details of 130 species and three varieties belonging to the tribes *Ventilagineæ*, *Zizypheæ*, and *Rhamneæ*. The anatomical differences seem to correspond fairly well both with differences in distribution and in purely systematic classification by floral characters. The identity of various species surmised by Weberbauer has been confirmed by the anatomy. Styloid crystals are found in *Gouaniæ*, large crystal glands occur in some, large Citrus-like single crystals in a few species, while small solitary crystals are common. The arrangement of the details is adapted to the recognition of species by the anatomy alone.—*G. F. S.-E.*

Rhododendron ciliicalyx. By C. Bonstedt (*Die Gart.* No. 21, p. 245, February 20, 1904).—The seeds of this new Chinese species were collected by the Abbé Delavay in 1883; the seedlings have since flowered. The ovate leaves are scabrous on the surface and glaucous beneath. The flowers are white, tinged rose or violet, and have a ciliated calyx: they are very fragrant.—*G. R.*

Ribes alpinum Leaf-spot. By R. Laubert (*Nat. Zeit. Land-Forst.* ii. pp. 56–58; 3 figs.; 1904).—Description of a new leaf-spot fungus on *Ribes alpinum*, now cultivated in parks and gardens. The fungus, *Glæosporium variabile* Laub. is distinct from other species of this genus which attack Black Currant and Gooseberry; the illustrations show a leaf attacked, and details of structure of the fungus.—*W. G. S.*

Ribes leptanthum (*Gartenflora*, Aug. 1, 1904, p. 408).—An introduction from the Colorado mountains, where it grows at an altitude of 7,000 feet. It is a dwarf shrub in height and of an elegant habit of growth. It produces pink and white flowers at the end of April and the beginning of May, these being followed by small black berries in the early part of August.—*R. C. R. N.*

Ricciocarpus natans, The Life History of. By J. F. Garber (*Bot. Gaz.* xxxvii. No. 3, p. 167; with 4 figs. and 2 plates).—This consists of a complete description under the following heads: The Thallus, Sex Organs, Fertilisation, Sporophyte, and Biology, with general summary of results.—*G. H.*

Rice. By W. C. Stubbs, W. R. Dodson, and C. A. Brown (*U.S.A. Exp. Stn. Louisiana, Bull.* No. 77, 2nd series, 1904; plates).—An addition to the already existing official literature on Rice-growing, which is every year becoming a more important industry in Louisiana. The bulletin was published before the gathering of the 1903 crop, which it estimates at probably 300,000,000 lb. of clean Rice, and there are at least four million more acres of land in the State which could be devoted to the crop.

In districts which are too far from streams for irrigation by canals, artesian wells are dug, and the water is pumped over the land. A great part of this bulletin is taken up with a description of the worst of the many weeds which invade the Rice, and which seem so far an almost unavoidable result of some of the processes of its culture; but the writer suggests various fresh methods of keeping them under, and points out the necessity of cleaning, not only the fields themselves, but the waste places in the neighbourhood and the banks of the canals, from where the noxious seeds are carried in bushels into the cultivated ground during the yearly irrigation.

An account is given of the preparation of the rice for market, and tables of the various degrees of nutrition and digestibility of its waste products. Of these the husks have not only no feeding value, but are actually injurious to stock.

Rice bran has been used with considerable success as one ingredient in the ration of horses and mules in Louisiana, though it does not seem a suitable food for cows; and both the bran and what is called the "polish," with skim milk, have been found good for fattening pigs. Neither are, however, very palatable to animals on account of the large percentage of oil they contain, which easily becomes rancid.

It is suggested that this objection might be removed either by subjecting the bran as soon as made to a heat of 200° Fahr. and pressing the material into a cake, which would remove all danger of rancidity, or by removing part of the oil, which is in excess of what is required for feeding purposes, and would have considerable commercial value when removed.

M. L. H.

Rice, Wild: Its Uses and Propagation. By Edgar Brown and Carl S. Scofield (*U.S.A. Dep. Agr. Bur. Pl. Ind.*, *Bull.* No. 50, 1903; plates).—The Department has been so often applied to for information which should ensure successful planting of Wild Rice, *Zizania aquatica*, that careful inquiries have been instituted, and this bulletin is published as the result.

The Wild Rice plant grows naturally in several districts of North America, more especially along the Lower Potomac River and in the State of Minnesota, and thrives best in the muddy bottoms of fresh-water lakes, in river marshes where the water is just not stagnant, and at the mouths of streams where the fresh water meets the salt. The grain has been parched and eaten by the Indians at least as long as anything has been known of their customs, and it is valuable as a food for wild fowl. It is now suggested that it might take its place as one of the many American breakfast cereals. So far, white men have not been very successful even in harvesting it, though the Indians do not seem to find this a difficult process; and attempts to sow it in places where it does not naturally exist have hitherto proved almost entire failures. The results of these official investigations, however, prove that it is the treatment of the seed which has been in fault. It has always been carefully dried after being gathered and sown in spring, whereas it should either be kept all the winter in water which is constantly renewed to prevent fermentation, or, if this is considered too troublesome, it should be sown as soon as gathered in the autumn, without ever being allowed to dry. Careful botanical descriptions are given of the plant and of the various functions of its parts, and chemical analyses are given of soils from Wild Rice beds, to show their general nature and how large an admixture of salt tide-water the plants will bear with impunity.—*M. L. H.*

Richardia 'Mrs. Roosevelt.' Anon. (*Gard. Mag.* 2619, p. 44; 9/1/04).—This is said to be a new hybrid *Richardia* or *Calla*, the result of intercrossing *R. albo-maculata* and *R. Elliottiana*. The photograph of the plant under field culture shows how floriferous it is. The spathes are lemon-yellow, and the foliage is spotted with white. Though described as hardy, the raisers state that it is not more hardy than the Potato, and therefore is a greenhouse plant.—*W. G.*

Rock-garden making. By F. W. Meyer (*Garden*, No. 1695, p. 335; 14/5/1904).—This is an article, of a series, dealing with water in the rock garden. Picturesque vegetation, blended with rocks and running water, is the most fascinating picture Nature can produce. Hence, in the rock garden, where we try to follow Nature's laws in the arrangement of everything, the addition of water is a most important factor. Without the presence of any water whatever very interesting and even picturesque rock gardens might be constructed; but so great are the additional advantages of water that whenever the chance occurs to have it introduced into the rock garden it would be foolish not to take full advantage of such a chance. Nor is it from a picturesque point of view only that water is so desirable, but it is most useful as well. Since mountain plants from high alpine regions require a moisture-laden atmosphere to flourish in, this can be supplied in the rock garden through the constant evaporation from ponds or streams.—*E. T. C.*

Rosa gigantea. By W. B. H. (*Bot. Mag.* t. 7972).—Native of East India, North Burma, and West China. Nat. ord. *Rosaceæ*; tribe *Roseæ*. A vigorous climbing shrub; prickles few or none. Flowers white or tinged with yellow, 4 to 6 inches diam.; fruit globose, 1½ inch diam.
G. H.

Rosa polyantha and Varieties. By Philomel (*Garden* No. 1703, p. 25; 9/7/1904).—Botanists make *R. polyantha* a variety of *R. multiflora*. There is, however, a great difference, so far at least as gardens are concerned. Many of the varieties of *R. multiflora*, such as 'de la Grifferaie,' 'Laure Davoust,' and 'Crimson Rambler,' are double. The true *R. polyantha* has immense and dense clusters of white single Blackberry-like blossoms that are so abundantly produced as to give the plant a marvellous decorative character for a few weeks. To see this fine Rose in its glory one should plant it where its branches may fall outward and overhang a rockery or some old roots or stumps of trees. It is also a beautiful plant for the wild garden.—*E. T. C.*

Rose 'Crimson Rambler' and R. polyantha 'Madame Norbert Levavasseur' (*Rev. Hort.* p. 325, July 16, 1904).—If the latter be grafted on the former, a successive flowering on very similar lines is secured.—*C. T. D.*

Roses, Own-root. By Practitioner (*Garden* No. 1703, p. 24; 9/7/1904).—No one who has seen the luxuriant growth of an own-root Rambling Rose can ever desire any other. How freely the new growths break from the base, compelling the cultivator to cut away the old wood to make way for the new, and by so doing keeping the plant in a youthful flowering condition! In this way should be grown more especially the bedding or massing Roses, also those for hedges, and all that are grown in the free rambling way, for draping and garlanding trees, pillars, and arches with their wreaths of blossom.—*E. T. C.*

Roses, White Bedding (*Garden*, No. 1715, p. 220; 1/10/1904).—It is astonishing how many Roses, when seen from a short distance, are white in effect, though on close inspection there are subtle charms and tints that are only apparent upon a closer view. Several varieties may be called snow-white, such, for instance, as 'Baronne de Meynard,' 'The Queen,' 'Frau Karl Druschki,' 'Katharina Zeimet,' and 'Anna Marie de Montravel,' these last two being dwarf Polyantha Roses. Then comes the section of flesh-white Roses, headed by the 'Hon. Edith Gifford,' a splendid Rose which gains in popularity every year. 'White Lady' is magnificent, 'Augustine Guinoisseau' and 'Souvenir du Président Carnot' are excellent, and 'Marjorie' is a little gem.—*E. T. C*

Roses, Yellow Banksian. By E. H. Woodall (*Garden*, No. 1728, p. 447; 31/12/1904).—When grown on a sunny and sheltered wall in favourable positions, this fair climber attains to much beauty in England; but even then it is not every year that it is permitted to adorn itself with its butter-gold rosettes of clustering flowers. Those who wish to realise the full luxuriance and beauty it is capable of must travel further afield and see it in Italy or on the Riviera, where it often smothers a tall tree with its growth and hangs down, a tangle of golden glory, from a height of 40 feet or more, that puts to shame the puny endeavours of less sunny climates. How much do we not owe to those who brought it from its Eastern home! The pretty single yellow form, presumably the wild type, was not introduced till comparatively lately. It has the merit of even greater vigour and luxuriance, and is quite a fortnight earlier than the double form.—*E. T. C.*

Root Pressure in Trees. By Alfred J. Ewart (*Ann. Bot.* xviii. Jan. 1904, pp. 181–182).—A note dealing with observations made on two Elm trees which had been cut down. The following questions are suggested as lines for future research:—(1) Does the total resistance to the flow of water in the trunk of a deciduous tree vary, and show an annual rhythm or periodicity? (2) Is the root-pressure comparatively constant throughout large root systems, and do all regions of such systems awaken an active absorption at the same period of time?—*A. D. C.*

Roots: Are Roots Aerotropic? By M. E. Bennett (*Bot. Gaz.* xxxvii. No. 4, p. 241).—Miss Bennett experimented with several plants and in various ways, presenting O, CO_2, H, &c. on one side only. Negative conclusions were arrived at. "Definite direction curvatures are not induced in roots by the one-sided access of such gases as mentioned, and roots are therefore not aërotropic."—*G. H.*

Roots, Geotropy in, Starch-grain Theory of. By B. Němec (*Beih. Bot. Cent.* xvii. pp. 45–60, with 1 plate).—Gives several experiments and answers various criticisms by Czapék, Wiesner, Noll, and others with regard to the above theory. He cut off pieces ·5 mm., 1 mm., and 1·5 mm. long from the root tips of *Lupinus albus*, and found in seven hours a clear curvature in the first lot (·5 mm.), whilst the others were not curved. In twenty hours the 1 mm. set showed a clear curvature, and it was found on sectioning that cells with starch-grains had been formed. Those with 1·5 mm. cut off showed no curvature. The use of glass caps leads to compression and possible deformation of the perceptive zone. Even contact curvatures may be produced. Czapék's observation that homogentisinic acid is increased in geotropically affected roots does not conflict with Němec's views.—*G. F. S.-E.*

Roots, Sensitiveness of, to Contact. By Frederick C. Newcombe (*Beih. Bot. Cent.* xvii. pp. 61–84).—Gives experiments showing that by attaching objects to the roots when in a damp chamber it is not possible to show sensitiveness to contact. Roots in water growing against curved tongues of thin paper, rubber, and collodion gave in most cases a positive reaction. Strong evidence is given for the identity of rheotropism and thigmotropism. The sensitiveness of roots to pressure is all-sided. The feeble thigmotropism precludes any possibility of utility to the plant.
G. F. S.-E.

Rubber Tree, The Culture of the Central American. By O. F. Cooke (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 49).—Following coffee and sugar, rubber is the largest import of the United States. In the sense that the practicability of the agricultural production of rubber has been demonstrated, the culture of the tree has passed its experimental stage, and promises to be very profitable under the most favourable conditions. *Castilloa elastica*, from which the best class of rubber is obtained, has rather a small range of culture, the regions best adapted being Mexico and Central America. A tree of about 18 inches in diameter tapped in April would yield about 20 gallons of milk, capable of giving 50 lb. of caoutchouc. The whole process is of particular interest as related by Mr. Cooke, and the excellent illustrations help the reader clearly to understand the text.—*A. D. W.*

Rubbish-heaps, The Garden. By J. Simpson (*Gard. Chron.* No. 893, p. 81, Feb. 6, 1904).—The abolition of the rubbish-heap is the moral of this article, in which it is shown that it is very much better to dig all the refuse into the soil on which a crop has been grown than to wheel it away, let it rot, and then wheel it back again; this rotting process deprives the contents of the heap of "the largest portion of its manurial value." The author says: "I calculated that if I could return to the soil that portion of each crop that was not needed for consumption, such as stems and leaves, &c., in the green state, if possible, I should be putting back almost as much as had been taken out of it, if not more, and that next to no other manure would be needed. I acted on that principle, and for over twenty years I never allowed a barrowful of weeds or other vegetable refuse to be removed from the quarter where they grew." "Then there are the weeds. My plan of keeping all the rubbish where it grew, and digging it in green or dead, I was told, caused more weeds to grow; but my experience was that it did not do so." There are other reasons against making rubbish-heaps which the author does not mention, namely, the risk of carrying various noxious insects, the seeds of weeds, and the spores of fungi with the decayed rubbish. A certain amount of risk is also run of not destroying these pests by burying the rubbish. It is far better to burn all the refuse of an infested crop, and all weeds which have run to seed.—*G. S. S.*

Rubus incisus Thunberg (*Gartenflora*, Oct. 15, 1904, p. 554).—This is a not very well known Bramble introduced from Japan into Europe in 1888. It is an upright growing shrub from 5 to 6 feet in height. The leaves appear on the white stems in spring, and are, when young, of a dark brown colour. The flowers are pure white, the whole making an extremely effective colour scheme.—*R. C. R. N.*

Rusts, Investigations of. By M. A. Carleton (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 63, July 12, 1904; 2 plates).—This bulletin consists of contributions to the life-history of species of *Uromyces* and *Puccinia*, for the most part connected with the United States. Amongst these are the following: Euphorbia rust (*Uromyces euphorbiæ* C. & P.), Sunflower rust (*Puccinia helianthi* Schwz.), which latter is regarded as the true species of Schweinitz and not a form of *Puccinia tanaceti* as some European authors have contended; crown rust of Oats (*Puccinia rhamni* Pers.) and a segregation of host-plants; rust of *Chloris* (*Puccinia chloridis* Diet.); the rusts of Willow and Cotton wood (*Melampsora*) and winter resistance of the *Uredo*; emergency adaptations, and investigations on *Puccinia vexans* Farlow, with experiments on Lepto-uredineæ, and remarks on perennial species.—*M. C. C.*

Salpingacanthus nobilis. By Spencer Moore (*Journ. Bot.* 496, pp. 107–8; 4/1904).—Description of the only species yet known of a new genus of *Acanthaceæ* collected by Mons. A. Robert at Corumbá, Matto Grosso. This remarkable plant has white flowers with a corolla-tube 10 centimetres long and a limb 4 centimetres across.—*G. S. B.*

Salvia grewiæfolia. By Spencer Moore (*Journ. Bot.* 496, pp. 109–110; 4/1904).—Description of a new species collected by Mons. A. Robert at Sant' Anna da Chapada, Matto Grosso. This species has rather large scarlet flowers, and approaches *S. Benthamiana* and *S. mattogrossensis*. —*G. S. B.*

San José Scale. By W. E. Britton (*U.S.A. Exp. Stn. Conn. Rep.* 1903, pp. 233–257).—The greater part of Connecticut is infested by this scale, the insect being particularly prevalent on Apple, Pear, and Peach trees. Spraying with the lime, sulphur, and salt wash; lime and sulphur; lime, sulphur, and copper sulphate; lime and potassium sulphide; whitewash; strong Bordeaux mixture; 25 per cent. crude oil in water on dormant trees, and kerosene emulsion on trees in foliage was tried. The most generally successful were the lime and sulphur wash, the lime, sulphur, and salt wash, and the lime and potassium sulphide, while the 25 per cent. crude oil in water proved very effective, most of the others washing off too easily. The summer spray of kerosene emulsion did not appear to be very beneficial.—*F. J. C.*

San José Scale, Experiments on (*U.S.A. Dep. Agr. Year Book*, 1903, p. 73).—Experiments have been made with a lady-bird, imported from China and Japan, which has been found to be an enemy to the San José scale. Eight colonies of this beetle were imported during 1902 and distributed for trial. One colony is especially mentioned as having had good results. These were established in an orchard of 17,000 Peach trees with a contiguous orchard of 250,000 trees, all more or less infested with the scale. By July 1, 1903, the lady-bird had spread in this orchard to the number of thirty or forty thousand with very encouraging results. Arrangements are being made to import and distribute large quantities of this lady-bird.—*V. J. M.*

San José Scale Investigations. By V. H. Lowe and P. J. Parrott (*U.S.A. Exp. Stn. Geneva, N.Y., Bull.* No. 228, pp. 391–456, pls. i.–vi. ; 1902).—In summarising these investigations it is claimed that the "lime-sulphur-salt wash" gave uniformly good results, indicating that it is a safe and reliable remedy for the San José scale in the East. The experiments, however, represent but one season's work, and therefore should be considered preliminary.—*R. N.*

Sand Dunes, Methods used for Controlling and Reclaiming. By A. S. Hitchcock (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 57 ; 1904 ; plates and figs.) ; and **Reclamation of Cape Cod,** by J. M. Westgate (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 65, 1904 ; plates).—The writer of the first of these bulletins gives an account of his visits of inspection to all the principal regions in Europe where systematic efforts have been made towards planting and reclaiming sandy wastes, and describes the various methods adopted and their results.

In the second bulletin we have an account of the problem as it affects the extreme spur of the narrow, sickle-shaped peninsula which incloses Cape Cod. Here it concerns not only the possibilities of securing for cultivation so many acres of land, or even of preserving a certain amount of valuable property, but the very existence of a magnificent natural harbour is at stake, the home of a large and important fishing fleet, a place of refuge where more than a thousand vessels have been known to shelter from Atlantic storms, and an important strategic position in case of war. The peninsula just here presents a long line of sandy beach towards the Atlantic on the north, with a narrow strip of cultivated land, forest, and the township of Province-town lining the inner harbour on the south. The areas of forest land and of permanent pasture were at one time much larger than they are now, but have been much reduced by early carelessness, want of foresight, and penny-greed with deplorable results, which were engaging the spasmodic attention of the Legislature as far back as 1703. Only in 1826, however, were any consecutive efforts made to replant the deforested area. It fortunately happens that even after Massachusetts had become a State all unoccupied lands retained the old title of "Province lands," and remained the property of the State, and, in view of the strategic importance of the harbour, the right to these sandy shores has always been jealously guarded by the Government, so that there are now no difficulties of private ownership to contend with in carrying out the works of reclamation and planting.

The precise way in which moving sand exhibits its destructive activity seems to be practically identical along every sandy sea-shore described by either of these writers, but at Cape Cod the conditions are intensified by the force of the sweeping northerly gales which prevail along that coast.

First, sand is blown or washed up on to the beach; then, when dry, carried further inland and deposited in low ridges, which gradually drift backward into higher dunes, and, becoming slowly encroached upon by vegetation, are at last merged into the surrounding forest where such exists. Here it is that the exceeding mischief of denuding such reclaimed dunes comes in, and where the necessity of planting them artificially appears. Left bare, the loose sand is exposed to the gales blowing inland from the sea, and carried backwards in such clouds as to bury houses, destroy vegetation, and in the case of Cape Cod appreciably to alter the geography of an important harbour.

On one disastrous occasion the wind actually scooped out a channel through the whole rampart of sand, and the waters of the Atlantic poured through into Cape Cod harbour across the narrow neck near what is still called "East Harbour," though now silted up into a salt-marsh. From that time the inhabitants of the neighbouring township of Truro inaugurated a system of yearly planting of Beach Grass, *Ammophila arenaria*, which is now regularly carried out all over this area by the State.

Experience shows that the process of reforesting the dunes must necessarily be a progressive one. Planting or sowing any species of tree or plant in shifting sand is but abandoning your young stock to certain destruction. The only form of plant life which will not only bear such conditions, but which actually requires, for continued growth, a yearly deposit of sand upon its crown, to induce root-formation in the young growth is *Ammophila arenaria*, and this is to be found wild in the neighbourhood of all the regions, both in Europe and in America, where dunes exist.

Descriptions are given of the best and cheapest methods and time to plant the grass, with diagrams illustrating the way in which it acts, both as a sand-binder and as the nucleus of an accumulation of sand in places where it may be required to strengthen or establish a natural barrier against the inroads of the sea. Other diagrams in Mr. Hitchcock's paper show the effects of various other forms of obstruction to passing sand-storms, and he describes the uses and formation of brush fences, solid fences, and surface coverings of cut bush or heather. He also gives diagrams illustrating the gradual growth of a dune, and describes the works that are being carried on near Alkmaar and at an inland dune near Barneveld, in the Netherlands, at Axböl and Skagen, in Denmark, at the Kurische Nehrung in N.-E. Prussia, and along the south-west coast of France.

This preliminary planting, however, is only one step, and the Beach Grass cannot be depended upon for effective life during more than ten years. With it, and trusting to its protection, must be planted some shrubby plant, preferably the Bayberry, as experience has proved; so that by the time the Beach Grass has finally succumbed the soil may be ready for another step in its reclamation, and seedling trees, or even Pine cones or Acorns, may be introduced with safety among the Bayberries.

Suitable species of trees for this pioneer planting have so far proved few. *Pinus rigida*, *P. Laricio*, and *P. sylvestris* are proved successes in America, with the addition of *Pinus excelsa*, *P. austriaca*, *P. montana*, *P. maritima* for Europe. *Robinia Pseud-acacia* and *Alnus glutinosa* appear also to be thoroughly adapted to the conditions at Cape Cod, and the plan is to extend the hitherto restricted plantations of these two species.

These plantations once established, the introduction of the choicer forest trees may follow in due course.—*M. L. H.*

Sand-steppes, Servian. By Lujo Adamović (*Engl. Bot. Jahrb.* xxxiii. March 1904, pp. 555–617 ; 5 plates).—The writer describes the result of trips made in the end of May and the beginning of July. He gives an account of the area of the steppes, the history of their development, the nature of the climatic and biologic conditions which prevail, and the character of the flora and plant formations.—*A. B. R.*

Sap, Ascent of, in Plants. By Prof. Dr. A. Ursprung (*Beih. Bot. Cent.* xviii. Abt. i. pp. 147–158).—Shows that the living cells of stems and petioles do assist in the ascent of water, and points out how the contrary opinion of Strasburger and Schwendener cannot be maintained.

The experiments (*Primula* petioles, *Phaseolus*, *Hedera*, and *Fagus* stems) consisted in killing by steam portions of the stem or petiole, when it was invariably found that the leaves withered and dropped off, although by microscopical examination it was clear that the vessels were not closed.

G. F. S.-E.

Sap-flow. See **Maple.**

Sap in Trees, Ascent of, in Relation to the Dynamic Action of Internal Differences of Tension in Liquids. By C. Steinbrinck (*Flora*, xciii. 1904, pp. 127–154 ; 7 cuts).—The author draws attention to the fact, too much neglected by physicists, that the internal tension of liquids is an important factor in the action of a syphon, which will work even if the shorter column has a greater downward pressure than an atmosphere, so long as the column is uninterrupted. He uses this as a ground for supporting and extending Dixon's well-known theory of the sucking action of the transpiring leaf-cells and its transmission through the plant.—*M. H.*

Saprolegnieæ, On Fertilisation in the. By A. H. Trow (*Ann. Bot.* xviii. October 1904, pp. 541–569 ; 3 plates).—*Achlya polyandra* and *A. De Baryana* were the species investigated. The conclusion is arrived at that both species are sexual. In the case of *A. De Baryana* the author traces the entry of the sperm-nucleus into the oosphere, and also the fusion of the male and female nuclei to form the zygote-nucleus.

Whilst admitting that some *Saprolegnieæ* are obviously apogamous, the author believes that other species besides the ones he has already examined will prove to be sexual.—*A. D. C.*

Sauromatum brevipes. By J. D. H. (*Bot. Mag.* t. 7940).—Native of Sikkim, Himalaya. Nat. ord. *Aroideæ* ; tribe *Arineæ*. This has a small tuber. The spathe is ampullæform, quite entire, pale yellowish-green, faintly spotted with rose, globose below, with an arching limb 4 to 6 inches long. The spadix has a long slender extremity, purple below and yellow above.—*G. H.*

Saxifraga Cotyledon in the Palmhouse (*Gartenflo a,* March 1, 1904).—Herr L. Wittmack mentions the use of this Saxifrage in a cool palmhouse at the gardens of Baron Rothschild at Ferrières-en-Brie in France. It seems to have grown to extraordinary dimensions under such treatment, and threw a flower-stem of over a yard in length, covered with flowers from top to bottom.—*R. C. R. N.*

Scale Insects of the Orchard (*U.S.A. Exp. Stn. Connecticut, Bull.* 143, pp. 1–10, figs. and two plates, 1903).—Two species are considered, viz. the American Scurfy Bark-Louse (*Chionaspis furfurus,* Fitch), and the almost universally distributed Mussel scale (*Mytilaspis pomorum,* Bouché). "Spraying the trees during the first two weeks in June, or while the young are crawling, with soap and water (1 lb. in 8 gals.) or with kerosene emulsion, will readily destroy the newly hatched larvæ." In Great Britain the spraying should be done not later than the first week in June, as the larvæ hatch in May.—*R. N.*

Scale Insects of the West Indies. By H. Maxwell Lefroy, M.A. (*Jour. Imp. Dep. Agr. W.I.* vol. iii. No. 4, pp. 295–319).—This is a continuation of the paper published earlier in the volume. The observations refer to the seventy-four species found in the Lesser Antilles. The following are the subjects here dealt with: native and introduced species; species likely to be introduced to foreign countries from the West Indies; wild and cultivated species; coccids and ants; habits; food-plants; males; enemies (predators); parasites; diseases; the place of *Coccidæ* among economic insects; plant species; control.

The paper concludes with the details of a new compound of crude oil, naphthalene, and whale-oil soap, which has been recently tested and gives very good results in all but *Lecanii* and some *Diaspinæ*. Excepting the "whale-oil soap and rosin compound" and the very useful "crude oil and soap compound" no new mixtures have been devised, and the ordinary "summer washes" used in America are equally useful here.

The proportions used were: 10 lb. whale-oil soap, $5\frac{1}{2}$ pints of oil (crude Barbados oil), 4 oz. of naphthalene. The soap is heated in a metal vessel, and if it contains much water is boiled till the water is reduced. The naphthalene is dissolved in the oil by stirring, and the two are thrown into the soap and well stirred. On cooling a practically solid body is produced. The emulsion is made by rubbing this compound up by hand in water. This emulsion has been tested at the rate of 1 lb. to 10 gallons of water, and then is effective.—*M. C. C.*

Scent or Colour, Are Insects guided by? By Eugen Andreæ (*Beih. Bot. Cent.* xv. pp. 427–470).—The author has again taken up the experiments of Plateau and subjected them to an extremely destructive criticism. Many original experiments are detailed recording a great many visits of insects to artificial flowers (one such visit of course invalidates all Plateau's conclusions). Thus, with *Papaver orientale,* he arranged three sets of flowers: (*a*) natural flowers so covered that only the scent and not their colour could be perceived, (*b*) natural flowers easily visible, and (*c*) larger artificial flowers. He found that no insect was attracted by scent, eighty-one bees (chiefly *Osmia* and honey-bee) by the artificial flowers, and fifty-six by the natural flowers. He gives strong evidence to show that the honey-bee can distinguish colours at more than 8–10 metres' distance, and also that it cannot be much guided by scent. The same appears to be the case with butterflies, the more distinctly flower-haunting bees, and such flies as *Eristalis*. On the other hand, he found also, as one would expect, that small flies and bees and night-flying moths are often guided by scent at a distance, though they are also guided by sight. Some of the experiments are very ingenious, and it is perhaps rather unfortunate that so good an observer should have given so much time and ingenuity to disproving what has been completely discredited. But to those interested in the working of bees and insects many interesting hints are to be obtained from this paper.—*G. F. S.-E.*

Sciadopitys verticillata. By W. T. (*Gard. Mag.* 2634, p. 272; 23/4/04).—An excellent account of this Conifer (with illustration), giving the history of its introduction and hints upon its cultivation in this country.—*W. G.*

Seeds, Old and new. By Georges Bellair (*Rev. Hort.* pp. 134–135, March 16, 1904).—Fresh seeds of Melons, Cucumbers, &c. when sown are apt to produce mainly male flowers, but if kept two or three years produce mainly female flowers, and it is suggested that fresh seed may be artificially used by subjection to dry warmth for a time to mature the seed contents properly, and thus affect the embryo. [This justifies the old-fashioned habit of some gardeners of keeping such seeds in their pockets.]
C. T. D.

Seed, Selection of Corn. By F. W. Card (*U.S.A. Exp. Stn. Rhode Is. Rep.* 1903, pp. 214–216).—Seeds were selected from the upper ears of Corn (Maize) and from the lower, and gave results in favour of using the former, as may be seen from the following table:—

—	Seeds from Upper Ears		Seeds from Lower Ears	
	No. of Plants	Percentage	No. of Plants	Percentage
Plants with no ears	31	6·7	54	7·1
,, one ear	213	45·6	408	53·5
,, two ears	141	30·2	267	35·0
,, three ears	58	12·4	31	4·1
,, four ,,	20	4·2	2	0·3
,, five ,,	4	0·9	—	—
Total	467	—	762	—

In 1900 no stalks in either line of plants produced more than two ears. The results show that it is better to select from the upper ears as a rule, since these are usually the best developed.—*F. J. C.*

Seeds, The Vitality and Germination of. By J. W. T. Duvel (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 58, May 28, 1904).—The conditions affecting the vitality and germinating power of seeds have been made the subject of a comprehensive survey by the University of Michigan, U.S.A.

Thirteen samples of seeds were selected so as to include representatives of ten different families and twelve genera and species, as follows:—*Poaceæ: Zea Mays* (Sweet Corn); *Liliaceæ: Allium Cepa* (Onion); *Brassicaceæ: Brassica oleracea* (Cabbage); *Raphanus sativus* (Radish); *Apiaceæ: Daucus Carota* (Carrot); *Fabaceæ: Pisum sativum* (Pea); *Phaseolus vulgaris* (Bean); *Violaceæ: Viola tricolor* (Pansy); *Polemoniaceæ: Phlox Drummondii* (Phlox); *Solanaceæ: Lycopersicum esculentum* (Tomato); *Cucurbitaceæ: Citrullus vulgaris* (Water-melon); *Asteraceæ: Lactuca sativa* (Lettuce). The seed was all of the harvest of 1899, grown in Michigan, Nebraska, Washington, California, and France, and was received at the botanical laboratory of the University of Michigan on January 27, 1900. The object of the inquiry was to test the effect of climate, moisture, and temperature on vitality, with further experiments to investigate the changes that take place in mature seeds, especially the respiratory activities and the part played by enzymes. The "Geneva Tester" was adopted for the germination tests, 200 seeds, or 100 in the case of the larger seeds, Peas, Beans, Corn, and Water-melon, being selected. The germination tests were made in a dark room, where the temperature could be comparatively well regulated, and it was maintained fairly constant through most tests. Germinated seeds were removed daily during early stages of the tests, and a complete record of the number germinating each day was kept. This point is of value, since the germinative energy of a seed tells much as to its vitality.

In February 1900 packets of seeds were distributed to eight different parts of the United States, and submitted to the free influence of various climates. The result proved that moisture is a very deleterious factor in determining the longevity of seeds. It may almost be said that loss in vitality is directly proportional to amount of rainfall. Seeds stored in dry climates retain their vitality much better than those stored in places with a humid atmosphere. The deleterious action of moisture is greatly augmented if the temperature be increased; and where the temperature of the storage-house is raised, ample ventilation must be provided to carry off the moisture liberated from the seed. For this reason seeds kept at low temperatures during the winter often deteriorate in the warm weather of spring.

Most seeds, if carefully dried, can withstand long exposures to a temperature of 37° C. (98°·6 F.) without injury, but long exposures of from 39°–40° C. (102°·2–104° F.) will cause premature death. If the seeds are kept in a moist atmosphere, a temperature of even 30° C. (86° F.) will soon cause marked injury. Seeds can endure any degree of drying without injury, *i.e.* by drying in a vacuum over sulphuric acid. Reduction in water-content appears to be actually necessary if vitality is to be preserved over a long number of years. But the seed-coats of course harden in the process, and the germination will probably be retarded by the inability of the seeds to absorb sufficient water rapidly enough to induce the physical and chemical processes of germination.

Seeds sent to countries with moist climates should be put up in air-tight packages, after careful drying. Experiments undertaken with (1) regular seedsmen's envelopes, (2) similar envelopes paraffined, after filling with seed, at a temperature of 70°–75° C., (3) bottles closed with firm cork stoppers, showed that bottles are really the best, when good corks are chosen.

The paper concludes with an interesting discussion of why increased moisture should cause the premature death of the seed. The answer to this question is *respiration.* The respiratory activity of seeds is directly proportional to the quantity of moisture absorbed by the seed up to a certain point, the maximum being attained during germination. The chemical activity of the cells during respiration produces an expenditure of energy which ultimately leads to the death of the seed. Life, in short, is a process of dying. Decreased water-content results in a corresponding diminution in intensity of seed-life, and prolongation of life in the embryo.

The life of a seed is not, however, bounded by respiration, for even where this is entirely prevented seeds continue to deteriorate, and ultimately lose their vitality. And, conversely, seeds can be kept in conditions unfavourable for respiratory activity, and still retain their vitality even better than under normal conditions of storage.

After some interesting but inconclusive observations on the part which enzymes play in the process of germination, the report ends with the reminder that while "the life of a seed is undoubtedly dependent on many factors, the one important factor governing the longevity of good seed is *dryness.*"—*F. A. W.*

Segrez Arboretum, The. By W. J. B. (*Gard. Chron.* No. 923, p. 161; Sept. 3, 1904).—In this article a very interesting account is given of the once famous Segrez Arboretum. The author says: "A quarter of a century ago the Arboretum at Segrez, and in France, contained probably the most comprehensive as well as the most interesting collection of trees and shrubs on the Continent. It was planned and planted by the late M. Alphonse Lavallée, the proprietor of Segrez, and the author of several useful botanical works." M. Lavallée died in 1884, and since then, though Madame Lavallée continues to live in the mansion on the estate, the plantations have been allowed to run wild; consequently many of the smaller shrubs have been killed by their larger and more pushing neighbours in the struggle for existence; "but some of the rarer exotic trees are still probably amongst the finest of their kind in Europe." Some notes are then given of the most interesting specimens. Segrez is about 30 kilometres to the south-west of Paris.—*G. S. S.*

Selection, the Improvement of Plants by. By H. J. Rumsey (*Agr. Gaz. N.S.W.* pp. 324–326, April 1904).—This article points out that the opinion is often expressed that varieties of vegetables and flowers are multiplied needlessly, and to some extent it is the case, but it is rather the persistent hunt for improvement by the seed-growers of the world that causes the varieties to be so multiplied, and it is this same hunting that so frequently results in something extra good being given to the world. Many of the novelties, however, that are placed on the market with a great flourish of trumpets no doubt disappear mysteriously within a few years. The reason for this is not always that they were not so good as the introducers claimed, but that they had not bred them long enough to fix their special characteristics, so that they would continue to reproduce faithfully. Most of our common vegetables have been improved from wild straggly plants of an almost fixed type to the nearly perfect forms of dozens or even hundreds of types now grown. The writer refers to the Tomato as being one of the most noticeable plants for illustration, and says that it has been improved by selection in the short time of little more than a generation from a weedy plant bearing small seedy fruit to its present perfection, and scores, and even hundreds, of varieties. While we have in this plant one that is susceptible to improvement, on the other hand it is one that degenerates just as easily. The article infers that the combined results of selection of natural improvements and careful breeding have given us the great improvements in types of economic plants with which we open the twentieth century.—*H. G. C.*

Sequoia sempervirens, The Gametophytes, Archegonia, Fertilisation and Embryo of. By Anstruther A. Lawson (*Ann. Bot.* xviii. Jan. 1904, pp. 1–22, plates i.–iv.).—A detailed account of the development of the gametophyte generations and fertilisation phenomena.

The reduction division of the macrospore mother-cell takes place in March. A primary and secondary prothallus is distinguished: the former arises as the result of free nuclear division, and simultaneous cell-wall formation; in it the archegonia are formed.

The nuclei of both male cells are functional. During fusion the chromatin of both sexual nuclei are in the spireme stage. It is believed there are sixteen chromosomes in the gametophyte and thirty-two in the sporophyte.—*A. D. C.*

Sigillariopsis in the Lower Coal Measures, On the occurrence of. By D. H. Scott (*Ann. Bot.* xviii. July 1904, p. 519–521).—Hitherto no fossil referable to the genus *Sigillariopsis* has been described besides *S. Decaisnei.* The author describes two specimens occurring in the calcareous nodules from the Lower Coal Measures of Lancashire. They differ somewhat from Renault's specimens, and the name *S. sulcata* is given. –*A. D. C.*

Siphoneæ, Studies on. By A. Ernst (*Beih. Bot. Cent.* xvi. pp. 199–236, three plates; also pp. 367–382, with one plate).—The author continues the detailed studies of the *Siphoneæ* which were begun in vol. xiii. The present papers contain many interesting details. A new species of *Udotea*—*U. minima* Ernst—is described, with specially full details as to branching, growth, and manner in which a false rind is formed. *Udotea Desfontainii* (Lamx.) Dcne. is also fully described and especially the regeneration phenomena, which are particularly interesting. All parts of the plant can show regeneration. The phylogeny and systematic classification of the *Codiaceæ* are also explained. He also describes the manner in which the branch filaments are so arranged and differentiated as to form in the highest type, *Halimeda*, a perfectly close "rind" or bark consisting of the ends of filaments without spaces between them. *Udotea* has not quite so perfect an arrangement, but there is a difference between the central string and the branch filaments. For the second paper the sporangia and aplanospores of *Vaucheria piloboloides* were studied. It was found that during the four to six weeks' season of its development only spores were formed, and sexual reproduction began only towards the close of the season. The methods recommended by Klebs for producing sporangia were found not to be successful. But sporangia were found by culture in three parts sea-water and one part of fresh water, or two parts of each, after three days. The author considers that endosmosis is favoured by the change to a weaker salt solution, and that this increases the turgor and so favours sporangium formation.

G. F. S.-E.

Sisal Culture. By F. E. Conter (*Agric. Exp. Stn. Honolulu, Bull.* 4, 1903; 5 figs.).—The cultivation of *Agave rigida* vars. *elongata* and *sisalana* for their fibre (Sisal Hemp) is described, and its further growth in Hawaii advocated. Directions for propagating, planting, harvesting the leaves, and drying and baling the fibre are given.—*F. J. C.*

Sisal Hemp (*Agave rigida*) (*Qu. Agr. Journ.* xiv. pt. 4, April 1904, p. 280; 1 plate).—This communication describes the plant which furnishes the Sisal Hemp, with notes as to the soil, preparation of the land, planting, cultivation, harvesting, produce, extraction of the fibre, and cost. These details are given with a view to the introduction of the *Agave* into Queensland as the source of a new industry.—*M. C. C.*

Sisal Hemp Industry (*Agave*) (*Jour. Imp. Dep. Agr. W.I.* vol. v. pt. 2, 1904, pp. 150–172).—This is a summary of the information which has been obtained from various sources as to the cultivation and preparation of Sisal Hemp, the produce of *Agave rigida* var. *sisalana.*

After some statistics concerning its cultivation in the Bahamas, this paper goes on to describe the Sisal plant, distribution, soil, cultivation, poling of Sisal plants, extracting the fibre, drying and baling, yield, freight, fluctuation in prices: it proceeds to Sisal cultivation in Yucatan (with two woodcuts). It is stated incidentally that its cultivation on a commercial scale has hitherto been confined to Yucatan, the Bahamas, Turks Islands, Cuba, and Hawaii. Recent plantations have been made in Venezuela, Santo Domingo, and Bombay and Madras Presidencies in India.—*M. C. C.*

Sobralia Ruckeri. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 184).—Historical and descriptive particulars are here included.—*H. J. C.*

Sobralia violacea alba. By R. A. Rolfe (*Orch. Rev.* vol. xii. p. 291).—Historical particulars of this white *Sobralia*, and a description, made from a flower supplied by Messrs. Hugh Low & Co., Bush Hill, Enfield, are given.—*H. J. C.*

Soil Management, Investigations in. By F. H. King (*U.S.A. Dep. Agr. Year Book*, 1903, p. 159).—The advantages of thorough cultivation are here fully set out, and where the rainfall is intermittent it is shown to be most important for intertilled crops, like Corn and Potatos, that fields receive good cultivation to a depth of three inches. This is needed (1) to lessen the bad effects of drought by reducing surface evaporation; (2) to prevent the plant-food in solution being carried by excessive capillary rise too near the surface above the zone of roots, and to obviate its being left by evaporation where the heavy rains will dissolve it and carry it into the surface drainage; (3) to give better circulation of air to the soil, which roots and soil organisms require; and (4) to allow every heavy rain at once to enter the soil deeply, and thus lessen the loss of fertility by surface washing. Tables are given showing the results of experiments in different types of soils, such as sandhill, selma silt loam, pocoson, Norfolk sandy soil, &c. Results are also given of washing the surface inch of soils with distilled water for three minutes, the nitrates phosphates, and sulphates being recovered to the extent of hundreds of pounds per acre. From the tables given it is seen that relatively much larger amounts of each of these salts have been carried in the surface inch of soil in the cases where the soil has not been left loose. The granular structure and porosity of different soils are considered. Most valuable results are given in the article, and tables set out to illustrate the results of the experiments.—*V. J. M.*

Soil Physics to Plant Growth, An Experiment on the Relation of. By B. E. Livingstone and G. H. Jensen (*Bot. Gaz.* xxxviii. No. 1, p. 67).—The object of the experiment was to discover the different effects of the size of the particles of soil in retaining water. Crushed quartz was used in three grades, the finest having an average diam. 0·02 mm., the medium 0·6 mm., and the coarsest 1·15 mm., the necessary nutritive salts being added alike to each. Photographs show the final results. Nine wild flowers were grown in each tub filled with the above. In the finest soil all the plants were in great vigour; in the medium soil they were much reduced; while in the coarsest soil several were dead and all more or less stunted.—*G. H.*

Solanum Commersonii (*Rev. Hort.* pp. 402–3, Sept. 1, 1904).—Some interesting remarks *re* this Potato species and its capacity of improvement by culture. The flowers afford a sweet perfume like Jessamine, the foliage serves as forage, and the tubers for food; apparently a very valuable introduction.—*C. T. D.*

Solanum Commersonii and its Varieties, from their Bearing on the Origin of the Cultivated Potato. By E. Heckel (*Compt. Rend.* Nov. 1904, p. 887).—Seven species of tuber-producing *Solanum,* also several others grouped by Baker as simple varieties of *S. tuberosum,* were cultivated. Out of these only one species—*S. Commersonii*—survived after eight years of cultivation. This species presented the phenomena of variation and of productivity in a manner which suggests a solution of the much-disputed question as to the origin of the varieties cultivated under the name of *S. tuberosum.*

In support of this statement the following observations are recorded. During a period of two years *S. Commersonii* did not show the slightest variation when grown in the Marseilles Botanic Garden; but all at once, on changing the climate and conditions—to wet soil—it passed through a sequence of variations to the wild form. Between some of the varieties produced by *S. Commersonii* and those derived from the so-called *S. tuberosum* there was not the slightest difference. The chain is thus manifested under our eyes between the type of *S. Commersonii* and its varieties, which are confounded with those of the Potato cultivated for four centuries. It is considered that the wild Morell of Commerson was the origin of the Virginian Potato, which was the first introduced into England. In conclusion, it is considered certain that *S. Commersonii*, if not the actual origin, has played an important part in the origin of the common cultivated Potato. The violet variety of *S. Commersonii*, on account of its extremely prolific nature and its predilection for wet soils, promises to be a boon, and will enable profit to be made out of wet land at present useless.—*G. M.*

Solanum glaucophyllum. By W. B. H. (*Bot. Mag.* t. 7945).—Native of Southern Brazil and Uruguay. Nat. ord. *Solanaceæ*; tribe *Solaneæ*. A glabrous shrub, with rather thick leaves. Flowers rose-purple; fruit oblong-ovoid, $\frac{3}{4}$ inch long, purple-violet.—*G. H.*

Sonchus arboreus laciniatus. By Max Garnier (*Rev. Hort.* pp. 144–145, March 16, 1904; 1 woodcut).—A very elegant plant, about 3 feet high; good habit. Native of Canaries, and therefore requires winter protection.—*C. T. D.*

Sorghum: Green Sorghum Poisoning (*Jour. Imp. Dep. Agr. W.I.* vol. iii. No. 4, pp. 326–333).—Wherever *Sorghum* has been grown for fodder an idea has been prevalent that the plant is, under certain circumstances, injurious to stock. It was observed that the young plant, when crushed and moistened with cold water, soon acquired a strong odour of hydrocyanic acid. Without entering into the details, it was found that *Sorghum vulgare* contains a glucoside which, under the influence of some hydrolytic agent simultaneously present, undergoes hydrolysis, furnishing as one product hydrocyanic acid, to which the observed toxicity of the young plants must be ascribed.—*M. C. C.*

Sparmannia africana, On the Movements of the Flowers of, and their Demonstration by means of the Kinematograph. By Mrs. Rina Scott (*Ann. Bot.* vol. xvii. No. 68, p. 761; with plates 37–39).—This is a common greenhouse plant, and the sensitiveness of its stamens and staminodes is well known. When the flower opens they are more or less erect and close together, but on being touched immediately spread to hemispherical outline. "*Sparmannia africana* is an exceptionally favourable plant on which to study reaction to stimulus, as so many of its parts are sensitive. The most strikingly sensitive organs are the stamens: these are arranged in four groups, having an outer circle of staminodes. Both stamens and staminodes are provided with curious tooth-like outgrowths, few in number on the stamens, but becoming more and more numerous and conspicuous as the outer staminodes are reached. All of these are sensitive to touch; if only one stamen be touched, the stimulus spreads until all the stamens and staminodes have moved outwards away from the stigma. . . . Then the petals and sepals respond to the stimulus of light, and lastly the flower as a whole is capable of special movements, regulated not merely by the curvature of the pedicel but by the action of the pulvinus or joint situated at a short distance below the flower." The observations, which extend over two seasons, are principally on the movements of the flower-bud and flowers up to the time of the setting of the fruit, but all the positions assumed by the organs above referred to are illustrated. Kerner's description of the effect of rain on the flowers is quoted. He says: "The flowers are inverted and their anthers are turned towards the ground and covered over by the petals. When the flower is open, however, the petals are slightly tilted back, *i.e.* upwards. The margins of the petals overlap one another, and their outer surfaces, which in consequence of the inverted position of the flower are uppermost, thus form a basin open to the sky. When it rains this basin placed above the anthers fills with water, thus adding to the weight borne by the stalk, and as drop after drop increases the strain upon the latter, a point is at length reached when the basin tips over, letting the water flow over its edges without wetting the stamens suspended beneath it." . . . "But if the rain is long continued or very heavy the stamens eventually get wetted." Some experiments were tried with chloroform, and its effect seems to have been to make the buds and flowers lose all count of time. "A bud, after recovering from chloroform, often missed out several stages of its development, another would grow a long style as if it were a two-day-old flower, while an open flower would take up the position of a fruit, or fall off at the joint, as if it were a ripe fruit." It struck the authoress that the inflorescence would be admirably adapted for an experiment with the kinematograph. There were difficulties, and the authoress describes these and how they were got over. Experiments extended over a year, and recently fairly good results were obtained. Sixty-six illustrations are given. The paper is extremely interesting, and some important points cannot here be referred to.—*R. I. L.*

Spathoglottis Hardingiana. By R. A. Rolfe (*Bot. Mag.* t. 7964). Native of North Burma. Nat. ord. *Orchidaceæ*; tribe *Epidendreæ*. A distinct species in having the lip reduced to a long linear form and bearing a pair of small yellow auricles. Flowers rose-purple or pale lilac, about 1 inch diam., on a slender raceme.—*G. H.*

Spirogyra-nucleus, Pathological Enlargement of. By J. J. Gerassimow (*Beih. Bot. Cent.* xviii. Abt. i. p. 45–119; 2 plates).—Gives a very detailed account, with measurements, of the enlargement and diminution in size of *Spirogyra* nuclei. Either extreme is injurious. In enlarged nuclei, the number of chromosomes may be twice or four times the usual one. Those with enlarged nuclei are formed by division of a mother-cell of which the other half has no nucleus. The enlargement of the nucleus produces an increase in the diameter of the cell.—*G. F. S.-E.*

Spore-formation in Leptosporangiate Ferns. By R. P. Gregory (*Ann. Bot.* xviii. July 1904, pp. 445–456; 1 plate, 1 text fig.).—An account of a cytological investigation of the spore-formation in ten species of Leptosporangiate Ferns.

The author believes his results confirm the essential features of the heterotype division phenomena described by Farmer and Moore. The paper concludes with a discussion in connection with Mendelian hybrids.

A. D. C.

Spraying. By A. E. Steine (*U.S.A. Agr. Exp. Stn. Rhode Island, Bull.* 100).—A comprehensive list of materials to use for fungoid and insect injury of fruits and vegetables, with advice as to procedure, illustrated by photographs, spraying in the college orchard, types of nozzles and gipsy moth. The following are some of the newer or less well-known spraying compounds:—

Soda Bordeaux mixture, consisting of copper sulphate 4 lb., commercial caustic soda sufficient to make mixture alkaline, or from 1 lb. 2 oz. to 1 lb. 8 oz., according to strength. Water to make 50 gallons. This can be used on ripening fruit, as it does not stain it, or for the same purpose a weak copper sulphate solution may be used on trees in foliage and when the fruit is ripening.

Copper sulphate (1 lb. to 200–400 gallons).—For Peaches and Japan Plums, the solution with 400 gallons should be used. This solution is designed to take the place of ammoniacal copper carbonate, and is much cheaper.

Arsenate of lead is advocated as being entirely harmless to all plants at any strength, being perfectly insoluble in water; the particles are very fine and remain in suspension in the spraying tank for a long time; its mechanical structure also causes it to adhere better to the foliage and reduces the necessary number of sprayings. Dissolve 4 oz. arsenate of soda in half a gallon of water in a wooden pail, and 11 oz. acetate of lead in 1 gallon water in another wooden pail (hot water is preferable in both cases). Pour the arsenate of soda solution into the lead solution, stir and add from 40 to 50 gallons of water.

Arsenite of lime is one of the cheapest insecticides obtainable, and if well prepared is safe for most plants. It is superior to Paris-green in that it remains easily in suspension, costs only about one quarter as much, and is equally efficient. Boil 1 lb. white arsenic and 2 lb. stone lime in 2 gallons water for 40 or 50 minutes. This solution may be added to 150 to 300 gallons of water for spraying. As an extra precaution in making up the spraying solution, slake one pound of lime dilute to a thin whitewash and add the arsenite of lime, then dilute to the required strength.

Bisulphide of carbon.—Though dangerous to men and very explosive, if great care is taken it may be used for fumigating storerooms of grain seed or clothing, one pint of the liquid to each 1,000 cubic feet. To destroy ants and insects parasitic on roots and other underground parts of plants, small holes may be made where the insects are known to be, and a small quantity of the liquid poured in, covering the holes with moist earth to confine the fumes.

Poisoned bait.—Cut worms (surface caterpillars) may be caught by scattering about the field, preferably just before planting, the following mixture: Mix thoroughly 1 oz. Paris-green or white arsenic with 3 oz. bran. If to be used after the plants have begun to grow, moisten the mixture with sweetened water, enough to make a paste. Towards evening put a spoonful near each hill; the caterpillars are quite partial to bran, and a little of this mixture will accomplish much. If this method is used chickens should be kept out of the field for a few days.

Formalin for potato scab.—Use 1 pint to 50 gallons of water; soak the tubers in this solution for two hours. For grain smuts, moisten the grain thoroughly by sprinkling and shovelling it over, allow the grain to remain in piles for four or five hours, then spread out to dry.

Lime, sulphur, and salt wash.—An effective and cheap remedy against scale insects. Apply after leaves have fallen and before the buds open in spring. Slake 15 lb. lime in 4 or 5 gallons of hot water, using an iron kettle of 20 to 25 gallons capacity. When the slaking is in full progress sift in 15 lb. sulphur (flowers) gradually, meanwhile stirring the mixture thoroughly. Mix well, and add sufficient water to make a thick paste. Add 5 to 10 lb. salt and 6 or 8 gallons of hot water, and boil for 40 or 50 minutes. Pour through a strainer made of tin or brass wire, 16–20 meshes to the inch, add water to make fifty gallons, and the mixture is ready for use.

An adhesive spray for plants with smooth glossy leaves.—Place 1 lb. fish oil (or any cheap animal oil, except tallow), 5 lb. pulverised resin, and a gallon of water in a kettle, and heat until the resin is thoroughly softened. Then dissolve and add 1 lb. concentrated lye slowly, stirring constantly until the solution is thoroughly mixed. Add four gallons of hot water and boil until a clear amber-coloured liquid is obtained. Add more water, if necessary, to make five gallons of this stock solution. For spraying, take the following:

Stock solution	1 gallon.
Water	16 gallons.
Milk of lime or whitewash . .	3 gallons.
Paris green	$\frac{1}{4}$ lb.

This mixture can be used with the Bordeaux mixture, and also with arsenate of lead and other stomach poisons, at the rate of 1 gallon of the stock solution to 16 gallons of the spraying mixture.—*C. H. H.*

Spraying Fruit-trees. By E. P. Sandsten (*U.S.A. Agr. Exp. Stn. Wisconsin, Bull.* 110, pp. 3–28).—Recommends thorough spraying—trunk, branches, and leaves—as uncovered patches serve as means of attack and breeding places for the pest, from which the enemy or enemies may spread over the orchard. Scab on Apples and brown rot in Plums are the chief fungoid diseases. Fungicides in general should not be looked upon as remedies, but as preventives. The first spraying should be made before the leaves have begun to expand or before the blossom buds are too prominent, to prevent the spores of fungi that have lodged among the buds and axes of the leaf shoots from germinating. Bordeaux mixture or sulphate of copper are the best sprays for this purpose.

The second spraying should be made as soon as the petals have fallen: this may be of Bordeaux mixture together with Paris-green or lead arsenate, which will be useful in killing the larvæ of the codlin moth, the eggs of which are generally laid at the calyx end of the Apple, and by adding Paris-green the young Apples become coated with it, and this poisons the larvæ of the codlin moth as soon as it emerges from the egg and begins to eat its way into the Apple. The third spraying, with combined fungicide and insecticide, should be made when the Apples are about the size of small Crab Apples. The Paris-green is to poison any leaf-eating insects that might chance to be on the foliage.

The Bordeaux mixture for the first two sprayings should be at the rate of 5 lb. copper sulphate to 5 lb. fresh lime; that for the third and fourth applications, 3 lb. copper sulphate to 4 lb. lime.

The fourth and last application should be made when the fruit is three-quarters grown, consisting of Bordeaux mixture and Paris-green. If the season should be very rainy and the fungicide washed off shortly after application, extra applications should be made in order to prevent the appearance of the disease. It is well known that diseases are more prevalent during wet than during dry seasons. If late spraying become necessary, use ammoniacal solution of copper carbonate, as it does not discolour the fruit to any appreciable extent. The same methods used in preventing Apple scab are used to prevent brown rot on Plums and Peaches.

Apple scab spores are believed to remain on the trees during the winter. At first the appearance of the disease is not noticeable, but it soon spreads over the leaves and fruit, causing dark greenish spots almost regular in outline; these spots gradually assume a brownish-black colour about the time when the fungus fruits. The disease disfigures and to some extent dwarfs the fruit, it also lowers the vitality of the tree by impairing the leaf area.

Brown Rot in Plums (*Monilia fructigena*) is the most serious fungoid disease affecting the Plum, attacking young twigs, blossoms and fruit. It first appears on the fruit in the form of brownish spots, not larger than a pin's head: these spots spread very rapidly, and in a short time they extend over the entire surface of the fruit, which soon changes to an ashy-grey colour, and produces a large number of spores. The infestation is believed to be carried on by spores from the mummified fruit, which is allowed to remain on the tree or fallen on the ground; these should be gathered up and burned. Free circulation of air and sunshine is recommended.

Potassium sulphide (liver of sulphur) at $\frac{3}{4}$ oz. to 1 gallon water, used fresh, is quite effective against mildew on Gooseberries, Grapes, and Currants, also against damping off of vegetable plants. The mixture does not discolour the fruit, and may be used where Bordeaux mixture would be objectionable.

Spraying in full Bloom.—Spraying just after the blossoms have opened is injurious if the spraying mixture comes into contact with the pollen or stigma of the flower; but spraying is not injurious to the setting of the fruit after a few days of full bloom, since it requires only two or three days at the most for the pollen to fertilise, and spraying after this is done would not injure or decrease the number of fruit set. One spraying in full bloom did not injure more than about 5 per cent. of the total number of blossoms, while two successive applications reduced the number to 25 per cent. One application thoroughly done in full bloom may amount to a thinning of the fruit, and in a season of heavy blossom gives the fruit a better chance to develop, as although fewer in number the size of fruit and total yield are increased. Spraying in full bloom would not be advisable in a season of small quantity of bloom. The writer considers the danger of spraying when in bloom to bees and birds that visit the blossoms to be more imaginary than real.

Plum curculio is well illustrated, also drawings of two forms of sheet catchers to catch the weevils when trees are shaken.

Apple and Plum aphis and mussel scale are fully dealt with, also preparation of fungicides and insecticides, and spray pumps.—*C. H. H.*

Spraying Calendar Fungicides, Insecticides (*U.S.A. Exp. Stn. Hatch, Bull.* 96).—Numerous receipts; it is stated that Bordeaux mixture destroys flea beetles.

Treatment of greenhouse plants.—When greenhouses are empty the house may be closed and 6 oz. sulphur burnt to 1,000 cubic feet of space. Keep the house closed at least twelve hours. For red spider and mites—mix well 1 oz. flowers of sulphur in 1 gallon water and spray over infested plants; soapsuds may be used instead of water with good results. For plant lice, aphides—burn tobacco stems. For thrips—mix $\frac{1}{7}$ oz. nicotine in 5 fluid oz. water per 1,000 cubic feet and vaporise in the house at night; will kill most of the thrips.—*C. H. H.*

Spraying with Paris-green. By J. K. Haywood (*U.S.A. Dep. Agr. Bur. Chem., Bull.* 82).—Free arsenious oxide being the constituent of Paris-green is liable to scorch the foliage. The States of California and New York have therefore passed laws limiting the amount of free arsenious oxide to 4 and 3·5 per cent.

Experiments were made with samples of Paris-green with from 4·29 to 8 per cent. soluble arsenious oxide, used with and without lime; the experiments were made at six State experiment stations.

Peach and Plum were more susceptible to injury than Apple and Pear; Peach trees should never be sprayed without the addition of lime to the Paris-green.

The following table gives the amount of soluble arsenious acid it is advisable not to exceed :—

	Without lime.	With lime.
Apple	6 per cent.	7 per cent.
Pear	6 ,,	7 ,,
Peach	0 ,,	4·5 ,,
Plum	4 ,,	6 ,,

Photographs are given showing Peach trees normal and sprayed with Paris-green without lime, showing the ill-effect of the latter.

The strength used in the experiments was 1 oz. Paris-green to $9\frac{1}{2}$ gallons water (1 lb. to 150 gallons) for Apples and Pears; 1 oz. to $15\frac{1}{2}$ gallons of water (1 lb. to 250 gallons) for Peaches and Plums.—*C. H. H.*

Spruce: Influence of Mountain Pine on Growth. By P. G. Muller (*Nat. Zeit. Land-Forst.* i. pp. 290–306, 377–397; 11 figs.; 1903).—Spruce is an important forest tree in the heath region of Jutland, and widespread failure in its culture has attracted attention. The trees, after starting well, are checked, the annual increase diminishes, the needles become smaller year by year, and the top dies off. Whole plantations may die off completely, or may recover after a check; in any case the loss of revenue is considerable. Even where the land is cleared of heather before planting, and where ploughing every few years is resorted to, growth of the Spruce may be unsatisfactory. Good results are obtained when Spruce is planted with *Pinus montana* as a nurse. The author has endeavoured to find an explanation. After an examination of the possible factors, he fixes on the mycorhiza (fungus roots) of the Pine as the chief agent. On this tree two forms of mycorhiza occur (and are figured): (*a*) a racemose form with ectotrophic or external covering of fungus filaments; (*b*) a dichotomous form with endotrophic or internal occurrence of the fungus. The Spruce, on the other hand, has only racemose ectotrophic mycorhiza. The author's argument is that just as Clover or other *Leguminosæ* by means of their root-tubercles (or endotrophic mycorhiza) provide food materials—chiefly nitrogenous—for cereals and grasses, so the Mountain Pine, with its endotrophic mycorhiza, furnishes nutrient material for the Spruce, which the latter by itself is unable to procure. It is shown that Heather and many other plants of heaths have endotrophic mycorhiza, hence by analogy the Mountain Pine is better fitted for life on the heath than the Spruce. Details are required before the relationship is finally proved. The suggestion that one tree may provide food for the growth of another species is one which has hitherto received little attention, and, if proved, will have an important bearing on forestry.—*W. G. S.*

Stachys tuberifera, Notes on the Introduction and Culture of. By E. Brucalassi (*Bull. R. Soc. Tosc. Ort.* 1, p. 17, Jan. 1904).—A native of China and cultivated for a long time in Japan, where it is known under the name of *chono-gi*. It was introduced into Europe about 1882, and cultivated for the first time in France, thanks to the researches and studies of M. Paillieux. It was introduced into cultivation in Florence for the first time in 1899 at the Royal School of Pomology. It belongs to the *Labiatæ*, and perennates by means of its white rhizomes, which reach a length of about 5 cm. by 14 mm. in diameter. The constrictions at intervals give the rhizome a screw- or shell-like appearance. The square stems are about 40 cm. high; the stalked leaves are opposite, with crenulate margins, and slightly acuminate. The sessile flowers have a campanulate calyx and purple corolla about 12 mm. long. Fertilisation rarely takes place, and seeds are therefore difficult to obtain.

It should be planted in a light soil, chiefly for facilitating the digging of it in winter.

In February the rhizomes are planted at intervals of 30 cm. and at a depth of 5 cm. in furrows 50 cm. apart. When the shoots are 15 cm. high they must be supported and the soil weeded. The tubers are gathered when the aërial shoots are completely withered, *i.e.* in November or December. The rhizomes can be stored in light, moist sand.

The plant is quite hardy; the culture is very easy, inexpensive; and the production is abundant and remunerative. For eating it is prepared with sauces of various kinds, and is sometimes pickled. It has a pleasant taste, and contains a large quantity of easily assimilable substances.

W. C. W.

Stapelia Pillansii. By N. E. Brown (*Gard. Chron.* No. 903, p. 242, fig. 100, April 16, 1904).—This fine and distinct species was collected in South Africa by Mr. N. S. Pillans. A full description of the plant and a good figure are given.—*G. S. S.*

Starch-formation of Leaves in various Solutions (*Beih. Bot. Cent.* xviii. Abt. i. pp. 133–146).—Reinhard and Suschkoff (Charkow) find that when leaves are placed in saccharose solution the amount of starch formed depends on temperature. A temperature of about 25° C. seems to be the optimum in most cases. An acceleration at first, but eventually less starch is formed with ·01 per cent. chinin and natrium chloride. Caffein, antipyrin, morphium, are favourable, and iron chloride and zinc sulphate are at first of advantage. The effect of ether is not very clearly brought out. Asparagin and "Harnstoff" at first assist in the starch-production, but eventually inhibit the formation of starch.

G. F. S.-E.

Starch-grain Theory of the Action of Gravity. By H. Schröder (*Beih. Bot. Cent.* xvi. pp. 269–288; with 1 plate).—Gives further evidence towards the theory that starch-grains assist in the perception of the gravity stimulus much as the statoliths of the ear assist in hearing. He found cells with movable starch-grains in all the Angiosperms studied generally as a sheath; similar cells occur in Gymnosperms, *Equisetum*, Ferns, and *Marsilia.* They also are found in geotropically sensitive flowers. The peculiar bodies in the tip of the root-hairs of *Chara* probably act as statoliths. The time required by the statolith to change its position is always shorter than the time required by the root-hair to change its direction. No such bodies were discovered in the shoot of *Chara.* It is doubtful if the oil-drops in Phycomyces act as statoliths. Many papers dealing with this subject are cited in the text.—*G. F. S.-E.*

Starches, West Indian. By W. R. Buttenshaw, M.A. (*Jour. Imp. Agr. Dep. W.I.* vol. v. pt. 1, 1904, pp. 1–40; with 15 woodcuts).—This exhaustive paper treats of the various kinds of starches which are yielded by the starch-producing plants of the West Indies. In addition to the ordinary food-plants, the list contains a number of plants that serve for feeding purposes in times of scarcity. These starch-plants are arranged according to their natural orders. This is followed by an account of the preparation of starch from the foregoing plants, and a dissertation on the microscopic characters of starch-grains. The latter includes the three systems of classification of starch-grains, viz. (1) Vogel's table of the starches and arrowroots of commerce, (2) Muter's table for the detection of starches, and (3) Blyth's classification. After describing a number of fruit-grain and tuber starches, the starch-grains of many of which are figured, a table is furnished of the measurements of thirty-three varieties of starches. The only cereal grains included are Maize and *Sorghum vulgare.* The commercial starches are cassava, tous-les-mois, the arrowroot of *Maranta*, and that of the Yams and Sweet Potato. It is a useful contribution to economic botany.—*M. C. C.*

Statoliths in Cucurbitaceæ, On the Distribution of. By Miss D. F. M. Pertz (*Ann. Bot.* xviii. Oct. 1904, pp. 653–654).—A note as to the presence of scattered starch and falling starch in various *Cucurbitaceæ*. The results do not conform exactly with those of Tondera.—*A. D. C.*

Stellaria nemorum, The Formation of Hibernacula in. By F. W. Neges (*Flora*, xciii. 1904, pp. 160–163; 1 cut).—This species emits from the lower nodes long suckers with small reflexed leaves and elongated internodes, which hang down the rocks and in the autumn penetrate and branch into sods of moss or damp earth. These branches are richly rooted, with crowded subsessile leaves, elongated and fleshy, recalling those of a Cerastium. The runners appear to be neither geotropic nor heliotropic (+ or —), but simply hydrotropic. They serve to extend the distribution of the species.—*M. H.*

Stigmarian Rootlets, The Vascular Supply of. By F. E. Weiss (*Ann. Bot.* xviii. Jan. 1904, pp. 180–181).—A supplementary note to the author's paper on Stigmarian Rootlets which appeared in *Ann. Bot.* 1902. Since then another slide has been obtained showing the vascular supply to form a complete network in the outer cortex.—*A. D. C.*

Stomata, A Self-recording Method applied to the Movements of. By F. Darwin (*Bot. Gaz.* xxxvii. No. 2, p. 81; with 15 figs.).—The experiments were recorded by means of a Callendar's recorder, a platinum or resistance thermometer, in which the difference between the temperatures of two fine platinum wires is recorded on a revolving drum.

A leaf with stomata shut is as a rule warmer than one when they are open, as the cooling effect of transpiration acts on the leaf. After describing the process the author discusses the effect of withering. The first effect of severing the leaves is an opening of the stomata, followed by their gradual closing. The cutting off the leaf is accompanied by a practically instantaneous fall of temperature. The effect of dry air was next considered. The closing of stomata, according to Stahl, is due to the loss of water by the guard-cells. Mr. Darwin thinks they do so "in response to a stimulus," possibly "the slight flaccidity of the rest of the leaf." Aloi observed that leaves exposed to a very dry atmosphere may have widely open stomata if the plants are well watered. From his experiments it appears that "the closure of the stomata depends on the loss of water in the plant as a whole being greater than the intake."

This is corroborated by compressing a stem, when "the checked water supply produces closure of the stomata."—*G. H.*

Strawberry, Hautbois, Cropping of. By F. M. (*Gard. Chron.* No. 919, p. 85, August 6, 1904).—This paper is a summary of one by Prof. E. Zacharias, in the "Proceedings" of the Natural History Society of Hamburg, 1903, detailing some experiments made by the author to prove the truth of the opinion, prevalent among growers of the "Hautbois Strawberry," that the variety has degenerated owing to long cultivation.

The result was that "the observations taken in the Botanical Garden (Hamburg) afford no support to this theory." The proper way of growing this Strawberry is then given.—*G. S. S.*

Strawberries. By L. C. Corbett (*U.S.A. Dep. Agr. Bur. Pl. Ind., Farmers' Bull.* No. 198, 1904).—The introduction to this bulletin gives an account of the parentage of the Garden Strawberry.

Our cultivated variety owes apparently little or no relationship to our native wild berry, but comes to us as an American product, the descendant largely of a wild Chilian Strawberry, *Fragaria chiloënsis.*

The Strawberry is a specially convenient subject for the producer of new varieties, inasmuch as a new and profitable sort, once procured from seed, may be propagated indefinitely by runners, without any fear of change of character.

The bulletin describes all the processes of field culture, forcing for winter fruit, preparing young plants for sale and transplantation, picking, and shipping to near or distant markets. It recommends the use upon the plants of some highly nitrogenous manure at blooming time, such as nitrate of soda at the rate of about 100 lb. per acre, applied preferably in solution.

"If the fertility of the soil is little more than enough to support the plant, when the heavy strain of fruit production comes on, the plant will only perfect the number of fruits its food supply will allow; hence the advantage of applying quickly available plant foods just at this critical time."

Hybridisers are reminded that many individuals, even of the heaviest fruiting Strawberries, have imperfect or pistillate flowers, and that it will be necessary, in order to secure a supply of pollen to fertilise the seed, to plant every fourth row with pollen-bearing plants flowering at the same time as the imperfectly flowered ones.

The bulletin concludes with an outline map of the United States divided into numbered sections, and a list giving after each number the names of the most suitable varieties of Strawberry to grow in that section; for while "no fruit is perhaps more cosmopolitan than the Strawberry, yet this is only made possible by the great variation in sorts adapting it to all the varied conditions of soil and climate which it has to encounter."

M. L. H.

Strawberries. By L. R. Taft and M. L. Dean (*Agr. Exp. Stn. Michigan, Bull.* 213–214, pp. 3–10).—Thrive under a great variety of conditions, best on moderately heavy sandy loam or a light clay-loam soil, with abundance of moisture, yet fairly drained. The soil should contain a considerable amount of humus. There is no better way of fitting land for the crop than to turn under a heavy clover sod. The use of liberal amounts of stable manure (30 or 40 two-horse loads per acre) is also advisable, but it should be thoroughly decomposed. If it is not thoroughly decomposed it is advisable to apply it one year in advance, and use the land for some hard crop. If there is a fair amount of humus, use 50 or 100 bushels of wood ash, or, say, 100 to 200 lb. of nitrate of soda, 200 to 300 lb. of muriate of potash, 200 to 300 lb. of ground bone, 200 to 300 lb. acid phosphate per acre. Plough, drag, roll, loosen surface with smoothing harrow. In early spring the plants are ordinarily set in rows $3\frac{1}{2}$ to 4 feet apart, and from 2 to 3 feet in the rows. This makes it possible to cultivate the land both ways for a number of weeks and thus save considerable hand labour. Medium-sized plants from one-year-old plants, the first or second plants from the parent plant, are considered best. Land is marked out by a corn marker, plants are set with dibble or spade. During the first year cultivate frequently by horse, with an occasional hand-hoeing. The width of the rows is restricted to about one foot, by cutting off all runners that start after this space has been covered, by means of a rolling cutter which can be attached to a cultivator.

If the plants have made a strong growth they will have filled the row by September 1, and the production of plants can be checked and the development of fruit buds aided if some crop is sown between the rows to act as a winter mulch. Barley seems especially adapted to the purpose, although oats will give good results. Under favourable conditions these crops will reach a height of one to two feet before they are killed by frost, and falling down will form a very effectual mulch. The mulching protects the plants from the breaking of the roots caused by the alternate freezing and thawing of the land in spring. After further cultural notes, the results of trial of some 24 varieties of Strawberries are given, also trial of Blackberries and Cherries.—*C. H. H.*

Strawberries, an Experiment in Shading. By V. M. Taylor and V. A. Clark (*U.S.A. Exp. Stn. Geneva, N.Y., Bull.* No. 246, Feb. 1904).—The results of experiments in shading Strawberries with thin cheese cloth, supported on stakes about 20 inches above the ground, show that the slight increase of yield in some varieties was not enough to offset the cost of shading; and in one of the experiments in which the cloth used was slightly thicker than in the others the yield was actually reduced.

The interference with the access of light to the plants was a decided objection; and though in some cases the fruit gained in size, it was at the expense of sweetness. Earliness was little affected by the cover, in spite of the fact that the temperature, except on a few very grey days, was uniformly higher under the cloth than outside. The cover proved a protection against frost, but this could have been obtained more cheaply in other ways. In some general remarks at the end of the bulletin it is pointed out that—1, shading preserves soil moisture by lessening evaporation and transpiration; 2, it increases the temperature of air and of soil, stimulating the plant to more rapid growth; 3, it diminishes the intensity of the light, promoting the growth of aërial vegetative parts, but interfering with the fruiting function. It should therefore prove beneficial to plants like Celery, Lettuce, &c., in such regions as the Great Plains, where there is a high percentage of sunshine, a rather light rainfall, and a considerable wind, with a consequent high rate of evaporation.

M. L. H.

Strawberry-growing. By W. L. Howard (*U.S.A. Agr. Exp. Stn. Missouri*; May 1904).—Strawberries are grown between the rows for the first few years, in Peach and Apple orchards; thriving best on fairly fertile, cool, yet well-drained land. Though a great many successful Strawberry fields are on very stony land, the stones prevent loss of moisture from the soil and baking after rain.

As preparation for Strawberries, if time allows, cowpeas or clover may be grown for ploughing in ; if this is not feasible fresh manure may be applied in the autumn ; if applied in spring it should be thoroughly rotten. Autumn ploughing allows earlier planting in spring, as the land dries more quickly. "For Strawberries one should harrow as long as it seems to be doing any good at all, and then harrow two or three times more," afterwards roll. 'Excelsior' is grown as the earliest Strawberry and 'Gandy' as the latest. It is advised commercially to limit oneself to two or three varieties. For planting, use only the first three runners, next the parent plant ; an inch or two of the tips of the roots should be clipped off, and all the leaves, except two or three of the youngest, removed to lessen evaporation ; for commercial purposes it is generally best to plant in the spring to lessen evaporation. If blossoms appear they should be immediately pinched off. The rows should run north and south, four feet apart, and the plants 18 inches to 2 feet apart in the row. The three methods are in hills, in matted rows, and in solid beds. If in hills, all the runners should be cut off as fast as they form, to prevent the plants from spreading. The matted row is the common method for both commercial and home plantings. The mat is allowed to form a strip from 12 to 18 inches wide, and the remaining space between the rows is kept clear by cultivation. For home use where one has only a few square feet of ground, plants are sometimes allowed to form a solid mat over the entire space; grown this way they become so badly crowded that the fruit is very small and inferior. In planting, spread the roots so as to come in contact with as much soil as possible. A good plan is to plant in a wedge-shaped hole made by a spade ; the roots are spread out in the shape of a fan, and then firmly planted by pressing back the earth against the roots, and stepping on both sides of the plant. When setting the plants, it is best to have them in a bucket containing a little water, in order that the roots may be kept moist until they are planted. It is not necessary or advisable to water the plants immediately after setting them.

If the plants are set in the spring it will be necessary to begin cultivation within a few days.

After this, every week or ten days the cultivator should be at work in the field. The object should be to keep the surface stirred to prevent the soil baking. If the rows are straight, one can cultivate up to within two or three inches of the plants. The remainder of the space will have to be pulverised well with the hand hoe. At no time during the season will it be necessary to cultivate the soil deeply, a mere scratching of the surface being sufficient. In midsummer, when the runners are forming rapidly, the cultivation will have to be confined more towards the centre of the rows, in order to allow the runners to take root for a few inches on either side of the plants. Occasional cultivation will continue till late in August ; no weeds should be allowed to seed.

The following summer, when the straw or grass mulch has been removed after the fruiting season is over, the cultivation should begin and be kept up until early autumn.

It is usual in early winter, when the ground is first frozen, to mulch the Strawberry rows with clean wheat straw or prairie hay, the object of which is to prevent frequent freezing and thawing of the soil, which breaks the roots of the plants and causes them to "heave out of the ground." If straw is used it should be applied, if possible, to a depth of four or five inches, but a thinner layer would furnish a great deal of desirable protection.

In early spring, when the plants begin to grow, the mulch, if applied heavily, should be raked away from the plants sufficiently to allow them to get through, the material being deposited in the spaces between the rows. The straw is useful during the fruiting season to keep the berries from contact with the ground and being soiled. As soon as the fruiting season is over the mulch has served its purpose, and may then be removed by either working it into the soil by cultivation, or, if the plants show signs of disease or being troubled with insects, they may be mowed down and the whole field burned off. The burning is best done when there is a brisk wind blowing, so that the fire will pass quickly over the ground and not injure the crowns of the plants.

Strawberry fields should be picked every day, when dry, not wet from heavy dew or rain; late in the afternoon, for early the next morning, for local market. For large shipments the fruit is picked during the day, carefully crated at the packing-sheds in boxes containing 24 quart boxes, and hurried into the refrigerator car. Women and girls are found to make the best pickers, then boys from the neighbourhood are fairly reliable. Metal checks are issued for each four or six box tray delivered to the packing-shed. The average price for picking is $\frac{3}{4}$*d.* per quart box. It is becoming common for buyers to purchase the fruit loaded on the railway truck. The average price is 6*s.* 3*d.* to 7*s.* 3*d.* per crate of 24 quart boxes. An average yield is about 150 crates per acre=450 pecks. It is estimated that harvesting the fruit costs about £15 per acre.

Irrigation.—The Horticultural Department of the Experiment Station has found by careful tests that the yield of Strawberries may be increased in a dry season as much as six times by watering the plants at the proper season. The water is carried to the field by V-shaped wooden troughs made by nailing together 5- or 6-inch boards. The water is distributed through 4- to 8-inch canvas pipes. In the field it is distributed by flowing through holes bored in the bottom of a 16-foot wooden trough, which will reach across five rows. The water should be applied during the latter part of July or the month of August. At this time the fruit buds are being formed to produce the berries for the coming season, and if the plants be watered and kept in a vigorous growing condition it may almost be guaranteed that there will be an abundant crop the next summer.

If land is properly prepared by previous cropping, the first crop will be matured without adding any more fertilising materials to the soil. If plants seem to require stimulating after this, well-rotted farmyard manure may be applied to the land by spreading between the rows. If it be possible to allow the straw mulch to rot on the land by being worked into the soil, much fertility will be added. If commercial fertilisers are used, materials may be mixed to yield a formula of ammonia 3 per cent., phosphoric acid 7 per cent., potash 9 per cent.

Each fertiliser being purchased with an analysis, it may be worked out what quantity of each to use.

100 lb. nitrate of soda, 100 lb. of sulphate or muriate of potash, and 300 lb. of acid phosphate or dissolved bone is recommended as a general fertiliser; scatter between rows, not on plants. It is stated lime should never be used on land for Strawberries. *C. H. H.*

Sugar Beet, Influence of Environment on the Composition of the, including a Study of Irrigated Sections. By H. W. Wiley (*U.S.A. Dep. Agr. Bur. Chem., Bull.* 78, 1902).—Reports on the influence of environment on the constitution of the Sugar Beet in sections where irrigation is practised. The average of sugar in Beets from the irrigated areas is 2·4 per cent. higher than that of the other stations. Analysis of soils on irrigated and non-irrigated stations shows a larger percentage of insoluble matters in the former, which are more highly basic, while the non-irrigated are more acidic in character. The large quantities of lime and potash present in the irrigated soils cannot fail to be of lasting benefit to such a crop as the Sugar Beet.

Unobstructed sunshine is not absolutely necessary to the normal development of the sugar-content of the Beet. In fact, during the very hot days of summer a screening of the sunlight by clouds may even prove beneficial. This observation does not of course apply to artificial shade, which induces etiolated growth and hinders assimilation. In such cases greater comparative quantities of non-sugars are formed, and the value as well as the quantity of the Beets produced is greatly diminished.

F. A. W.

Sugar Beet, The Principal Enemies of. By F. H. Chittenden (*U.S.A. Dep. Agr. Div. Ent. Bull.* No. 43).—A brief account is given in this bulletin of some 69 different insects that injure the Sugar Beet crop. Fortunately these are chiefly, if not entirely, American insects, though of many we have their "doubles" in this country and on the Continent. The life-history, with the best means to employ for the destruction of the various insects, is given, and also a figure of each insect in all its stages.

G. S. S.

Sugar Beets and Mangels. By F. C. Burtis and L. A. Moorhouse (*Agr. Exp. Stn. Oklahoma, Bull.* 61, Jan. 1904).—These were field experiments conducted in Oklahoma to determine the comparative yields of Sugar Beets and Mangels on the station farm.

It had been decided, as the result of other experiments, that the cultivation of Sugar Beets for sugar production was unprofitable, but as an additional and succulent ration for the winter feeding of stock these roots were invaluable.

Other experiments of the same nature were undertaken with Kafir Corn and Indian Corn, and also with Oats. The English sparrow proved very troublesome, reducing the grain obtained from Kafir Corn by $\frac{1}{4}$ to $\frac{1}{3}$.

C. H. C.

Sugar Beets, The Relation of, to general Farming. By C. O Townsend (*U.S.A. Dep. Agr. Year Book*, 1903, p. 399; illustrations).—A very interesting article is here given upon this subject. The general farmer, who grows the bulk of the Beets used in the manufacture of Beet sugar, is the most important factor connected with the Beet-sugar industry. When the Beet is taken from the ground at harvest-time, the sugar is already made. The whole process that the Beet undergoes at the factory consists simply in separating the sugar. Clay loam and sandy loam, containing a proper amount of humus, are the best soils. Alkaline soils and virgin timber soils should be avoided. The choice of locality, the preparation of the soil, and the planting and care of Beets are well dealt with. Amongst the drawbacks of Beet-farming is mentioned the heavy outlay in money, but a good fortune is prophesied for the industry.

V. J. M.

Sugar, Cane *v.* Beet (*Bull. Bot. Dep. Trin.* xliv. p. 126, October 1904).—Deals with the custom of importers of describing Beetroot sugar as containing 99 per cent. of Cane sugar; the term "Cane sugar" having been in use among chemists for pure sugar or sucrose, irrespective of the plant producing it. An extract from an article in "The Epicure" of March 1899 shows that the flavour of Cane is superior to that of Beetroot sugar owing to the large amount of carbonates of potash and soda present in the latter.—*E. A. B.*

Switzerland, History of the Flora and Plant Associations of. By Aug. Schulz (*Beih. Bot. Cent.* xvii. pp. 157–194).—Criticises the views of Marie Ch. Jerosch on the above subject. The latter holds that a small number of species—Mid-European alpine, North European alpine, Arctic-Altaic, Altaic (Mongolia), and Himalayan—inhabited the Alps at the culmination of the third and last glacial period of the Alps. They colonised the Swiss low grounds and are left as "glacial relicts." After the retreat of the glaciers a dry hot period (xerothermic) of climate, with formation of steppes, occurred. In this a southern invasion of Mediterranean and Pontic elements took place, and the loess of St. Gall (Rhine) and Wallis (Rhone) was formed. The "Föhn" plants, steppe heath associations, "xerothermous colonies" of Briquet from Savoy and other warmth-loving plants date from this time. These plants passed the ground now covered by wood or meadows during the steppe climate and penetrated to the alpine regions, where they found and still live in a climate which resembles their original one in several respects. After the steppe period followed a forest period, which has now very likely passed its prime. The alpine flora is even now changing.

Schulz criticises these views and expresses his belief in a series of postglacial changes of climate; after the last ice age there followed a hot period, then a dry hot steppe period, then a cool period, another hot period and a second cool period ending in the present climate. Much stress is laid on the existence of gaps in the present distribution of plants, and on the adaptability of plants which have been long settled under special conditions. The paper is, however, very difficult to follow without a thorough knowledge of Schulz's previous works.—*G. F. S.-E.*

Tanakea radicans. By W. B. H. (*Bot. Mag.* t. 7943).—Native of Japan. Nat. ord. *Saxifragaceæ*; tribe *Saxifrageæ*. This is a diœcious, scapose herb, with thick leaves. Scapes 6 to 7 inches long; flowers very small, with greenish-white sepals and no petals.—*G. H.*

Tecoma shirensis. By T. A. Sprague (*Bot. Mag.* t. 7970).—Native of Tropical Africa. Nat. ord. *Bignoniaceæ*; tribe *Tecomeæ*. A shrub, 4 to 10 feet high. Leaves pinnate, inflorescence terminal, with orange flowers.—*G. H.*

Telangium Scotti, a New Species of Telangium (Calymmatotheca) Showing Structure. By Miss M. Benson (*Ann. Bot.* xviii. Jan. 1904, pp. 161–177; 1 plate).—*Telangium* is a form-genus of plant-remains from the Palæozoic rocks. A description of *T. Scotti* is given, and the authoress suggests that this body is the microsporangial organ of the fossil plant *Lyginodendron*. A new theory as to the phylogeny of integument is presented.—*A. D. C.*

Thermometric Movement of the Branches in Trees and Shrubs, An Undescribed. By W. F. Ganong (*Ann. Bot.* xviii. Oct. 1904, pp. 631–644; 6 text figs.).—The observations of the author show that a number of shrubs and small trees exhibit large inward movement accompanying the fall of the leaves, and an outward movement accompanying the formation of new leaves. Besides this, there is a real seasonal movement, independent of leaf-fall and leaf-formation, consisting of an inward movement during the advancing winter, and an outward movement on the approach of spring. There exists, in addition to the seasonal movement, a secondary movement, which is closely dependent on temperature, a higher temperature resulting in an outward and a lower in an inward movement, and this movement is appreciable within a single day and night.

The movements, though correlated with changes of temperature, are not caused by temperature directly, but by the larger or smaller quantities of water which the temperature determines in the plant.—*A. D. C.*

Thunbergia primulina. By W. B. H. (*Bot. Mag.* t. 7969).—Native of East Tropical Africa. Nat. ord. *Acanthaceæ*; tribe *Thunbergieæ*. Perennial; at first silky hairy; leaves rhomboid-ovate. Flowers solitary, axillary, primrose-yellow, with an orange ring, $1\frac{1}{2}$ inch diameter, much resembling the Primrose.—*G. H.*

Tillandsia usneoides, A Study of. By F. H. Billings (*Bot. Gaz.* xxxviii. No. 2, p. 99; 1 fig. and 4 plates).—This so-called "Moss" frequents dead trees, and prefers those of a sunny situation, with scanty foliage; hence *Melia Azedarach*, with a dense foliage, is almost universally devoid of it.

The source of water supply is atmospheric precipitation, which it retains in storage tissue within the leaves. The water is absorbed by scales which cover them. During the dry spell in the spring of 1902 "Moss" plants were known to have been subjected to two months of rainless exposure without injury.

The author discusses and describes with figures the development of the embryo-sac and fertilisation, the seed and its germination, but they rarely grow. They are provided with a coma having barbs for adherence. The leaves are auricular and semicircular in cross-section, densely clothed with overlapping peltate, absorbing scales. When saturated the circumference rises, but in drought they are flat on the epidermis, and so check transpiration.

There is much reduction in the mechanical tissue; so that the leaves resemble submerged ones in this feature and in their absorbing superficially.

The guard-cells are massive and permanently closed.

The slender stems have a dense sheath of sclerenchyma fibres around their fibro-vascular bundles. This has a commercial value for stuffing purposes, forming a hair-like mass.—*G. H.*

Timber: Cross-tie Forms and Rail Fastenings, with Special Reference to Treated Timbers. By Hermann von Schrenk (*U.S.A. Dep. Agr. Bur. For., Bull.* 50).—With rising prices and gradually diminishing supplies the timber trade of the United States can hardly be said to be in a very satisfactory state. To those interested in railway timbers the present work will be of greatest value, the tie forms, rail fastenings and tie-plates, with the tests of the comparative pulling strength of various spikes, being carefully recorded.

The illustrations, which are numerous and cleverly executed, should prove useful in further elucidation of the text, there being five plates and seventy-one text figures.

With the decrease in the timber supply, the question of substitutes in the shape of granite and concrete is discussed, and may in the near future lead to a lessening of the wood supply.—*A. D. W.*

Timber, Dry Rot of (*Nat. Zeit. Land-Forst.* vols. i. and ii.; 1903-4).—Two important contributions on some of the Dry Rot problems already referred to (Journ. R.H.S. May 1904, p. 644). Prof. K. v. Tubeuf (i. pp. 249-268, 2 plates) describes his observations on pure cultures of *Merulius lachrymans* grown on gelatine and other nutritive substrata. The photographs of Petri dish cultures show how different media influence the growth. Full nutrition (*e.g.* malt extract, beef extract, &c., in gelatine) gives the best results if the medium is acid; but if it is alkaline growth is poor.

Lieut. B. Malenkovic (ii. pp. 100-109 and 160-168, 1 fig.) describes the germination of the spores of *Merulius*, and figures them. Germination took place only in acid solutions (1-2 p.c. citric acid) with malt extract, with or without meat extracts and phosphates. The spores did not germinate in many other media tried, and bacterial growths were always fatal to germination.—*W. G. S.*

Timber, Fungi on. By P. Hennings (*Zeit. f. Pflanz.* xiii. pp. 198-205, 1903).—The author considers that the number of *Agaricineæ* recorded as parasitic on living trees in the text-books is incomplete. From his own observations, he gives a list of about thirty native Agarics "which occur as partial parasites on tree-stems and timber," with short notes on each. The notes are too brief to give much information, except that the fungi were found on all kinds of timber: living stems, tree stumps, felled timber, and timber in buildings. How far the assumption can be supported that these are all parasites (even partial) will require better proof than is given before the claims can be admitted as proved. The list is useful, however, as indicating fungi whose life-histories are worthy of closer examination.—*W. G. S.*

Tobacco: Wilt Disease, and its Control. By R. B. E. McKenney (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 51, pt. 1; Sept. 18, 1903).—The wilt disease of Tobacco has been known for a number of years in North Carolina. So far as at present known, the wilt disease does not make its appearance until the Tobacco has attained about a third of its growth. The first evidence is a sudden wilting or drooping of one or more leaves. As a rule the wilting of a few leaves is followed by wilting and withering of all the leaves. Later the base of the stem blackens and rots. At times nearly the entire field will go down with the disease during the first year. Microscopic examination of wilted Tobacco always reveals the presence of a fungus belonging to the genus *Fusarium*. This is found in the woody parts of roots and stem.

As shown in other wilt diseases, the *Fusarium* is a soil fungus, and gains entrance to the plant through the fine roots. It rapidly spreads into the larger roots and up into the stem.

Once a plant becomes infected by the disease there is no hope of its recovery. The treatment must be one of prevention of the spread of the disease. The *Fusarium* has been known to live in the soil for a number of years and still be able to produce the disease, especially in mild winters. It is useless therefore to plant Tobacco on infected fields until they have rested for from five to eight years. In order to eradicate the disease all sources of infection of new fields must be destroyed. All diseased plants should therefore be burned on the field where they were grown. None of the diseased Tobacco should be mixed with manure and compost heaps. It is recommended that no fertiliser containing kainit or muriate of potash be used, as these make the conditions more favourable for the continuation of the disease.—*M. C. C.*

Tomato, The. By Ed. J. Kyle and Edward C. Green (*Agr. Exp. Stn. Texas, Bull.* 65, Jan. 1903; illustrated).—A *résumé* of the successful cultivation of early Tomatos in Texas for the trade. This particular branch of market-gardening being very profitable when successful, but offering more difficulty than other crops, farmers and growers will be sure to find the practical instruction contained in this paper most useful.

The importance of seed-testing, and, better still, of saving one's own seed from good fruit on early plants, rather than from early fruits on ordinary plants, is emphasised.

The whole process, from the preparation of the ground to the final marketing of the produce in suitable receptacles, together with likely diseases and insects, is freshly and crisply described.

The paper concludes as follows: "How much will it cost to produce an acre of Tomatos? What number of crates of marketable fruit does an acre produce? What is the price per crate usually obtained by the grower?"

The answers, based on 1902 experience, are: "The total cost of an acre of Tomatos is from $40 to $60; the range of yield from 75 to 200 crates; while prices vary from 40 to 90 cents per crate."—*C. H. C.*

Tomatos. By Taft and Dean (*Agr. Exp. Stn. Michigan, Bull.* 214, pp. 13–17).—A comparison was made between plants sown in boxes on April 13 in a greenhouse, and pricked out into flats giving a space two inches square. On June 13 the plants were transplanted into the field; at the same time seed was sown in hills. On June 20 seedlings began to show through the ground, and on July 14 were thinned to one plant in a hill, leaving the strongest and most thrifty plant. The seedlings made a very rapid growth, and grew faster and more stocky than did those transplanted. There was but little difference in the maturing of the Tomatos, but the exact difference it would be hard to determine, because so many of the varieties failed to mature the crop.

The advantage of staking Tomatos was very clearly demonstrated; as the Tomatos can be planted much closer, the fruit will be of better quality, and in excessively wet years it is possible to ripen a good crop of fruit when, if planted in the ordinary manner, it might not mature at all.

Trials were made of 82 different varieties to compare their value.

C. H. H.

The Trade-wind Scum of the South Atlantic, The Composition of. By P. F. Reinsch (*Flora*, xciii. 1904, pp. 533–536; 3 cuts).—This scum gives the surface of the sea a yellowish or greenish-yellow colour, often streaky, and disappearing in the wake of ships. This is not due to falls of pollen, as had been conjectured, but is due to the filaments of an Alga of the *Schizophyceæ* belonging to the genus *Trichodesmium*, which Ehrenberg described and named from the Red Sea sp. *T. erythræum.* The Atlantic species appears to be identical with (or at most a variety of) the *T. Hildebrantii* Gomont, and is termed by our author "forma Atlantica."—*M. H.*

Transpiration of Sun-leaves and Shade-leaves of Olea europæa and other Broad-leaved Evergreens. By J. Y. Bergen (*Bot. Gaz.* xxxviii. No. 4, p. 285).—The author first makes comparisons of colour, size, shape, and structure of leaves naturally exposed to sun, and of others in the shade, on the same plant. He then calculated the amount of transpiration (*a*) of both kinds of leaves, each in its natural environment; (*b*) in full sunlight; (*c*) in shade; with the following conclusions:—(*a*) Sun-leaves transpire from three to ten times as much as shade-leaves of the same species (*b* and *c*) with both classes of leaves; the sun-leaves more than one and a-half time as much as shade-leaves.—*G. H.*

Transvaal, Wayfaring Notes from. By R. F. Rand (*Journ. Bot.* 493, pp. 21–24; 1/1904).—Field notes on various plants near Greylingstad, sixty miles south-east of Johannesburg, including *Barleria macrostegia, Crabbea hirsuta, Gamolepis laxa,* and several specifically undetermined.—*G. S. B.*

Tree-planting for Posts, Fuel, and Windbreaks (*U.S.A. Agr. Exp. Stn. Oklahoma, Bull.* 60).—The providing of posts and fuel to the farmer who resides in out-of-the-way districts of the country will always be a matter of the most serious consideration, and the advice given in this pamphlet should do much to educate him in the proper way to set about starting a plantation and producing the necessary timber for his immediate wants. Collecting, storing, and planting the seed, with a carefully compiled table of the number of seeds to a pound weight and approximate cost, preparation of the land and transplanting, and a list of the most desirable species for the particular purpose, are all very lucidly discussed. The Black Locust, Walnut, Catalpa, and White Elm are specially recommended.—*A. D. W.*

Tree Lifting. Anon. (*Gard. Chron.* No. 905, p. 276, figs. 120, 121, 122, April 30, 1904).—An account and figures are given of a very effective apparatus for removing trees, which was designed by Mr. C. Jordan, the Superintendent of the Royal Parks, and was used in transplanting the trees in St. James's Park.—*G. S. S.*

Trees for Profit. By E. Molyneux (*Gard. Mag.* 2632, p. 247; 9/4/04).—The writer gives practical notes upon the important matter of planting forest trees for profit, and states facts in regard to the value of young Larch poles at different ages.

He also states an interesting fact about *Thuya Lobbi* as a timber tree. He planted 2,000 trees 2 feet high fifteen years ago, and these are now 20 feet high. They were planted alternately with Larch, but he does not state the distance apart they were planted.—*W. G.*

Trees, Transplanting Large. By E. Beckett (*Gard. Mag.* 2635, p. 283; 30/4/04).—The writer describes, in a practical, clear way, the method of successfully transplanting large trees.

The account is well illustrated with photographs, showing the various stages in the operations.—*W. G.*

Trees, Planting and Arrangement of. By Ed. André (*Rev. Hort.* pp. 7–11, Jan. 1, 1904; 4 woodcuts).—A very interesting article, indicating especially the advisability of planting in continuous trenches instead of square holes, the undisturbed walls of which are apt eventually to check the spread of the roots and lead to stunted growth, while the trench system at any rate facilitates lateral root extension.—*C. T. D.*

Trees and Shrubs for Shade and Ornament. By L. Cranefield (*U.S.A. Agr. Exp. Stn. Wisconsin, Bull.* 108).—This puts us in mind of some of our own publications on the selection of trees and shrubs for ornament, particularly with reference to buildings and grounds connected therewith.

Evidently this important branch of landscape-gardening is well understood at the experimental station of Wisconsin; while the great wealth of suitable material in the way of beautiful trees and shrubs renders such undertakings unusually successful.

The illustrations, too—such as of the wild Black Cherry, Golden Elder, Willow-leaved Spiræa, the Snowball and Smoke-bush—are clearly rendered, and make this interesting work of more than usual value.

Lists of suitable shrubs for the various districts are added.—*A. D. W.*

Trees and Shrubs, Ornamental. By C. B. Waldron (*U.S.A. Agr. Exp. Stn. N. Dakota, Bull.* 59, 1904).—The average lawn requires but few large trees, and these will ordinarily be at the sides and rear. Small compact trees and shrubs give a better effect, and these should be arranged so as not to break up the open effect in front nor interfere with good views from the house.

Planting in irregular masses about the boundaries of the place and close against the house, leaving a free open expanse of lawn between, will give the best results. The Cut-leaved Weeping Birch, Mountain Ash, Blue Spruce and Black Hills Spruce are specially adapted for lawn planting.

Of ornamental shrubs the common and Persian Lilac, Snowball, Tartarian Honeysuckle, Barberry, Red Dogwood, Burning Bush, Ninebark, *Spiræa* (*Vanhouttei*), June Berry, Choke Cherry, Buckthorn, Whitethorn, Buffalo Berry, Golden Currant, Elder Berry (black), Red-berried Elder, Sumach, and the Rugosa Roses are all easily grown and very ornamental.

They should be grown for the most part in clumps or masses, close about the porch and sides of the house, to relieve the bareness of the building, and also where walks diverge or curve, or against the larger trees, to hide the trunks. Shrubs give a rich and soft aspect that cannot be attained by other forms of planting.

Next follows a description of the system of forming ordinary and ornamental hedges, with description of suitable plants. In trimming, the branches are topped off by quick upward strokes. The trimming may be done any time in the summer, not later than the last of July, or the last thing before winter sets in. Trimming in late summer causes a new growth to start that is likely to be winter-killed. The older branches in a hedge, as they begin to get scraggy, may be cut out entirely, and sometimes it is necessary to cut the whole hedge back to the ground to get a new healthy growth.—*C. H. H.*

Trees, Forest, in North Dakota. By C. B. Waldron (*U.S.A. Agr. Exp. Stn. North Dakota, Bull.* 59, 1904).—Forests are one of the great conserving elements of Nature, preventing the waste and wear of the fertile elements of the soil caused by wind and water; they are grown for shelter, ornament, timber, or fuel. About 40 species of trees can be grown in North Dakota. For planting groves and shelter belts, seedling trees, from one and a half to two feet high, are most satisfactory, purchased at 13*s.* to 21*s.* per thousand, or trees that have been transplanted in the nursery at from 42*s.* to 84*s.* per hundred.

In planting, a deep open furrow is ploughed out and a line marked at intervals of four feet stretched along the furrow. One man passes along the line, holding the trees in position, while a man on either side shovels the earth about the roots. Then the earth is trod very firmly about each tree. The trees are planted as early in the spring as the soil will allow.

Trees prefer a mellow, moist soil; hard dry soil, especially if grass and weeds are allowed to grow, is inimical.

Soil must be kept constantly cultivated until such time as the trees by their own shade supply the conditions under which they will thrive. Quick-growing trees in suitable soil, two by four feet apart and kept well cultivated will make forest cover in three years.

On the other hand, trees giving but little shade will never make a forest cover sufficient to keep out the grass and weeds, no matter how planted.

In choosing trees for shelter one aims at varieties easily and quickly grown, perfectly hardy, and of dense, compact habit. A single row of trees, excepting evergreens, is not sufficient to make a windbreak. Three or four rows are required to make a perfect shelter. To give height to the windbreak a row of a quick-growing variety, as Cottonwood or Carolina Poplar, should be planted eight feet apart on the north side of a windbreak running east and west, and on the west side of one running north and south.

The same distance should be maintained between the rows. The two middle rows should be made up of trees having a compact bushy growth like the Silver Maple and Box Elder. These will endure shade and may be planted closer than four feet apart. The inner row should be a compact-growing kind. For the first few years the windbreak will need to be kept well cultivated. When the trees begin to reach across the spaces between the rows, a heavy mulch of old straw may be applied to the ground to take the place of cultivation. By the time that is gone the trees will have the weed question settled for good. Trees for a windbreak should not be trimmed, but allowed to branch freely, right down to the ground if they will; to encourage this the trees are planted further apart than they should be in a grove.

A windbreak should not be too close to house and buildings, but allow large enough space to include garden, fruit plantation, as well as a spacious yard about the buildings for planting ornamental things. The appearance is much improved by planting more or less irregular masses of shrubbery against it: these break the rather formal and harsh appearance of the straight lines of the trees and give a more artistic effect.

The primary object in planting a grove is to establish a wood lot on which to draw for supplies of fuel and posts; incidentally it may be made a very attractive feature of the farm and also serve for shelter.

A list of trees suitable for groves follows.

Seedling trees must be planted close enough together to shade each other at the sides, to prevent the growth of lateral branches, and compel an upward growth.

Trees in a grove, to be of any value, should be tall and straight. By being forced to stretch up to get the light they naturally become so.

Two feet between the trees in a row is about the right distance at first. The rows may be far enough apart to cultivate easily with a two-horse team, or about eight feet; nurse trees and permanent trees, Elm, Ash, and Basswood, should not be nearer than eight feet apart in the row.

While small, the trees may be cultivated the same as Maize, with an ordinary two-horse cultivator. Another excellent tool is the acme harrow, which cuts about seven feet wide: it is a good weed destroyer and leaves the soil well pulverised to retain the moisture; it will cultivate an acre of trees in an hour. Until the trees begin to shade the ground, they should be cultivated frequently, about once in ten days or two weeks, and especially after every rain. In ordinary seasons the cultivation should continue until the autumn, but in seasons of excessive rainfall the cultivation may stop late in the summer to give the wood a chance to ripen for winter.

In dry seasons cultivation is more imperative than in wet. As the trees become large enough to shade the ground, which they will do very quickly if well tended, less cultivation will be required after four or five years, when they will need but little. In most cases it can be done away with entirely ; a good mulch of old straw will meet all requirements.

During the first and second years the trees will be benefited by cutting off the side branches, to keep them from forking and to force an upward growth. After that they should shade each other enough, so that side branches will not form. This work may be done in the spring or summer, not later than July or in the late autumn. Pruning late in the summer forces a late growth that will not mature before winter.

If left to themselves, no matter how thickly planted, the stronger trees gradually out-top the weaker ones, and thus Nature does her own thinning. However, better results are obtained by thinning out the nurse trees when the trees become crowded : these may be used for planting elsewhere. This leaves the trees standing four by eight feet apart, and in time these will need further thinning.

List of trees for timber plantation, with description, follows, including : White Ash, American Elm, Basswood, Silver Maple, White Willow, Golden Russian Willow, Box Elder, Burr Oak, White Poplar, Hackberry, American White Birch.

For street planting the Elm is usually looked upon as the best tree, though at the present time the Box Elder and the Cottonwood are more extensively used in North Dakota. The Elm combined with the Carolina Poplar and Box Elder make a good combination. On the outside of the walk, plant the Carolina Poplar and Elm alternately, leaving twenty feet between the trees ; on the inside of the walk, plant the Box Elders opposite the Poplars. At the end of fifteen or twenty years the Poplars should be removed, leaving the Elm and Box Elder alternating on opposite sides of the walk, with a space of forty feet between the trees of each row, and a tree for every twenty feet along the walk.

Trees for street planting should be nursery-grown if possible, and in all cases should be headed high ; the trunks should be straight, and two inches or more in diameter, except Carolina Poplars, which may be smaller. It is difficult for very small trees of most varieties to grow tall and symmetrical when set in an open and exposed place ; they should preferably be grown in the nursery long enough to give them an established form and character.

In order to prevent the trees, when old, drooping and getting in the way, the lower branches should be cut away while small. This process increases the rate of growth of the upper and outer branches, and gives what is needed, a tall spreading tree.

The Elm has a tendency to an irregular or even sprawling habit of growth ; this should be corrected by cutting back the extending branches, making the top symmetrical. The typical street tree is one headed high enough not to interfere with traffic, and to allow an open view between the house and street, under the trees. The general effect is also infinitely better if the pruning be done gradually as the tree grows, instead of waiting till one final day and then cutting off most of the branches, leaving crippled, crooked trunks, surmounted by a pinched and straggling top.—*C. H. H.*

Tremacanthus Roberti. By Spencer Moore (*Journ. Bot.* 494, pp. 33–4 and pl. 456; 2/1904).—Description of the only known species of a new genus of *Acanthaceæ* from Sant' Anna da Chapada, Matto Grosso.—*G. S. B.*

Trichocaulon Pillansii. By N. E. Brown (*Gard. Chron.* No. 903, April 16, 1904, p. 242).—A new species belonging to the same family as the Stapelias. It is very seldom that any of the species belonging to this genus are found in cultivation in Europe. "They are very difficult to increase by cuttings, and, as they inhabit the very driest parts of South Africa, under cultivation they usually get too much moisture and die." This species very much resembles a Cactus in appearance.—*G. S. S.*

Tulipa Batalini. By C. H. Wright (*Bot. Mag.* 7991).—Native of Turkestan. Nat. ord. *Liliaceæ*; tribe *Tulipeæ*. Flowers golden-yellow.
G. H.

Tupistra Clarkei. By W. B. H. (*Bot. Mag.* t. 7957).—Native of Sikkim. Nat. ord. *Liliaceæ*; tribe *Aspidistreæ*. A robust herb with creeping rhizome. Leaves oblong, acuminate; flowers in spikes, 1½ inch diam., dull reddish-purple within, buff without, close to the ground.—*G. H.*

Uredineæ and Ustilagineæ of Essex. By F. J. Chittenden (*Essex Naturalist*, vol. xiii. part 6, 1904).—This communication contains an enumeration of 86 species of rust and smuts hitherto found and recorded for the county of Essex, with their hosts and localities. As these fungi are parasitic on living plants, county lists are of considerable interest.
M. C. C.

Uredineæ, On Fertilisation, Alternation of Generations, and General Cytology of. By V. H. Blackman (*Ann. Bot.* xviii. July 1904, pp. 323–367; 4 plates).—*Phragmidium* and *Gymnosporangium* were investigated. The alternation of stages with single and paired nuclei, as described by Sappin-Trouffy, was confirmed, as was also the fact that it is in connection with the æcidium that the binucleate stage first appears.

The author finds the two-nucleate stage to occur in special cells of the young æcidium, which he terms *fertile cells.* These fertile cells become binucleate, not through division of their original nuclei, but by the migration of the nucleus of a neighbouring vegetative cell of the mycelium. This process is regarded as a reduced form of fertilisation, the fertile cell having the character of a female cell in that it is stimulated to further development by the entrance of a nucleus from without.

The cytological characters of the spermatia lead the author to conclude that these are male cells which have become functionless.

If spermagonia and æcidia represent male and female reproduction organs, a distinct alternation of generations may be regarded as present, the gametophyte generation starting with the uninucleate teleutospore, and the sporophyte with the fertilised cell in the æcidium.—*A. D. C.*

Vanda pumila. By W. B. H. (*Bot. Mag.* t. 7968).—Native of Sikkim. Nat. ord. *Orchideæ*; tribe *Vandeæ.* Racemes 3-flowered; flowers very fragrant, ivory-white, 2 to 2½ inches diam., lip striped with crimson, having an obconical spur.—*G. H.*

Variegation contagious (*Rev. Hort.* p. 402, Sept. 1, 1904).—M. Lindemuth notes numerous instances of variegation being transmitted to stocks by grafts of variegated plants, sometimes to such an extent as to cause entire etiolation and death.—*C. T. D.*

Vascular Bundles and Forms of Vessels, Types of. By P. Emmanuel Scherer (*Beih. Bot. Cent.* xvi. pp. 67–110; with 3 tables).—Describes nine types of monocotyledonous vascular bundles, and shows that the structure is altered by the time at which vegetation begins or ceases. Small vessels or tracheids are not always formed at first, for, in the case of some bulbous plants, there is a sudden beginning and short duration of the vegetation period. Annular and spiral vessels allow of longitudinal stretching, and are hence common in young parts of stems, less so in roots. Some roots also appear to show evidence of elongation, but most have porous thickening and a very short growth zone (except aërial roots). One and the same vessel shows different thickenings at different points. The narrow radial vascular bundle in stem and leaf of *Scilla bifolia* is a mechanical adaptation. The author lays stress on the necessities of supporting the stem, of preventing collapse in the vessels, and of providing for hydrostatic pressure in the root as explaining several structural details. The paper is both suggestive and interesting.

G. F. S.-E.

Vascular Bundles of Dicotyledons, Investigations on. By A. Col (*Ann. Sc. Nat. Bot.* xx. pp. 1–281; 40 figs.; 1904).—A comparative study of anomalous vascular bundles in Dicotyledons. These bundles may occur in the pith, or in the cortical region outside the normal vascular ring; they may be bundles with phloem and xylem elements, or they may consist only of phloem. About 150 species are dealt with, and, as many of them are figured, the paper is an exhaustive one. Following the introduction, the first part (pp. 17–97) deals with the *Campanulaceæ.* Some species have anomalous bundles in the leaf only, the stem bundles being normal; other species have anomalous bundles in the stem. The pith bundles in most cases are downward prolongations of bundles of the normal ring, which, if traced downwards, are seen to break away from the ring (generally at the junction of two vascular branches) and to enter the pith; these medullary bundles may either end blindly, or, more frequently, they return to the normal ring lower down the stem. The second part is a comparison of results obtained for the *Campanulaceæ* with anomalous bundles of other Dicotyledons. A chapter (pp. 99–151) is devoted to anomalous bundles occurring in the leaf only, the stem being normal, Anomalous bundles in the stem are dealt with in another chapter (pp. 151–206). The chief feature of this part of the work is the agreement with the results obtained for *Campanulaceæ*, and the proof that in the majority of the cases the anomalous bundles are produced at junctions of the normal bundles, and after a course through the pith they frequently return again and join the normal vascular system. Cases of anomalous bundles in the floral organs are also considered. The arrangement of the bundles in the stem and the gradual reduction of the leaf-trace bundles from their insertion downwards are more carefully entered into for a few selected species of *Phyteuma*, *Eucalyptus*, and *Erigeron* (pp. 215–247). The "phyton" theory is discussed at some length. In a general summary the chief results are gathered together.—*W. G. S.*

Vegetative Cell Division in Allium. By M. L. Merriman (*Bot. Gaz.* xxxvii. No. 3, p. 178 ; with 3 plates).—The details are given under the headings Cell-differentiation, the Achromatic Figure, Centrosomes, Nucleoli, the Chromatic Figure. The plates are photo-reproductions of karyokinesis in various stages.—*G. H.*

Vellozia trichophylla. By W. B. H. (*Bot. Mag.* t. 7962).—Native of East Tropical Africa. Nat. ord. *Amaryllidaceæ* ; tribe *Vellozieæ*. This plant has a thick stock upwards of a foot in diameter. Flowering shoots numerous and very short. Leaves grass-like ; flowers reddish-lilac, very fragrant, 2½ to 3 inches across.—*G. H.*

Venation of Iridaceæ Petals. By Ludwig Singhof (*Beih. Bot. Cent.* xvi. pp. 111–146 ; with 1 table and 25 text figures).—The author has investigated the venation of the petals of 206 species (belonging to 26 genera) of this order. The six types distinguished are : 1, one main nerve and two simple lateral ones ; 2, main nerve and two simply branched side ones ; 3, main nerve and two side nerves, all with numerous anastomosing branches ; 4, main nerve with two side nerves which give off at base a branch almost as large as themselves ; 5, main nerve and two side nerves of which each gives off two branches nearly equal to themselves ; 6, main nerve with two side nerves of which each gives more than two large branches. The genera do not fall exactly under these types.

G. F. S.-E.

Verbena bonariensis. By A. B. Rendle (*Journ. Bot.* 504, p. 370 ; 12/1904).—Description of a new species with somewhat the habit of *V. microphylla*, but distinguished by small trisected leaves and larger flowers. These latter are apparently mauve or lilac. It was collected by Mr. Hesketh Prichard on the slopes of Mt. Buenos Aires, Patagonia.

G. S. B.

Veronica Traversii. By W. Dallimore (*Garden*, No. 1725, p. 391 ; 10/12/1904).—The shrubby species of *Veronica* form an exceptionally interesting group. Unfortunately they are not very hardy, and, as a whole, are not to be depended on except in the warmer parts of the country. In Devonshire, Cornwall, South Wales, and other places it is a common thing to see great bushes of *V. speciosa* covered with purple flowers, and very fine they look. About London, however, it is impossible to grow *V. speciosa* out of doors the whole year round, and, of the forty or fifty species in cultivation, very few can be said to be sufficiently hardy to stand unharmed through a winter of moderate severity. *V. Traversii* stands the best, though in a very severe winter it is damaged; but when a succession of mild winters is experienced it becomes strong and sturdy, and grows into a bush 2½ feet or 3 feet high, and 3 feet to 4 feet through. Like the other shrubby species, it is from New Zealand.

The leaves are small and deep green, the flowers white with purplish anthers, and borne in short, stiff racemes in summer.—*E. T. C.*

Viola calcarea. By Mrs. E. S. Gregory (*Journ. Bot.* 495, pp. 67–68 and pl. 457; 3/1904; and 498, pp. 186–7, 6/1904).—A claim for specific rank for the Violet from chalk and limestone hills in Somerset, Cambridgeshire, Bedfordshire, Kent, Surrey, and Dorset, previously considered a state, form, or variety of *V. hirta.* Its distinctive characters are a woody rootstock with thick branches, peduncles much longer than the leaves, narrow petals, and a very short, almost imperceptible, straight, conical spur.—*G. S. B.*

Violets, Floral Variations among. By C. E. Britton (*Journ. Bot.* 497, pp. 140–148; 5/1904).—A careful study of the flowers of 1,000 specimens of each of the five species, *Viola odorata, V. hirta, V. sylvestris, V. Riviniana,* and *V. ericetorum,* as growing wild in Surrey.—*G. S. B.*

Vine Borders, in and out. By S. Castle (*Fr. Fl. & Veg. Trades Jour.* No. 8, p. 114).—It is contended that the wet summer of 1903 reveals the fact that outside borders for Vines have produced crops of both 'Alicante' and 'Gros Colman' Grapes of a far heavier character than is usual, and this is put down by the growers as due to the extra rain supply to the roots of such borders. It is true that successful crops have been obtained from inside borders, to which very free waterings were applied; but one leading grower, who has both inside and outside borders, says that the result cannot be put into comparison with the rain-watered borders. That the outside border in a dry season does suffer, even under good culture, is very often the case; but no amount of water put on by the cultivator can ever equal the rain-water supply; the natural constituents of the latter give it a value over that from the usual pipe supply.—*R. D.*

Vine Diseases, Simple Cure of. By Ed. André (*Rev. Hort.*, Feb. 16, 1904, pp. 83–84).—*Oidium* completely eradicated by syringing with very hot water from 70° to 80° Cent., which Vine leaves bear with impunity, though adjacent Rhubarb leaves were parboiled. Woolly aphis yielded to syringing with concentrated infusions of Walnut leaves. A trial was made, with complete success, of brushing infected places hard with stiff bunches of green Walnut leaves rubbed vigorously in. The pest entirely disappeared.—*C. T. D.*

Virescence and Proliferation of Flowers produced by Parasites acting at a distance. By M. Molliard (*Compt. Rend.* Nov. 1904, p. 930).—One of the most frequent cases of virescence is presented by *Trifolium repens*. This consists essentially in an atrophy of the stamens, and a transformation, more or less pronounced, of the sepals, petals, and carpels into green, foliaceous leaves. Although teratological literature abounds with references to this monstrosity, its cause remained undetermined up to the present. The author has, however, succeeeded in clearing up this point, and has shown that the monstrosity is due to the presence of the larva of an insect in the stem, probably that of *Hylastinus obscurus*, Marsh. The larva forms galleries in the pith from the stock upwards. Here and there the larva penetrates between two fibro-vascular bundles to feed on the cortical tissue. The disturbance caused by the work of the larva, the filling-up of the vessels of the plant by gum, &c., prevents the circulation of the sap, and thus modifies very materially the structure of those parts of the plant situate above the gallery formed by the larva.

A larva was found in the pith of every monstrous plant examined, but could not be found in healthy plants. In *Melilotus arvensis* the flowers are equally virescent, often to a very marked extent. This teratological transformation was found to be caused by a larva belonging to the *Curculionidæ*, and very probably that of *Apion meliloti*, Kirby. The galleries are in this instance also formed in the neck and branches. No larvæ could be found in normal plants of *Melilotus*. Other instances are recorded, and it is considered as proved that in many plants, at all events, proliferation and virescence are caused by the larva of an insect forming galleries in the pith of the stock or branches.—*G. M.*

Vitality of Seeds. By W. T. Beal (*Bot. Gaz.* xxxvii. No. 3, p. 222).—Seeds were put into earth for twenty years. They germinated very unevenly. The plants were thirteen in number, as follows:—*Amaranthus retroflexus*, *Brassica nigra*, *Capsella Bursa-pastoris*, *Anthemis Cotula*, *Malva rotundifolia*, *Œnothera biennis*, *Polygonum Hydropiper*, *Rumex crispus* and Chickweed and *Verbascum Thapsus*, *Lepidium virginicum*, *Portulaca oleacea*.—*G. H.*

Vitality of Vegetable Seeds, Tests of. By C. H. Jenkins (*U.S.A. Exp. Stn. Conn. Rep.* 1903, pp. 432–439).—The results of a large number of tests of vegetable seeds of varying age are reported. Among those that showed marked decrease in vitality as age increased may be mentioned Brussels Sprouts, Carrot, Dandelion, Kale, Leek, Onion, Parsley, Parsnip, Radish (after second year), and Water-melon.—*F. J. C.*

Vriesia psittacina var. **Morreniana** (*Gartenflora*, Feb. 1, 1904, p. 57; coloured plate).—A hybrid between *Vriesia psittacina* × *Vriesia brachystachys*, the former being a native of the Brazilian province of Rio de Janeiro, and the latter of the provinces of S. Paulo and Santa Catharina. *Vriesia psittacina* var. *Morreniana* should be cultivated in light soil in the hot-house. Its culture gives little trouble.—*R. C. R. N.*

Wall Gardening (*Garden*, No. 1704, p. 35; 16/7/04).—Wall gardening, among its many charms and merits, has the great one of making a good show sooner than can be obtained by any other kind of permanent planting. When we plant shrubs and trees we have to wait four or five years before they look at all mature; a border of hardy plants must have at least two years to come to fair strength; but wall plants, with their roots in the cool depths and their heads in the sun, grow away at once, and reward the careful planter well within the year. It is only needful that the wall shall be thick enough to allow the moisture to condense within it. Retaining walls are the best, because the soil that is supported by one of their sides stores a constant supply of moisture in immediate contact with them. In such a wall you have only to make a little opening, introduce the roots of your plant, and fix it in position with a little moss or sphagnum, or a little rather stiff mould; then you make it all firm by means of a few small angular stones.—*E. T. C.*

Water-plants, Fruits and Seeds of Certain. By Adolf Fauth (*Beih. Bot. Cent.* xiv. pp. 327–373; with 3 plates).—The author gives some interesting details on the anatomy, germination, and distribution of the following plants:—*Alisma Plantago* has a floating fruit (through intercellular air spaces in the carpels) and is protected by the woody thickening in the carpels and cork-testa. The radicle, in germination, fixes itself by root-hairs, and cotyledon becomes green. *Alisma natans.* The carpels have fibrous strings and the protection of the seed is due to the two lamellæ, of which one is formed from the nucellus remains, and the other from the remains of the embryo-sac. *Sagittaria sagittifolia.*—The seed does not fill the cavity of the carpels, so that the fruit has an air space which makes it able to float in water. Part of the pericarp consists of cork, but there are two or three intercellular oil canals, of which the oil helps in the floating of the seed. They swim a long time and germinate next spring. *Butomus umbellatus.*—Seeds have peculiar ribs, running lengthwise, and formed of projecting epidermis cells. They fall into the mud and are well protected by the hard testa. *Callitriche stagnalis.*—The pericarp, which is somewhat fleshy, becomes decayed, and the four stony seeds separately drop into the water. Probably parts of the plants with seeds are carried away by the current, or the seeds may be distributed by water-current. A hardened part of the pericarp protects the seed. The radicle is short and is pushed out of a gap in the stony shell by the growth of the hypocotyl. The seedling (except root) is covered by peculiar gland-hairs. *Hippuris vulgaris.*—A somewhat fleshy one-seeded stone-fruit from an inferior ovary. Protected by the hard inner pericarp; cotyledon becomes green. *Myriophyllum spicatum.*—The ovary is also inferior and contains four seeds, which have each a protecting stone derived from the pericarp. A peculiar plug of cellulose formed at the top of the seed closes in the stone at the top, and is pushed aside by the embryo in germination. The branching habit and position of the flowers at the ends of the branches probably ensure the seeds dropping at little distance from the parent when the fleshy part of the carpel is decayed. Sometimes also the branches are frozen in the ice and carried off when the ice breaks. *Limnanthemum nymphoides* has a green berry fruit. The seed floats, especially as it is flat in shape and has a circle of buoyant hairs round it. It is also carried on the plumage of waterbirds. *Menyanthes trifoliata.*—The seeds are either blown by the wind, carried by birds, or float on the water surface. The lightness of the seed is due to air hollows in the testa. *Gentiana lutea* and *G. Cruciata* totally differ in anatomy of the seed. *Littorella lacustris*.—In germination the hypocotyl pushes aside a "plug" formed of the enlarged funicle of the ovule, and then turns towards the earth, in which the very short roots fix themselves. The cotyledons are at first bent and absorb the food material in the seed; later they bend apart in their lower part, so as to strip off the testa, and then become green. Hairs secreting a mucilage are found on the seedling. *Plantago major* differs altogether from *Littorella*.—*G. F. S.-E.*

Water-rats destroying Trees. By R. Eppner (*Nat. Zeit. Land-Forst.* i. pp. 404–412, 3 figs.; 1903).—In tree nurseries near Munich water-rats have destroyed many trees by gnawing roots and bases of stems. The figures are from photographs of the damage done to Beech, Sycamore, Larch, and Spruce. Various methods of poisoning were tested, but on account of danger to other animals the author prefers traps. Owls are natural enemies of the water-rat.

In the same periodical (ii. pp. 81–88, 1904) there is a useful paper on the species of *Arvicolidæ* (Field-mice, &c.), with photographs of the skulls of several species.—*W. G. S.*

Water-relation of Puccinia Asparagi. By R. E. Smith (*Bot. Gaz.* xxxviii. No. 1, p. 19; with 21 figs.).—Since 1896 this fungus has spread entirely across the continent of America, from Massachusetts to California, with extremely disastrous results to the Asparagus industry. The appearance of the forms varies in extent in different districts. A decided difference in the formation of the disease coincides with the moisture-retaining powers of the soil, "the trouble being worse upon the drier soils," though "it is well established that the development of those fungi that live upon higher plants is favoured by wet weather," and it was "least in wet seasons." "The soil generally is of a high, sandy, dry nature." But the few beds now remaining are almost entirely upon the heavier soils.

In soils of high water-retaining capacity the teleuto stage alone appeared. In a very dry summer (1897) the uredo stage appeared where never before seen.

In dry seasons and soils Asparagus has its vitality reduced, and so becomes an easier prey to the fungus.

With regard to atmospheric moisture, the progress of the fungus was accelerated by excessive dew-fall. Asparagus growing in the shade remains free from rust, while all beyond is dead. This is attributed to the protection from dew. Dew is of absolute necessity in infection by rust, and of more importance than rain. Atmospheric dryness checks æcidial development, the mycelium remaining dormant, and may die out. Uredo is likewise checked, and changes to teleutospores; but with moisture uredospore formation begins again at once. The teleuto stage is a provision for surviving any condition unfavourable to the fungus.

With regard to soil moisture, this is of the greatest importance. It retards the development of the fungus by giving the host greater vitality and resistance.—*G. H.*

Water, Storage of, on Cache La Poudre and Big Thompson Rivers. By C. E. Tait (*U.S.A. Dep. Agr. Office Exp. Stn., Bull.* 134; 1903).—This bulletin shows the value of private enterprise in providing water storage to irrigate growing crops in the dry and arid portions of Northern Colorado. The method of construction of reservoirs and the operations attendant upon same in relation to supply are ably set forth and illustrated by numerous plates and figures.—*E. F. H.*

Water, The Relation of, to Yield. By J. Warren Smith (*U.S.A. Dep. Agr. Year Book*, 1903, p. 215; charts).—The writer of this article believes that few people have any proper appreciation of the effect of an abundant water supply upon the ultimate yield of crops. It is self-evident that, to have water furnished to the plant in any soil in sufficient quantities, there must be an abundant supply, available either through actual rainfall or through irrigation. A series of valuable charts is given, showing at a glance the precipitations during various months, also the yield of corn, and the price. A description and a discussion accompany each chart.—*V. J. M.*

Wattle, The Australian. By David G. Fairchild (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* 51, pt. 4, 1904; illustrated).—The bark of the Australian Wattle (*Acacia mollissima* Willd.) has long been used for tanning purposes. It is not as good as Oak, but tans more quickly, and is in request for the commoner grades of leather. The supply formerly came from Australia, but latterly Natal has produced a large quantity of the bark, and the object of the pamphlet is to encourage the industry in the Hawaiian Islands, where it is already promising, the United States proper being hardly free enough from frost for the successful cultivation of the Wattle. The trees are stripped when from seven to ten years of age, and the timber is used in the mines.

The industry pays well in Natal, and does not require much labour, sixty men being sufficient for an estate of 2,400 acres.

Some good illustrations from photographs are appended.—*C. H. C.*

Wheat, Durum, The Commercial Status of. By M. A. Carleton and J. S. Chamberlain (*U.S.A. Dep. Agr. Bur. Pl. Ind., Bull.* No. 70, October 1904; plates).—This is another contribution to the official literature on a subject which has been engaging the attention of the United States Agricultural Department for some time. It has been at some pains to demonstrate the fitness of the Russian Durum or Macaroni Wheat for growth in many of the semi-arid districts of North America, which are not favourable to the production of other classes of Wheat, and, in consequence of what has been done in this direction, large quantities of Durum Wheat are now being produced in these regions.

Earlier bulletins, in view of the fact that ordinary flour-millers fought rather shy of the Wheat, at first pressed its claims chiefly as being the only Wheat out of which the semolina for really first-class macaroni can be made, and, in consequence, it has acquired the name of Macaroni Wheat. This the Department now rather deprecates, as it is liable to conceal the fact that in their opinion, once millers and bakers become accustomed to it, bread can be made of it superior in every point but that of whiteness to any made of ordinary Wheat.

This bulletin is therefore chiefly concerned in recommending Durum Wheat flour to the ordinary consumer, though it is still a matter of concern to the Department that a native macaroni industry should be built up, and that the United States should even, in time, find itself in a position to export semolina to the Continental macaroni manufacturers. To add to the popularity of macaroni as an article of food in America, a number of tried European recipes are given for dishes made from it, spaghetti, and semolina.

An experiment was carried out by the Department and a large wholesale bakery, by which 250 loaves were made of Durum flour and 250 from ordinary hard winter Wheat flour, and one of each was forwarded to a number of persons whose opinion in the matter was of value, with a printed form asking for their views on the relative merits of the two loaves. The answers showed a balance of opinion of about 108 to 74 in favour of the Durum Wheat loaf.

Tables are given of the results of analyses of the chemical contents of Durum Wheat flour as compared with hard spring Wheat, hard winter Wheat, and soft winter Wheat, from which it appears that the flour made from Durum Wheat grown in an unfavourable season, which in this case means a wet one, is still equal to other hard Wheat flour in protein ash and sugar content, and superior to that from soft Wheat; while in a normal season these contents are considerably higher in Durum Wheat flour than in any other kind.—*M. L. H.*

Wheat, Variety Tests of. By George C. Watson and A. K. Risser (*Agr. Exp. Stn. Pennsylvania, Bull.* 67, April 1904).—Every year the station tests a certain number of new varieties in order to compare their productiveness with that of old varieties which have been long in cultivation.

To this end some varieties have been grown on the test plots as long as fourteen years.

Different dates for sowing were tried in order to avoid the damage done by the Hessian fly, but only partial success was recorded, so much depending on the season. The English sparrow did even more damage than the insect. A practicable remedy is desirable.—*C. H. C.*

White Pine in New England, The Planting of. By H. B. Kempton (*U.S.A. Dep. Agr. Bur. For., Bull.* 45).—Mainly as a practical investment, an examination of the existing White Pine plantations of the East was made, with careful surveys, in 1901.

As a result it was found advisable largely to increase the area of ground under this species, it being found a suitable tree, not only for the State plantations, but for the private landowner as well. There is a wide range of soils on which it will succeed, but its particular value would be on the sandy, barren, and seaside dunes that are so commonly met with in New England. The numerous tables showing the growth of the White Pine under various conditions are interesting, while the plates convey a good idea of what is wanting in the text.—*A. D. W.*

Willow Flowers, Abnormal. By J. Velenovsky (Prag) (*Beih. Bot. Cent.* xvii. pp. 123–128).—Describes *Salix* flowers with 2, 3, 4, or 5 stamens. Some shrubs flowered in August. In some cases the honey gland was distinctly divided into two elongated lanceolate flat scales. These, it is suggested, correspond to the bracteoles of *Juglans* and *Myrica*. A third scale represents a perianth segment, so that the *Salicineæ* may be considered as next allied to *Juglandaceæ* and *Myricaceæ*.—*G. F. S.-E.*

Willow Galls. By K. v. Tubeuf (*Nat. Zeit. Land-Forst.* ii. pp. 330–337; 5 figs.; 1904).—Young twigs of Willow frequently show small galls due to abnormal development of leaf-buds or catkins. In these Tubeuf sees the first stages of the branch gnaurs or galls, which may sometimes be over a foot in diameter. An excellent series of photographs shows the gradation in a striking way. The cause has not been investigated, but mites are suggested.—*W. G. S.*

Willow, Insects Injurious to. By F. H. Chittenden (*U.S.A. Dep. Agr. Bur. For., Bull.* 46; 1904; 17 figs.).—An account is given of a number of the insects affecting the Willows in America. Out of the 380 species known to attack these trees the following are the most troublesome and are described: The Willow curculio (*Cryptorhynchus lapathi* Linn.), the Poplar girdler (*Saperda concolor* Lec.), the bronze Birch-borer (*Agrilus anxius* Gory.), Willow-shoot saw-fly (*Janus integer* Nort.), all of which bore the shoots; the yellow-spotted Willow slug (*Pteronus ventralis* Say.), the Willow saw-fly (*Cimbex americana* Leach), the Cottonwood beetle (*Melasoma scripta* Fab.), the worst enemy of the Basket Willow; the Willow-leaf beetle (*Melasoma lapponica* Linn.), the Poplar-leaf beetle (*Phytodecta pallida* Linn.), many leaf-feeding caterpillars, and several aphides attacking the foliage. The beetle *Gracilia minuta* Fab., which attacks dried Willows in Europe, is occasionally met with. Means of attacking these pests are mentioned, particularly the periodical flooding of the land, and, as a prevention of attack, the careful cutting of the rods.
F. J. C.

Witches' Brooms. (In *Nat. Zeit. Land-Forst.* vols. ii. and iii.; 1904–5.)

(1) Herr F. Muth (ii. pp. 439–443; 4 figs.) describes one of these malformations on *Taxodium distichum*, probably the first case described for this tree. One figure shows the broom on the tree; the others give parts of the characteristic tangle of twigs of all sizes, with many undeveloped buds. Two fungi, which might be the cause, were found, but the evidence is not conclusive.

(2) Prof. Tubeuf (ii. p. 296) gives a figure of a broom on Beech, the cause of which is unknown. This we have also seen in Britain.

(3) Prof. Solereder (iii. pp. 17–23) reproduces a photograph showing three well-marked brooms on *Quercus rubra*; cause also unknown. This apper has also a useful summary of the known cases of witches' brooms on trees and shrubs, with the organism which causes them, where it is known.—*W. G. S.*

Woburn Exp. Fruit Farm, 4th Report, 1904. By the Duke of Bedford, K.G., and Spencer V. Pickering, F.R.S.—The report points out the difficulty in experimenting with fruit crops, due to the possible inadaptability of the plant to the soil, to climatic conditions (frost, irregularity of crop), and insect attack ; also that it is advisable not to draw conclusions from fewer than three years' trial ; and that a conclusion at one station, though suggesting probability, does not necessarily apply in the case of another farm with different soil or conditions. Some of the present conclusions of the results are given under the headings of Strawberries, Gooseberries, and Apples.

Strawberry Trials (pp. 10–34).—Strawberry plants were found to be very sensitive to surrounding conditions. The experiments with dung applied after planting showed a better return with a light dressing of 12 tons per acre than a heavy dressing of 30 tons. The application of dung increased the size of the berries and lengthened the life of the plants, but the increase in the yield compared with the unmanured was not very great ; neither dung nor artificial manure affected the earliness of the crop. A light dressing of artificial manure may give a better monetary return than that from dung; those from dunged plots were superior in quality. In other experiments plants were watered with either plain water or water containing artificial manure during the month previous to ripening, but neither kind of watering showed beneficial results.

The practice of manuring in the great Strawberry districts of North-West Kent is to dung heavily, say, thirty or forty tons before planting, and afterwards not to manure. It would appear that experience may have proved this system to be the best, both practically and scientifically.

Gooseberries (pp. 35–44).—Whilst dung increased the growth of the bush throughout, and the crop after the third year, artificial manures had no appreciable effect on the crop and only slightly increased the growth.

The dunged plots yielded fruit much superior in size, and the growth and vitality of the bushes were greater, the foliage being larger and more luxuriant. It would again seem that an increase in the dressing beyond twelve tons per acre is not productive of any increase in the crop, although it may increase the growth of the bushes. The value of the dung would appear to be in its physical action, the soil becoming more workable, with a smaller growth of weed than on the other plots ; also, as shown by trial, the soil contained more moisture where dung was applied.

Bushes dressed with artificial manure were little better than those on unmanured land, and were worn out and dying after seven or eight years.

In Kent the practice is to dung moderately once in three years.

Currants (pp. 45–49).—Live longer on dunged than on other plots.

Average crop has been 20 cwt. per acre ; after nine years' growth the average weight of the bushes was 200 cwt. per acre.

Apples (pp. 53–90).—Neither dung nor artificials have given appreciable increase in the way of growth or fruit, and it is advised not to spend money in manuring Apple trees, especially in heavy or fairly fertile soil, unless it is ascertained, by trials extending over several years, that such manuring would repay its cost.

Nitrate of soda applied in July has shown effect in the increase of the size of leaf and fruit, but no similar action is noticeable in any case where it was applied in February.

The average weight per acre of the Apple bushes after nine years' growth was found to be 430 cwt.—*C. H. H.*

Woodlice, The British. By Wilfred Mark Webb, F.L.S., and Charles Sillem (*Essex Naturalist*, vol. xiv., pt. 1, April 1905 ; with 25 plates and numerous cuts).—This promises to be a useful monograph, of which the present is the first part, and consists of an introduction, position in the scheme of classification, geological history, external structure and appendages, alimentary canal, circulatory system, excretory system, nervous system, reproductive organs, development, habits and economic considerations, local names, methods of collection and preservation, classification.

"Woodlice do not appear to live on either animal or vegetable food alone, but adopt a mixed diet. It is, however, owing to their attacks upon cultivated plants that the creatures are looked upon as pests by the horticulturist. The animals feed, either in the night or in the very early morning, on seedlings, Orchid tubers, mushrooms, or anything that comes to hand. Careful inquiries have enabled us to discover several observers who have watched woodlice feeding, also to give an account of the methods, out of many tried, which have been found most successful for getting rid of the crustaceans" &c. From this extract it will be seen how much this work appeals to horticulturists. The parts following will be concerned with the individual species.—*M. C. C.*

Zamia, The Nutrition of the Egg in. By I. S. Smith (*Bot. Gaz.* xxxvii. No. 5, p. 346 ; with 6 figs.).—The central cell of the archegonium becomes surrounded by a "jacket" as it begins to fill with nutritive substances. The cells surrounding the jacket abound with starch, the latter being almost entirely of protoplasm. To convey nutriment the inner walls of the jacket become very much thickened, and are pierced by numerous pores. Through these the protoplasm of the egg protrudes into the jacket-cells, forming haustoria-like processes ; their ends become knot-shaped. They behave like gland-cells, as seen by staining. The contents of the jacket-cells are strongly attracted toward the haustoria, shown by the protoplasm streaming towards them.—*G. H.*

Zephyranthes Taubertiana. By H. Conrad (*Die Gart.* No. 43, p. 506, July 23, 1904).—A new introduction from Brazil. The leaves appear after flowering, and are linear and fleshy. The flowers are delicate pink with yellow anthers.—*G. R.*

Zingiber spectabile. By C. H. Wright (*Bot. Mag.* t. 7967).—Native of the Malay Peninsula. Nat. ord. *Scitamineæ* ; tribe *Zingibereæ*. A tall herb with distichous, oblong-lanceolate leaves. Flower-spike oblong-cylindric, 6 inches long ; peduncle 1½ ft. long ; bracts rotundate with orange-yellow margins ; corolla-lobes pale yellow ; lips reddish-brown, spotted with yellow.—*G. H.*

Zygocolax Veitchii. By W. B. H. (*Bot. Mag.* t. 7980).—Native of Brazil. Nat. ord. *Orchidaceæ*; tribe *Vandeæ*. This is a hybrid between *Colax jugosus* ♂ and *Zygopetalum crinitum* ♀, raised by Messrs. Veitch, but is "nearly all *Zygopetalum*." Flowers $2\frac{1}{2}$ to 3 inches across; sepals and petals similar greenish-yellow, blotched with rich purple-brown; lip nearly circular, yellowish-white, longitudinally striped with red-violet.

G. H.

THE SOCIETY'S PUBLICATIONS.

WITH a view to assisting Librarians, Fellows, and others in ascertaining whether their sets of the Society's publications are complete, the following collation of the Transactions, Proceedings, and Journals has been prepared, and the Secretary would remind those who may be anxious to complete their series that back numbers may be obtained at a considerable reduction by Fellows of the Society and by kindred and cognate Societies.

PUBLICATIONS OF THE HORTICULTURAL SOCIETY OF LONDON.

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,,	II.	1812–17	xxiv, viii, 408, 10. II. Ed. 1820; III. Ed. 1822.
,,	III.	1817–19	xxii, 465, 27, and Awards and Index. II. Ed. 1822.
,,	IV.	1820–22	vi, [xv], 573, and Awards and Index, &c.
,,	V.	1822–24	viii, xvi, 560, 7, Awards, &c., and Index.
,,	VI.	1824–26	vii, xiii, 586, List of Authors, &c., and Index.
,,	VII.	1827–30	vi, xiii, 590, List of Authors, &c., and Index.
Second Series	I.	1831–35	xi, 546, List of Awards and Index.
,,	II.	1835–41	viii, 555, List of Awards and Index.
,,	III.	1843–45	iv, 288 (cxxxix General Index to I. and II. Series issued in 1848.)

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1 Vol., from May 1838 to December 1843, 442 pp. 8vo., London, 1844.

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,,	II.	1847	vi, 316, lxv.
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,,	V.	1850	v, 284, lii.
,,	VI.	1851	v, 314, xliv. (This includes the Index to Vols. V. & VI.)
,,	VII.	1852	iv, 286, lxii.
,,	VIII.	1853	iv, 331, lvi. (This includes the Index to Vols. VII. & VIII.)
,,	IX.	1855	iv, 310, lxxix.

* These also had extra leaves, unnumbered, bound up at the end of each part, giving Awards, Presents, &c.

PUBLICATIONS OF THE ROYAL HORTICULTURAL SOCIETY.

Proceedings.

Vol. I. From June 1, 1859, to December 31, 1861, published 1861, pp. vii, 747.
„ II. „ January 1 to December 31, 1862, published 1862, pp. viii, 825.
„ III. „ „ „ „ 1863, „ 1863, pp. iv, 388.
„ IV. „ „ „ „ 1864, „ 1864, pp. iv, 189.
„ V. „ „ „ „ 1865, „ 1865, pp. vi, 209.

	Vol.		
New Series	I.	January 1866, January 1869	12 numbers, ccciv pp.

Journal.

	Vol.	Date	Pages
New Series	I.	1866	iv, 204, lxiv.
„	II.	1870	iv, 87, clxv. (Supplement 1871. Reduction of Meteorological Observations at Chiswick (1826–1869), by James Glaisher, F.R.S., 66 pages and 12 tables.)
„	III.	1872	iv, 177, clxxiv.
„	IV.	1877	viii, 274, xl.
„	V.	1879	iv, 208, clxxii. 8.
„	VI.	1880	xxiii, cxlvi, 22.
„	VII.	1886	312. (Reports of the Orchid and Primula Conferences.)
„	VIII.	1887	iv, lxvi, 338. (Frost Report.)
„	IX.	1887	230. (Report of the National Pear Conference, 1885.*)
„	X.	1888	376. (Report of the Apple and Pear Conference, 1888.)
„	XI.	1889	iv, 350, cliv.
„	XII.	1890	iv, 575, clxlii.
„	XIII.	1891	iv, 420, ccxii.
„	XIV.	1892	vi, 588. (Report of Conifer Conference.)
„	XV.	1893	iv, 268, ccvi.
„	XVI.	1894	iv, 261, ccxxxviii.
„	XVII.	1895	iv, 140, cclxx.
„	XVIII.	1895	ii, 192, ii. (Report of Conference on Trees and on British Fruit.)
„	XIX.	1896	ii, 460, ccxxxvi.
„	XX.	1896–7	iv, 296, ccxxviii.
„	XXI.	1897–8	iv, 588, ccxl.
„	XXII.	1898–9	iv, 498, ccxxxii.
„	XXIII.	1899–1900	ii, 438, ccviii.
„	XXIV.	1900	ii, 348. (Report of Hybrid Conference.)
„	XXV.	1900–1	iv, 406, ccxxxvi.
„	XXVI.	1901–2	iv, 980, cclx.
„	XXVII.	1902–3	iv, 1204, cclxxiv.
„	XXVIII.	1903–4	iv, 728, cclxxxvi.
„	XXIX.	1904–5	viii, 936, ccxl.

* "British Apples," being the earlier report of the Apple Conference, 1884, was not numbered in the Journal series.


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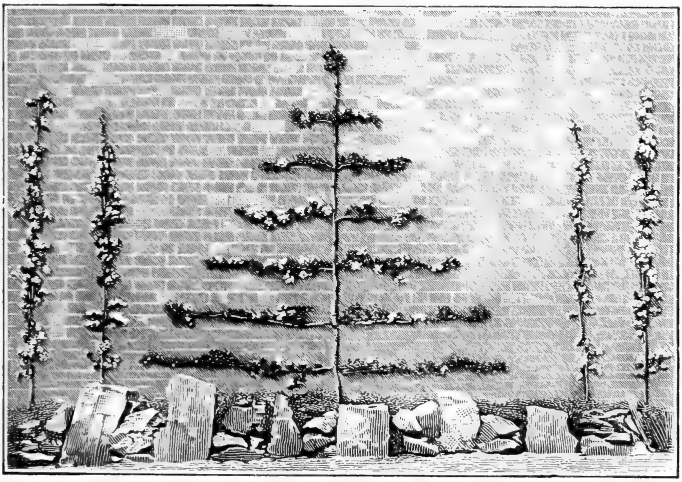

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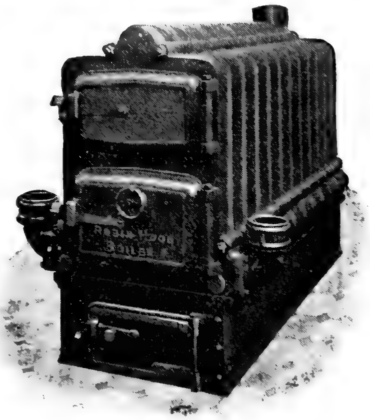

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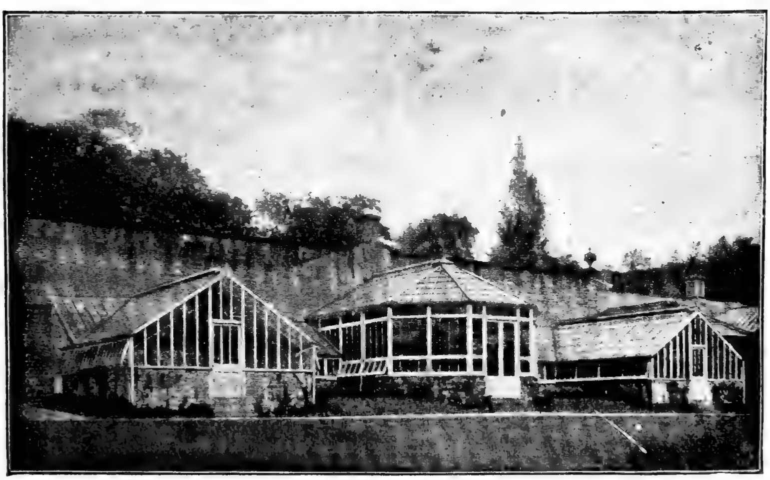

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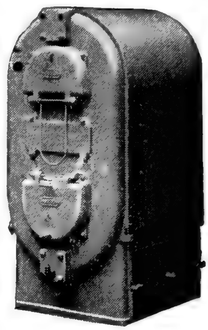

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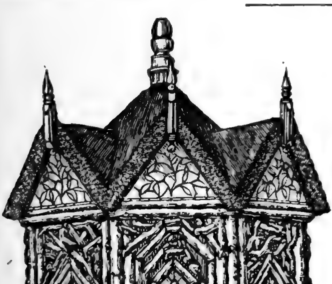

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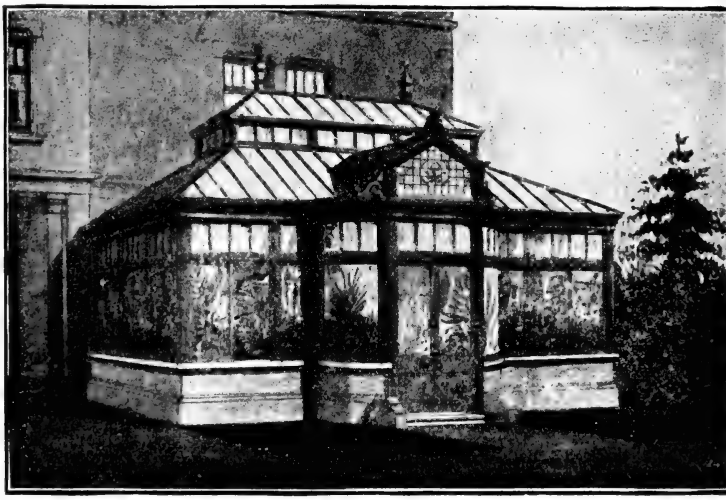

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INDEX TO ADVERTISEMENTS

IN THE PRESENT ISSUE.

VOL. XXIX. PART IV.

The figures refer to the pages, which are numbered at the bottom.

R.H.S. Advertisement Office:—VINCENT SQUARE, WESTMINSTER, S.W.

INDEX TO ADVERTISEMENTS

(Continued).

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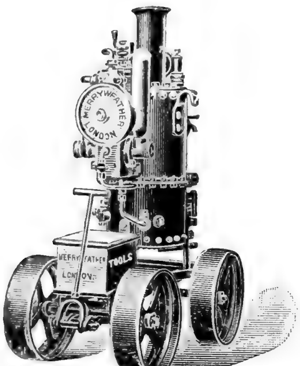
Fruit and Hop Washing by Steam Power.



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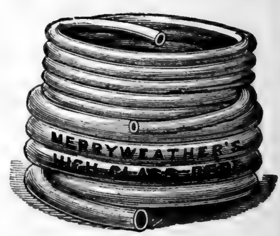

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(EVERBEARING.)

HAVING secured an importation of this latest and most valuable vegetable novelty produced by the notorious "Wizard of the West," I am offering a portion of the stock for sale, which has been grown at Tuckswood Farm this season.

This grand New Rhubarb may be described as a perpetual bearer or producer of leaf stalks—with perhaps the exception of a short rest during drought in summer, starting into growth again with the advent of autumn rains, and continuing growth during winter and spring in the open ground with only slight protection during severe weather. It was raised in California four years ago, and after having thoroughly tested its merits for three seasons, the raiser states, that it produced good marketable leaf stalks fully six months earlier than any other variety, when grown under same conditions, whilst it is a rapid and continuous cropper, continually throwing up new crowns as fast as the stalks are pulled.

The colour, as indicated by the name, is of the brightest crimson, and the flavour when cooked is excellent, much superior to the Common variety of Rhubarb at present grown, there being an absence of fibrous strings in the stalks. The latter are usually about one inch in thickness.

Young Plants planted out in April have come into bearing in December.

The possibilities of such a vegetable are very great, as will be apparent to the Market Grower, as also will its usefulness be evident to the Amateur, in providing a supply of nutritious vegetable for the household at a season of the year when it is most acceptable.

This New Rhubarb will grow in any soil, and in almost any situation, and moreover it is quite hardy.

In an article on "A Maker of New Fruits and Flowers," by Mr. Harold J. Shepstone, in June number of *The World's Work*, the following information occurs:—"In the Royal Gardens, at Sandringham, may be seen fruits and vegetables which Mr. Burbank has introduced. Only recently the King ordered from Mr. Burbank a new variety of Rhubarb. It was raised by Mr. Burbank from the wild Australian Rhubarb, and is unique in that the new plant is ready for table at all seasons of the year."

An Illustration of this Grand New Rhubarb appears on the opposite page.

Plants ready for delivery in April (which is best month to transplant).

Price, Including Delivery to any Port or Railway Station in Great Britain:

Plants, 3/- each; 3 for 7/6; 6 for 12/-; 20/- per dozen; or £5 per 100, carriage paid.

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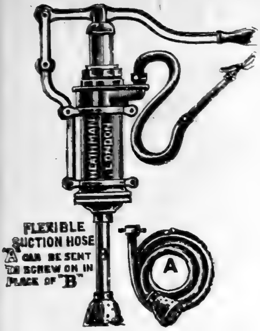


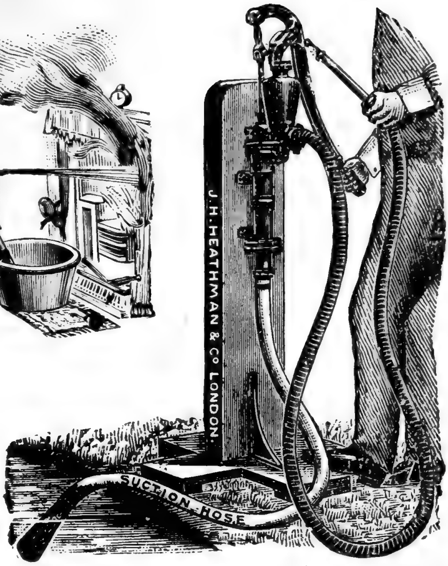

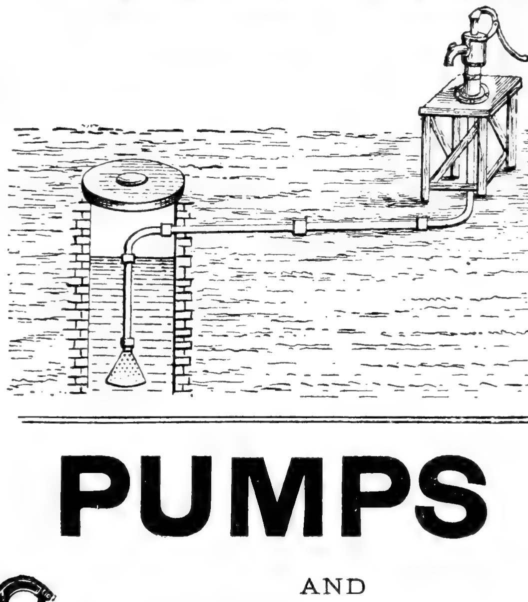


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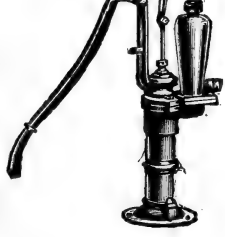

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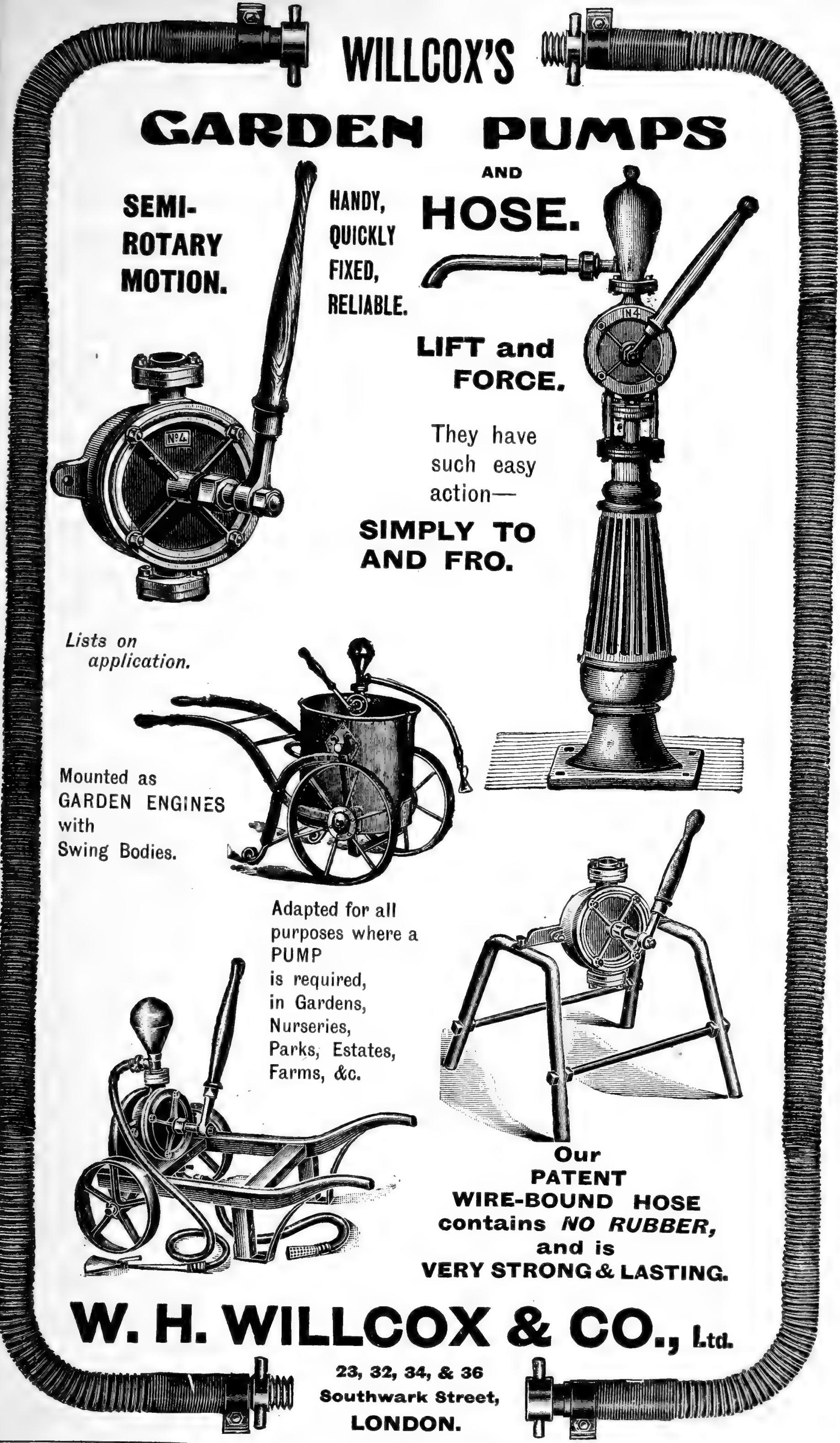
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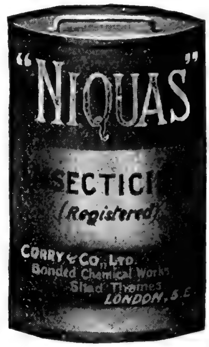

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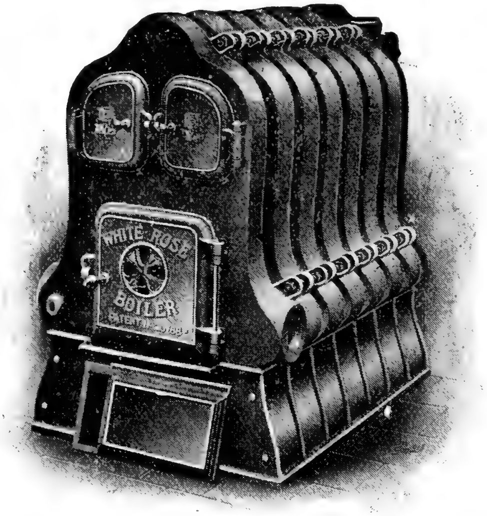

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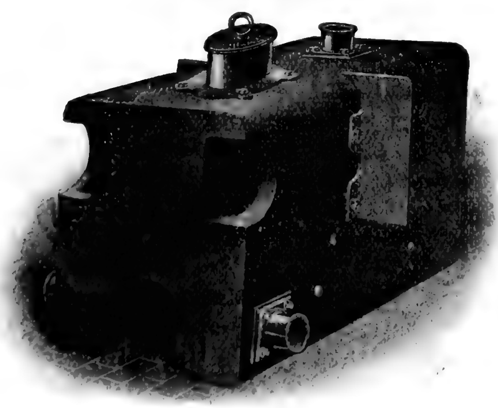

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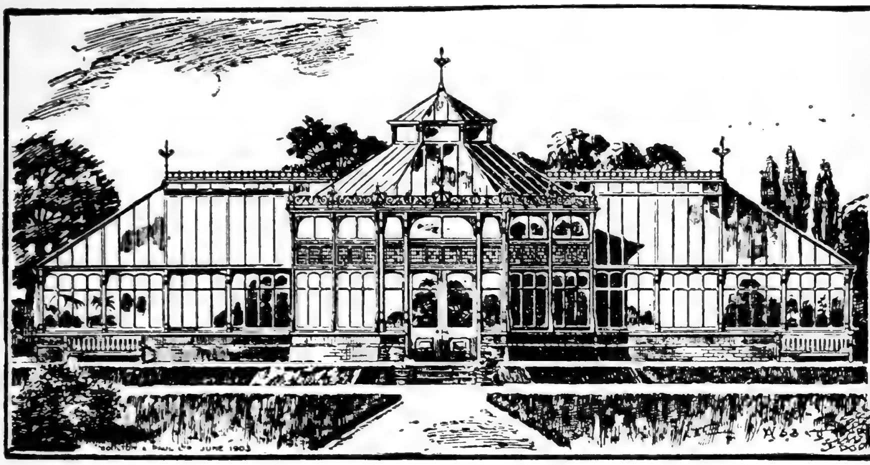

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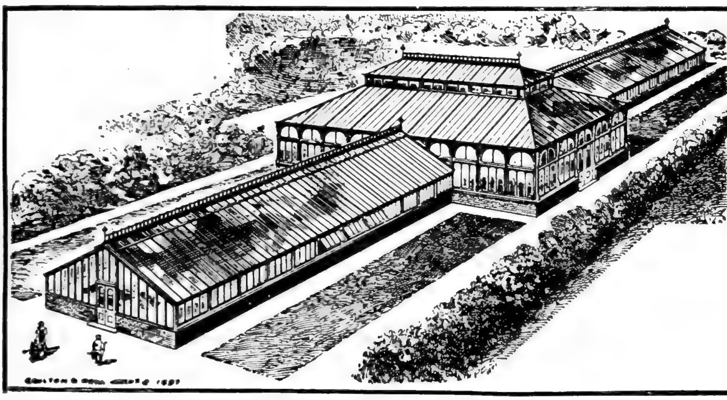

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FOR FINE FLOWERS

"Regis" in the *Gardener*, July 1904, says:—"For pot plants I have found it very beneficial, restoring yellow leaves to a bright healthy green, and at the same time swelling out the flower trusses in a manner pleasant to behold."

A. SMETHAM, Esq., Consulting Chemist to Royal Lancashire and Cheshire Agricultural Societies, after analysis, says:—

"'Fertilo' contains all the necessary constituents of Plant Food in available forms."

Mr. R. A. HORSPOOL, the Gardens, Ruabon, Winner of fifteen prizes at Shrewsbury Great Floral Show, and thirty-two prizes at Ruabon Show, 1904, says:—

"I cannot speak too highly of its use in growing plants, &c., for exhibition. It had a very marked effect wherever used, proving it to be a most perfect plant food."

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CHRYSANTHEMUMS and all Winter Flowers need generous treatment. A small dose of "Fertilo" will increase size and life of blooms.

"FERTILO." A complete food for all Plants, Garden or Greenhouse.

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PRICES:

4 lbs., 1/- (Postage Paid 1/4)

14 lbs., 2/6 (Carriage Paid 2/9)

28 lbs., 4/6

$\frac{1}{2}$ cwt., 8/- .... **1 cwt., 15/-**

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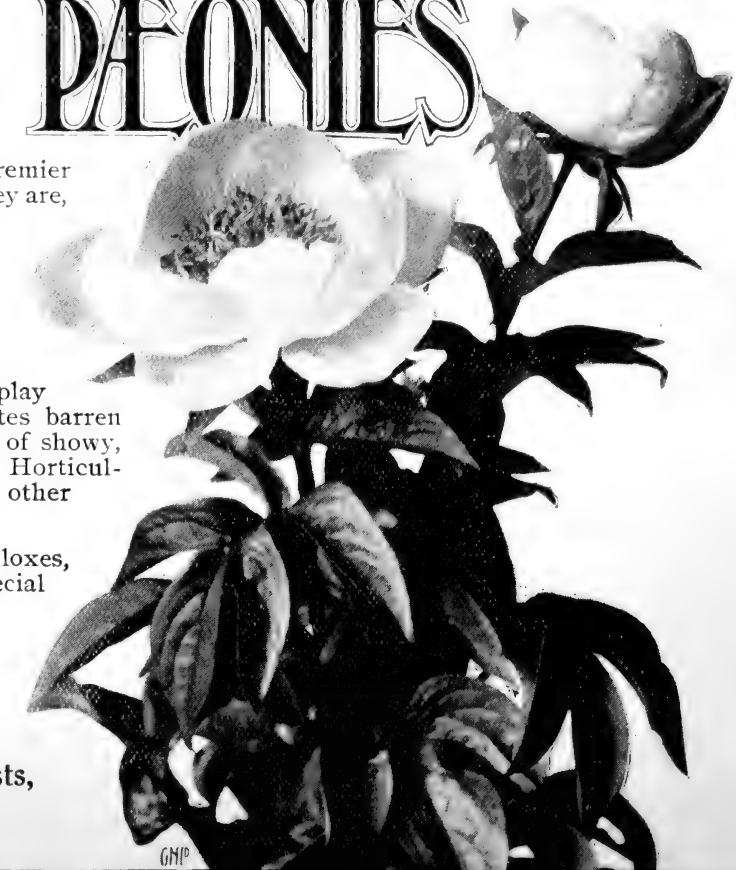


Of all cultivated flowers the Pæonies undoubtedly occupy the premier position as the gayest and most brilliant of border plants. They are, moreover, of an extremely hardy nature. Whether the garden be situate in town, suburb, or country matters little indeed, the Pæonies may ever be relied upon to yield a glorious wealth of blossom.

HERBACEOUS BORDERS.

The Langport plan for Borders and Beds ensures a brilliant display of colour throughout the greater part of the year, and obviates barren patches in flower beds. Border "A," composed of a selection of showy, hardy, and easily grown perennials (see "Kelway's Manual of Horticulture," p. 18), and measuring 150ft. by 10ft., costs £13 13s.; other sizes at proportionate prices.

Kelway's lovely new Pæonies, Delphiniums, Pyrethrums, Phloxes, Gaillardias, Gladioli, and other plants, for which we own a special reputation, can be included in this selection.

GOLD MEDAL, St. Louis, 1904; GOLD MEDALS, London, Paris, and Chicago for improvements in old-fashioned flowers.

Carriage paid for remittance with order.

KELWAY & SON, The Royal Horticulturists,
LANGPORT, SOMERSET.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

January 5, 1904.

Mr. A. H. Pearson in the Chair.

Fellows elected (49).—J. W. Bashford, A. H. Bennett, Miss M. Bevington, Victor Blumenthal, R. W. Cannell, J. A. Chabaud (Port Elizabeth), H. V. Clements, Miss Collyer-Bristowe, C. Harvey Combe, Leonard Cookson, Miss S. N. Cramp, Mrs. A. Duncombe, O. R. Dunell, Mrs. Eastwick, Edwin Edelsten, Miss M. L. Egerton, Mrs. Elmer, John R. Featherby, Miss Frere, Mrs. Garden, Mrs. H. Martin Gibbs, Miss E. J. Girdlestone, Miss Gower, Mrs. James Head, Lady Hely-Hutchinson, Mrs. H. M. Kerr, Harry Lander, Miss H. A. Little, G. Lockie (King William's Town), Henry Martin, Jules Matern (Transvaal), R. Mercer, E. J. Norman, Mrs. J. Owen, H. B. Packer, A. Pilcher, C. H. Popay, A. Rickarby, Mrs. H. A. Ritchie, John Robertson, L. Sanderson, M. E. Shields, Walter Southern, Mrs. Stoneham, Mrs. J. D. Thorburn, Mrs. Wyndham Waterfield, Harry Watts, H. Western, A. Wilson.

Associate (1).—W. E. Brown.

Societies affiliated (3).—Epping and District Horticultural Society, Hexham Horticultural Society, Khedival (Egypt) Horticultural Society.

GENERAL MEETING.

January 26, 1904.

Mr. A. H. Pearson in the Chair.

Fellows elected (113).—Sir John Aird, M.P., James Albou, H. Armytage-Moore, Rev. G. N. Ashdown, M.A., Mrs. Ashton, Richard Bent, Mrs. Royds Bentley, W. H. Berlandina, Herbert J. Bernau, Mrs. P. Birch, T. B. Bolitho, Edmund Boulnois, M.P., J. Annan Bryce, H. C. Bristowe, G. Brown, Mrs. A. Byass, Mrs. A. Campbell, George Cannon, Mrs. J. Houston Cassels, W. J. Chapman, William Chapman, Martin Chart, Miss H. E. I. de Jersey, Charles Denny, Jun., Ellis Dobson, R. T. Dowglass, C. J. Ellis, Harold Evans, Miss Eyres, Mrs. Eyres, D. H. Fairweather, Edgar D. Fear, B.A., T. Lawrence Fearon, Mrs. H. H. France-Hayhurst, Dr. D. L. Freeland, Mrs. B. E. Tristram, Miss Graham, Windham E. Hale, Alva J. Hall, Mrs. Hall, E. A. Hambro, M.P., Miss Fleming

Hamilton, Mrs. Fleming Hamilton, W. Hampton, F.C.S., E. B. Handley, Campbell B. Handsburg, F.R.G.S., Prof. J. Hara (Japan), E. J. Harris, E. W. Hewson, Miss M. B. Hilliard, The Lady Hindlip, John Hingston, Jun., Mrs. H. S. Horne, Thomas Horton (New Zealand), G. W. Hubbard (South Africa), Alfred G. Hunt (South America), Mrs. Murray Ind, J. Baynes Jago, Ernest E. Jex, Surgeon-Major B. Kendall, Mrs. Glen Kidston, James L. Kinnell, Rev. L. Knights-Smith, Ernest E. Lake, Mrs. Lambley, Mrs. Lawrence, V. F. Leese, Lieut.-Gen. W. G. Dunham Massy, C.B., D.L., Mrs. W. A. Mitchell, Charles Morris, Mrs. H. Nye, W. T. Ogden, Mrs. Henry Orford, Alfred H. Palmer, Miss W. Parker, F. L. Pattisson, Ernest W. Paul, Hugh A. Pettigrew, A. A. Pettigrew, Mrs. Platt, A. Vaughan Pott, E. Hunt Powell, W. H. Murray Ragg, Dr. John Rand, Dr. Charles Renner, Major H. W. R. Ricardo, J. R. Roberts, Mrs. Saunders, Mrs. A. T. Schreiber, Mrs. Scott-Gatty, S. J. Shaylor, S. Narayan Sinha (India), H. W. Smith, Mrs. S. Smith, Frank Spencer, Mrs. G. Stapleton, H. I. Stevens, Miss H. Stewart, Frederic Stokes, Robert Thompson, Miss Todd, E. E. Turner, Rev. Canon T. E. Usherwood, Miss Wakefield, Mrs. Wakefield, Miss E. M. Webb, R. Sidney Wells, Edward White, F. W. Wilbraham, E. Noel Wilson, H. H. Wyatt, Lady Wynford, B. Yeomans.

Associates (8).—R. Bye, J. Deans, W. Easton, Miss S. Fenoulhet, C. G. Pace, Miss Maud Prior, W. Saville, H. Ford Williams.

Society affiliated (1).—Eynsford Horticultural Society.

A lecture on "Oranges" was given by Mr. H. Somers Rivers (see p. 118).

ANNUAL GENERAL MEETING.

February 9, 1904.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. (President of the Society), in the Chair.

The Minutes of the last Annual Meeting were read and signed.

Fellows elected (78).—E. H. Allen, F.L.S., Dr. F. H. Anderson, S. Anketell-Jones, Mrs. R. C. Bainbridge, Mrs. W. Skidmore Barrett, W. J. Beard, T. Beeson, Sir Theophilus G. Biddulph, Bart., L. Brodie, Mrs. E. A. Broome-Giles, Mrs. Burbidge, C. T. D. Burchell, Albert Cay, J.P., Mrs. H. E. Clark, C. A. Cochrane, T. D. Coe, Mrs. Strickland Constable, Mrs. Cotton, Kenneth Crawley, Mrs. Crichton, Mrs. Davies-Gilbert, Mrs. H. W. Dixon, Mrs. Doré, Miss M. C. Douglas, P. J. Edwards, Mrs. G. Eyre-Matcham, Henry Fenner, Wilson Lloyd Fox, Mrs. Gibson, J. H. Gould, James Grandfield, Mrs. Hailstone, Cornelius Hanbury, M.R.C.S., Charles Hardinge, J.P., Mrs. H. Hardinge, J. E. Harting, James Henderson, Arthur S. Hickley, Rowley R. C. Hill, Harry J. Hindson, F. W. Hull, H. C. Jones, Mrs. E. F. Jowers, George J. Ingram, Victor Langbein, Miss Lloyd, John L. Lyster, Ronald J. Mackay, Mrs. W. M. Macleod, A. E. Masters, Samuel Mitchell, Mrs. Nevile, Mrs. Newman, Mrs. C. M. Nicholson, Mrs. M. C. Onslow, W. Dyson Perrins, Mrs. G. T. Pilcher, Duncan V. Pirie, M.P., Henry F. Porter, Miss Janette Ritter, Miss H. A. Ronaldson, C. E. Routh, Rev. J. B. Shackle, Charles J. Sharpe, William H. Shields, Mrs. S. F. Sinkins, J. M. Smithers, Vincent Soltan, John Studt, J. Campbell Sutherland, Henry R. Tamplin, S. G. Tillett, Eugène Turbat, T. W. Turner, H. M. Vesey-FitzGerald, Lieut.-Col. R. Gardner Warton, Spencer Whitehead, C. Alan Whiting.

Associate (1).—W. H. Dobson.

Societies affiliated (7).—Brenchley and Matfield Horticultural Society, Croydon and District Horticultural Mutual Improvement Society, Eltham and Rose Horticultural Association, Grayshott and Hind Head Horticultural Association, Oxfordshire, Northamptonshire, and Warwickshire Horticultural Societies' Competition, Pagham Horticultural Society, Société Française d'Horticulture de Londres.

The President moved the adoption of the Report, which is given in full on page vi. This was seconded by Mr. Alexander Dean and was carried unanimously.

The Secretary read the names of the proposed new Members of Council, Vice-Presidents, and Officers, and the President subsequently declared them all duly elected, viz.:

As new Members of Council.—Sir Trevor Lawrence, Bart., K.C.V.O., J. Gurney Fowler, Esq., and Mr. James Hudson, V.M.H.

As Vice-Presidents.—The Rt. Hon. Joseph Chamberlain, M.P., the Rt. Hon. the Earl of Ducie, the Rt. Hon. Lord Rothschild, Sir Frederick Wigan, Bart., Sir John D. T. Llewelyn, Bart.

As Officers.—Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., President; J. Gurney Fowler, Esq., Treasurer; Rev. W. Wilks, M.A., Secretary; Alfred C. Harper, Esq., Auditor.

The Treasurer (Mr. J. Gurney Fowler) made the following statement as to the finances, especially in respect to the New Hall.

	£	s.	d.	£	s.	d.	£	s.	d.
Donations received to February 8, 1904.							22,561	12	5
Add: Interest on investments				351	10	10			
Sale of old materials				30	0	0			
Transfer from Old Hall account				38	7	0			
Rents				31	5	0			
							451	2	10
							23,012	15	3
Deduct: Building expenditure, including fees to architect, clerk of the works, &c.				10,853	15	4			
Ground rent	508	15	0						
Stationery, printing, and postage	257	10	4						
Compensations to tenants, &c.	356	6	0						
Preparing plans	31	10	0						
Commission to collector	100	0	0						
Sundries	16	12	4	1,270	13	8			
							12,124	9	0
							10,888	6	3
At bank on deposit				8,500	0	0			
Current account				2,193	12	3			
In office				194	14	0			
				10,888	6	3			
Promised donations				2,113	3	10			
				13,001	10	1			

The Council have made contracts for:

	£	s.	d.	£	s.	d.
The foundations	2,340	0	0			
The building	32,440	0	0			
	34,780	0	0			
and have paid to the contractors the sum of	10,379	7	10			
There is therefore a liability to the contractors amounting to				24,400	12	2
and a deficiency as compared with the amount collected to date of				11,399	2	1

to which must be added the cost of furnishing the Hall.

This amount will have to be met either by further donations, by a mortgage, or by realising the investments of the Society. These investments are as follows:—

Consols	£8,310 13 9	@ $86\frac{5}{8}$	=	£7,199 2 7
Local loans . . .	£5,800 0 0	@ $97\frac{1}{2}$	=	£5,655 0 0
Rupee paper . . .	Rs. 37,000	@ $63\frac{1}{2}$	=	£2,349 10 0

and I would suggest—

(1) That so much of the investments as may be required should be lodged with the bank as security for a temporary loan until it can be seen what donations may be expected.

(2) That after a time a mortgage be obtained, for so much of the deficit as is necessary, from the North British and Mercantile Insurance Company.

(3) That at a favourable opportunity some of the investments of the Society be sold in order to pay off the mortgage.

Financial Statement *re* New Hall Income.

	£	s.	d.	£	s.	d.	£	s.	d.
Our income last year, as by Report, was in excess of the expenditure by							3,641	0	0
Assuming that we make the same income in the future as in the past, there should be deducted therefrom:									
New Hall expenditure:									
Ground rent	690	0	0						
Insurance	30	0	0						
Rates (on £1,500) . . .	525	0	0						
Water.	35	0	0						
Fuel and stoker	150	0	0						
Light	55	0	0						
Repairs	150	0	0						
Telephone	7	0	0						
Caretaker at 30*s*. . . .	75	0	0						
Lift	32	0	0						
Interest on, say, £16,000 at 4 per cent..	640	0	0						
				2,389	0	0			
Less: Saving in rent of office . .	203	3	0						
Rent of Drill Hall . . .	128	14	0	332	0	0			
							£2,057	0	0
							£1,584	0	0

So that, without taking credit for any extra rentals which may be received from letting the Hall at times when it is not in use by the Society, our surplus income will be reduced by over £2,000.

Mr. J. Gurney Fowler then moved the following alteration to By-Laws 11 and 12, which was seconded by Mr. A. H. Pearson, viz.: That By-Laws 11 and 12 in future read as follows,—

11. Subject as hereinafter mentioned, each Fellow shall pay an annual subscription, at his option, of 4*l.* 4*s.*, and be entitled to—

(i.) A vote at all meetings of the Society.
(ii.) Personal admission to all Conferences, General Meetings, and Exhibitions, and to the Society's Rooms, Gardens, and Library, subject to the regulations of the Council for the time being in force.
(iii.) A copy of the Society's Journal post free, and
(iv.) One non-transferable (personal) pass and five transferable tickets;

Or, of 2*l.* 2*s.*, and be entitled to—

(i.), (ii.), and (iii.), as above, and
(iv.) One non-transferable pass and two transferable tickets;

Provided that any Fellow who is (*a*) a *bona fide* working gardener earning his own living by the pursuit, or (*b*) a professional journalist writing for country or foreign papers only, may at his option pay an annual subscription of 1*l.* 1*s.* only, in which case he shall be entitled to—

(i.), (ii.), and (iii.), as above, and
(iv.) One transferable ticket;

And that any Fellow permanently residing abroad may at his option pay an annual subscription of 1*l.* 1*s.* only, in which case he shall be entitled to—

(i.) and (iii.), as above.

12. Any Fellow paying an Annual Subscription of 4*l.* 4*s.*, or 2*l.* 2*s.*, and wishing to commute such Annual Subscription, may do so by making one payment of Forty Guineas, in lieu of a 4*l.* 4*s.* Annual Subscription; or of Twenty-five Guineas in lieu of a 2*l.* 2*s.* Annual Subscription; such commutation entitling the Fellow for life to all the privileges of the corresponding Annual Subscription.

The following Amendment was proposed by Mr. H. J. Veitch and seconded by Surgeon-Major Ince: That By-Law 11 stand as heretofore, and that the following words be added to the end of it, namely:—"Provided that every Fellow not being (1) a *bona fide* working gardener earning his own living by the pursuit, or (2) a Fellow permanently residing outside the British Isles who in pursuance of the above-mentioned option elects to pay an Annual Subscription of 1*l.* 1*s.* only, shall with his first Subscription also pay an Entrance Fee of 1*l.* 1*s.*" On a show of hands being taken, the President declared the Amendment to be carried. The Amendment was then put as a substantive motion and carried unanimously.

A further consequential Amendment was moved by Mr. H. J. Veitch, seconded by Mr. J. Gurney Fowler, and carried unanimously, viz.: That in By-law 9, after the words "On paying his first Subscription," the words "and Entrance Fee (if any)" be inserted.

Sir John D. T. Llewelyn, Bart., moved a hearty vote of thanks to the President, which was received with acclamation.

REPORT OF THE COUNCIL

FOR THE YEAR 1903.

1. **The One Hundredth Year.**—The year 1903 will long be noteworthy in the Annals of the Society. Not only does it complete (i.) one hundred years of the Society's existence, but it has also seen (ii.) the commencement of the New Hall and Offices, (iii.) the inauguration of a New Garden, and (iv.) the largest numerical addition to the list of Fellows that has ever taken place in the Society's history.

2. To celebrate the One Hundredth year of the Society it has been decided to hold a Centennial Dinner at the Hôtel Métropole on Thursday, March 3, the nearest convenient date to the actual completion of the Centenary, which will take place on Sunday, March 6 next, the Society having been founded on March 7, 1804, by Mr. Charles Greville, Sir Joseph Banks, Mr. Richard Anthony Salisbury, Mr. W. T. Aiton, Mr. W. Forsyth, Mr. James Dickson, and Mr. John Wedgwood. The Rt. Hon. the Earl of Onslow, Minister for Agriculture and Horticulture, will preside at the dinner, and the Council hope that a very large number of the Fellows will join in the celebration. The Dinner Tickets, which the size of the room unfortunately necessitates being confined to gentlemen, will be 21*s*.

3. **New Hall.**—While the Centennial Dinner is the social commemoration of a striking anniversary, the Council have had under consideration, for not less than five years, in what way the Centenary could be most worthily celebrated.

4. Two projects speedily came into prominence: (1) a New Hall and Offices for the Society's Exhibitions and Shows and for the accommodation of the Library and of the Office staff; and (2) a New Garden less exposed to London smoke, fog, drainage, and crowding than Chiswick has of late years become.

5. These projects having been very deliberately considered, the Fellows finally decided in General Meeting assembled to adopt the proposal of a Hall.

6. The site in Vincent Square, almost exactly midway between the Abbey and Victoria Station, having been approved by the Fellows in General Meeting, the Council were instructed to push matters forward, so that the buildings might be opened in the centennial year. This they have done, and the Great Hall (containing, with its two annexes, a floor-space of almost 13,000 square feet) is now ready for roofing, and the Council are promised that the whole building shall be finished in July. The Hall and Offices, when completely furnished, will, it is estimated, cost nearly 40,000*l*., of which upwards of 24,000*l*. has been received or promised.

7. It is impossible to estimate what income may be derived from letting the New Hall when not required for the Society's use, but when it has become known what a fine and spacious hall it contains this will probably be a considerable asset. In this matter the Council ask the Fellows to help them by using their influence to get the Hall let for Concerts, Meetings, Bazaars, and such like purposes.

8. **New Garden.**—Meanwhile several influential Fellows, who preferred the establishment of a New Garden as the celebration of the Society's Centenary, had been urging their views in certain quarters, and on August 4, 1903, Sir Thomas Hanbury, K.C.V.O., having asked for an interview with the Council, offered to purchase the late Mr. G. F. Wilson's famous Garden and Estate at Wisley, comprising sixty acres of land, and to place it in trust for the use of the Society as a Garden as long as the Society desired to retain it.

9. It is needless to say that the Council accepted this timely and generous offer, which came as a complete surprise both to themselves and to the general body of the Fellows. It had the signal advantage of affording a solution of the rival claims of a New Garden as against a New Hall as the Centennial Celebration of the Society.

10. Wisley is some distance from a railway station and two miles from the village of Ripley. Full directions for reaching it will be found at page 15 in the Society's Book of Arrangements for 1904.

11. The Garden has no glasshouses upon it, being at present only a very beautiful and well-placed Wild Garden, stocked with a large number of rare plants. It will therefore be necessary to build a couple of small dwelling-houses for the Superintendent and Foreman, a room where the Council and Committees can meet, and suitable ranges of glasshouses and pits. The Water Supply and Drainage will also require careful attention. By limiting the glasshouses as far as possible at present, the Council estimate that the *necessary* equipment of Wisley can be carried out within the means of the Society, supplemented by the aid which they expect to obtain from the relinquishment of the Chiswick lease.

12. There are many other objects which will hereafter be desirable at Wisley, such as a Scientific Department with residence for a Professor and Laboratory attached, Bothies for young gardeners, Rooms for Students, &c. But the Council feel it imperative to allow these matters to wait until the New Hall is paid for and furnished and its upkeep expenses provided.

13. **Increase of Fellows.**—The exceedingly rapid increase in the number of Fellows (1,412 having been added during the last twelve months), gratifying as it is as a proof of the appreciation of the Society's work by the lovers of gardens, appears nevertheless to the Council to contain an element of danger, inasmuch as it is becoming more and more difficult at times for Fellows to see the Flowers, &c., without serious discomfort from crushing and crowding.

14. **New By-Law.**—After very grave consideration the Council have decided to advise that the minimum rate of Fellowship should in future be raised to 2*l*. 2*s*. except in the case of *bona fide* gardeners, persons living abroad, and journalists writing for provincial or foreign newspapers. The existing 1*l*. 1*s*. Fellows will of course be under no compulsion to change the rate of their subscription, though it is hoped that not a few will voluntarily do so. The Council have therefore directed a new by-law to be drawn up and submitted to the Meeting for approval, the effect of which will be, if carried, to make the lowest subscription for Fellows *in future* 2*l*. 2*s*. except in the cases mentioned.

15. It may be as well to point out the return value which a Fellow will receive for his 2*l*. 2*s*. subscription.

	£	*s*.	*d*.
3 Tickets admitting to—			
The Temple Show—1st Day	1	2	6
„ „ „ —2nd Day		7	6
„ „ „ —3rd Day		3	0
The Holland House Show—1st Day	1	2	6
„ „ „ „ —2nd Day . .		7	6
17 Exhibitions at Drill Hall or Vincent Square at 2*s*. 6*d*.	6	7	6
8 Exhibitions at Drill Hall or Vincent Square at 1*s*.	1	4	0
The Society's Journal	1	10	0
	£12	4	6

To this must be added free advice on all ordinary garden subjects; investigation of plant diseases &c. by the Scientific Committee; a share of plants at the Annual Distribution; facilities for chemical advice &c.

16. **Meetings.**—Twenty-two Fruit and Floral meetings have been held in the Drill Hall, Buckingham Gate, Victoria Street, besides the larger Shows in the Temple Gardens on May 26, 27, and 28; at Holland House on June 25 and 26; at Chiswick on September 29 and 30, and October 1. Lectures or Demonstrations have been delivered at almost all of the Meetings.

17. **Awards.**—The number of awards granted by the Council, on the recommendation of the various Committees, will be seen from the following table:—

Award	Ghent Show	Cardiff Show	Purchased by Affiliated Societies	Temple Show	Holland House Show	Chiswick Fruit and Vegetable Show	On Recommendation of				Total
							Fruit Committee	Floral Committee	Orchid Committee	Narcissus Committee	
Gold Medal	2	3	—	10	8	7	1	4	2	—	37
Silver Cup	—	—	—	22	16	2	—	—	—	—	40
Silver-gilt Hogg Medal	—	—	1	2	—	—	—	—	—	—	3
Silver Hogg Medal ...	—	—	—	—	—	3	2	—	—	—	5
Silver-gilt Lindley Medal	—	—	—	3	—	—	—	—	—	—	3
Silver Lindley Medal ...	—	—	—	2	—	—	—	—	—	—	2
Silver-gilt Flora ...	1	2	—	12	16	—	—	22	23	2	78
Silver-gilt Knightian ...	—	—	—	—	—	8	8	—	—	—	16
Silver-gilt Banksian ...	—	—	—	8	10	2	—	28	—	2	50
Silver Flora	—	5	4	18	13	1	—	55	56	10	162
Silver Knightian ...	—	3	—	1	2	7	5	—	—	—	18
Silver Banksian ...	—	5	14	18	15	11	10	90	42	11	216
Bronze Flora	—	1	6	—	2	—	—	11	—	—	20
Bronze Knightian ...	—	—	—	—	—	—	—	—	—	—	—
Bronze Banksian ...	—	5	6	—	—	5	—	15	—	—	31
Silver Gilt ... Affiliated	—	—	12	—	—	—	—	—	—	—	12
Silver ... Society's	—	—	38	—	—	—	—	—	—	—	38
Bronze ... Medal	—	—	46	—	—	—	—	—	—	—	46
First-class Certificate ...	—	2	—	8	6	—	9	15	22	—	62
Award of Merit... ...	—	17	—	28	16	11	32	92	61	33	290
Botanical Certificate ...	—	—	—	1	—	—	—	3	10	—	14
Cultural Commendation	—	1	—	—	1	2	10	2	21	—	37
Total ...	3	44	127	133	105	59	77	337	237	58	1180

In addition to the above:—A Silver-gilt Flora Medal was awarded to Miss W. E. Brenchley for having passed first in the Society's examination. One hundred and twenty-three Bronze Banksian Medals have also been granted to Cottagers' Societies.

18. **Temple Show.**—The Society's great Show held in May in the Inner Temple Gardens (by the continued kindness of the Treasurer and Benchers) was as successful as ever, and was visited by a very large number of Fellows and their friends. It is a matter of satisfaction to the Council to find that this meeting is universally acknowledged to be the leading Horticultural Exhibition of this country.

19. **Holland House Show.**—The best thanks of the Society are due to the Rt. Hon. the Earl of Ilchester for his kindness in allowing a Show to be held in his park at Holland House, Kensington, on June 25 and 26. Financially the Show was not a conspicuous success, but from every other point of view it more than fulfilled expectations. The Fellows will be pleased to know that his Lordship has consented to another Show being held at Holland House in the ensuing year on July 12 and 13. Fellows are requested to inform their friends of this Show, so as to make it this year a financial as well as a floral success.

20. **Special Societies.**—At the request of the various Societies concerned, the Council have arranged as follows:—

April 19.—National Auricula and Primula Society's Show.
May 7.—National Tulip Society's Show.
July 6.—National Carnation Society's Show.
September 20.—National Rose Society's Autumn Show.
September 20.—National Dahlia Society's Committee Meeting.

These will be held in conjunction with the Society's usual Fortnightly Meeting, and full particulars of the Prizes &c. will be found in the Book of Arrangements for 1904.

21. The Council greatly regret that the National Dahlia Society should not have seen their way to accept the same terms of co-operation as the other Special Societies, and they hope that next year a mutual agreement satisfactory to both sides may be arrived at.

22. **Fruit Show.**—The exhibition of British-grown Fruit and Vegetables held in the Society's Garden at Chiswick, September 29, 30, and October 1, was, from an educational point of view, most satisfactory. Full particulars will be found in Vol. xxviii. Part 3 of the JOURNAL, which will be issued in the course of a few weeks.

23. It is intended to hold a similar Show of British-grown Fruit in the New Hall on October 4, 5, and 6, 1904; but inasmuch as it is calculated that such a Show cannot be held under an expenditure of 350*l.*, if the intention is to be carried into effect it will be necessary for all who are interested in the encouragement of the growth of good fruit within the United Kingdom, now largely dependent on external and foreign supplies, to combine in raising at least half the amount of the money required. The Schedule of the Show is being proceeded with and will be ready for issue on April 2, should the list of subscriptions prove satisfactory. The List of Subscribers to the 1903 Show will be given in Vol. xxviii. Part 3 of the Society's JOURNAL.

24. **Examinations.**—An examination in the principles and practice of Horticulture was held on April 22, concurrently in different parts of the United Kingdom, a centre being established wherever a magistrate, clergyman, schoolmaster, or other responsible person, accustomed to examinations, would consent to act on the Society's behalf, in accordance with the rules laid down. No limit as to the age, position, or previous training of the candidates was imposed. One hundred and ninety-eight candidates presented themselves for examination. The names and addresses of those who succeeded in satisfying the examiners, together with the number of marks assigned to each, will be found in the Society's JOURNAL, Vol. xxviii. p. 119. It is proposed to hold a similar examination in 1904, on Wednesday, April 20. Candidates wishing to enter for the examination should make application during February to the Secretary, R.H.S. Office, 117, Victoria Street, Westminster.

25. The Council have also consented to hold an Examination on Tuesday, June 21, 1904, in Cottage and Allotment Gardening. It is intended for, and will be confined to, Elementary School Teachers, and has been undertaken in view of the increasing demand in Country Districts that the School Teachers shall be competent to teach the elements of Cottage and Allotment Gardening, and of the absence of any test whatever of such capacity. The general conduct of the Examination will follow the lines of the more general one, save in obvious points to which they would not apply.

26. **The Library.**—Valuable books have been presented to the Society during the past year by the Director of the Royal Gardens at Kew, Dr. Maxwell Masters, F.R.S., Rev. Professor Geo. Henslow, V.M.H., Miss Willmott, Mrs. Langridge, the Trustees of the British Museum, Rev. W. Wilks, Mr. A. D. Hall, and others, to all of whom the best thanks of the Society are due. A full list will be published in March 1904 in the Society's JOURNAL, Vol. xxviii. Part 3.

27. **Committees.**—The thanks of the Society are due to all the Members of the Standing Committees—viz. the Scientific, the Fruit and Vegetable, the Floral, the Orchid, and the Narcissus and Tulip Committees, for the kind, patient, and often laborious attention which they have severally given to their departments. Many of the members of these Committees have to travel long distances to attend. The thanks of the Society are especially due to all who are so good as to serve under these conditions.

28. **Plants, Seeds, &c.**—The Society has also to thank all those who have kindly presented plants or seeds to the Gardens. A list of the donors has been prepared, and will be included in the next issue of the Society's JOURNAL.

29. **Journal.**—The reception which has been accorded to the Society's JOURNAL during the past years not only by the great mass of the Fellows, but also by various scientific bodies and individuals, both at home and abroad, competent to speak with authority on such subjects, has been exceedingly gratifying to the Council. The Fellows may be proud of their JOURNAL, and feel that they are issuing a periodical which will compare not unfavourably with that of any other scientific society. At the same time it must not be for one moment forgotten how very deeply

we are indebted to the small body of scientific experts who so kindly volunteer their services in making the "Notes on Research" and "Abstracts," which form one of the JOURNAL's most remarkable and useful features. These gentlemen indeed deserve well of the whole horticultural community, and the Council are glad to take this opportunity of recording the grateful sense of the appreciation which they feel for their invaluable services. The Council also desire to express their best thanks to all who have so kindly delivered Lectures during the year. The Lectures themselves form a most valuable portion of the JOURNAL.

30. **Obituary.**—The Council have the sad duty of recording the death of 96 Fellows during the year, and among them they regret to find the names of the Right Hon. R. W. Hanbury, Sir Joseph Pease, Bart., Sir Colley H. Scotland, Mary Countess of Galloway, the Countess Spencer, Louisa Lady Ashburton, Mrs. Willoughby Smith, Surgeon-Major Bedford, Captain Alfred Torrens, Captain Cecil Drummond, L. Lindley Cowan (Australia), L'Abbé Dupuy (France), Charles Naudin (France), Hermann Wendland (Germany), John C. Lanyon, John D. Pawle, E. P. Youell, A. F. Barron, V.M.H., James Smith, V.M.H., William Thompson, V.M.H., William Fell, A. Pettigrew, William Beale, J. McKenzie, J. Peed, and J. H. Fitt.

31. **Annual Progress.**—The following table will show the Society's progress in regard to numerical strength during the past year:—

LOSS BY DEATH IN 1903.

		£	s.	d.
Life Fellows	22	0	0	0
4 Guineas	1	4	4	0
2 "	23	48	6	0
1 "	50	52	10	0
	96	£105	0	0

LOSS BY RESIGNATION &c.

		£	s.	d.
4 Guineas	3	12	12	0
2 "	24	50	8	0
1 "	180	189	0	0
	207	£252	0	0
TOTAL LOSS	303	£357	0	0

FELLOWS ELECTED IN 1903.

		£	s.	d.
4 Guineas	11	46	4	0
2 "	294	617	8	0
1 "	1,035	1,086	15	0
Associates	37	19	8	6
Affiliated Societies	24	25	4	0
Commutations = £183 15*s.* 0*d.*	11			
	1412	£1,794	19	6
Deduct Loss		357	0	0
NET INCREASE IN INCOME		£1,437	19	6

New Fellows &c.	1,412
Deduct Resignations and Deaths	303
NUMERICAL INCREASE	1,109

The total number of Fellows, Members, Associates, and Affiliated Societies is now 7,337.

32. **Affiliation of Local Societies.**—A scheme for the Affiliation of Local Horticultural Societies was put forward a year or two since, and 159 Local Societies have availed themselves of it. In order to enhance the utility of the Society, the Council have caused a Special Card to be prepared suitable for use by Affiliated Societies, for the purpose of granting Certificates or Awards, or for Complimentary Cards of Thanks, Commendation, &c. They have also caused a New Medal to be struck which is to be used by Affiliated Societies only. Details regarding the prices of the Medal and Cards will be found in the book of the Society's *Arrangements,* 1904, or they can be obtained from the Society's Office, 117, Victoria Street, S.W. The Council express the hope that Fellows will actively promote the affiliation of Local Horticultural or Cottage Garden Societies in their own immediate neighbourhood.

33. **Notice of Shows.**—At the request of some of the Fellows the Council have arranged to send (in the week preceding it) a reminder of every Show to any Fellow who will send to the R.H.S. Office, 117, Victoria Street, Westminster, 24 Post Cards, *fully addressed* to himself, or to whomsoever he wishes the reminder sent.

34. **Deputations.**—In January 1903 the Council received an invitation to send a Deputation to the Cardiff and district local Horticultural Society's Show held on July 22, which they accepted. The Earl of Ilchester, Mr. F. G. Lloyd, J.P., Mr. James H. Veitch, Mr. A. L. Wigan, Mr. Wright, and the Secretary were appointed for the purpose. The Council wish to express the pleasure with which they received the very satisfactory report of the Deputation and also to thank the Cardiff Society for the great kindness and courtesy shown them.

35. A Deputation was also sent to the Great Quinquennial Show at Ghent, consisting of the Rt. Hon. the Lord Redesdale, Mr. F. G. Lloyd, J.P., Mr. James Hudson, V.M.H., and Mr. Charles Pearson. Nothing could exceed the heartiness of the welcome and the abundant hospitality extended to the Deputation by our Belgian friends.

36. The Council have been asked to nominate a representative to serve on the Board of Directors of Lady Warwick's Hostel, and they have had great pleasure in nominating Dr. Burtt, of the Botanical Laboratory, Holgate, York, for this purpose.

37. **Prize Essay.**—In the hope of encouraging and promoting better cultivation in Cottage and Allotment Gardens, the Council have offered a Prize of £10 for an Essay on the subject, which they propose to publish in an inexpensive form as a pamphlet.

38. **Meteorology.**—Special thanks are due to Mr. Edward Mawley, Fellow of the Royal Meteorological Society, both for his annual kindness in drawing up the Meteorological Report for the JOURNAL and also for so kindly superintending the removal of the instruments from Chiswick and their re-erection at Wisley.

39. **Scottish Arboriculture.**—The Council have received a courteous invitation to send a representative of the Society to the Jubilee of the Royal Scottish Arboricultural Society, which takes place on February 16, and they consider themselves fortunate in having obtained the consent of Mr. A. D. Webster, F.R.H.S., to represent them on this happy occasion.

40. **Veitchian Cup.**—In celebration of another Jubilee, viz. that of the establishment in London of the old West-country firm of Messrs. Veitch, Messrs. James Veitch & Sons have presented to the Society five Silver-gilt Cups, each exceeding Fifty-five Guineas in value. One of these magnificent Cups, which have been specially made after an antique pattern, will be awarded to the best individual exhibit, be it a single plant, or group, or specimen of culture, shown at the Temple Show, 1904.

41. The Programme for the ensuing year will be found in the *Arrangements for the year* 1904, lately issued to all Fellows.

42. Subjoined is the usual Revenue and Expenditure Account, with the Balance Sheet for the year ending December 31, 1903.

ROYAL HORTICULTURAL SOCIETY.

CASH ACCOUNT, YEAR ENDING DECEMBER 31, 1903.

NEW HALL.

Dr.

	£	s.	d.	£	s.	d.
Jan. 1, 1903						
To Balance at Bank				653	3	6
Dec. 31						
,, Donations				12,037	19	5
,, Sale of old materials				30	0	0
,, Amounts transferred from 1890 Account for accrued Donations to a Hall				38	7	0
,, Interest on Investments				153	5	0
,, Interest on Deposit Account...				80	2	1
,, INVESTMENTS REDEEMED—						
May 18. Treasury Bills	2,000	0	0			
August 10. Exchequer Bonds	3,000	0	0			
Sept. 7. Exchequer Bonds	4,000	0	0			
Sept. 17. Treasury Bills	2,000	0	0			
Dec. 3. India Sterling Bills	2,000	0	0			
	13,000	0	0			
Less Investments made during the year, the whole of which are included in the above	4,938	6	6			
				8,061	13	6
				£21,054	10	6

Cr.

	£	s.	d.	£	s.	d.
Dec. 31, 1903						
By Mowlem & Co.—Foundation Contract ...				1,879	7	10
,, G. E. Wallis & Co., on account Building Contract				6,750	0	0
,, Ground Rent (to Michaelmas, 1903) ...				337	10	0
,, London County Council—Compensation ...				45	5	0
,, Architects' Fees on account				330	0	0
,, District Surveyor				8	8	0
,, Clerk of the Works—Salary				135	19	6
,, Commission (Collection of Donations) ...				100	0	0
,, Boiler Insurance				3	0	0
,, Postages				5	10	10
,, Printing and Stationery				39	0	9
,, Miscellaneous Expenses				6	8	0
,, Income Tax				2	13	1
,, Balance—						
on Deposit Account	8,500	0	0			
,, Cash at Bank...	2,911	7	6			
				11,411	7	6
				£21,054	10	6

ALFRED C. HARPER, F.C.A., *Auditor* (HARPER BROTHERS),
Chartered Accountant, 10 Trinity Square, E.C.

ROYAL HORTICUL

Dr. ANNUAL REVENUE AND EXPENDITURE

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Salaries and Wages	853 7 10	
Rent of Office	203 3 0	
Printing and Stationery	443 16 5	
JOURNAL—Printing and Postage	2,219 8 0	
Postages	268 11 8	
Coal and Gas	5 19 3	
Donation to Primula and Auricula Society ...	10 0 0	
" Carnation Society	10 0 0	
Miscellaneous	135 1 7	
Commission on Advertisements, JOURNALS, &c.	63 5 7	
Painting Orchid Pictures	17 5 0	
		4,229 18 4
" LINDLEY LIBRARY		27 14 0
" SHOWS and MEETINGS—		
Rent of Drill Hall and Cleaning	128 14 0	
Temple Show	716 11 11	
Holland House Show	622 8 10	
Fruit and Vegetable Show	405 1 10	
Labour	96 16 6	
Expenses of Floral Meetings and Conferences	24 8 0	
		1,994 1 1
" PRIZES and MEDALS—		
Committee Awards &c.		565 13 8
" CHISWICK GARDENS—		
Rent, Rates, Taxes, and Insurance	273 7 1	
Superintendent's Salary	225 0 0	
Pension, late Superintendent	145 0 0	
Labour	661 0 3	
Implements, Manure, Soil, Packing, &c. ...	119 10 5	
Coal and Coke	225 17 0	
Repairs	20 2 11	
Water and Gas	19 11 2	
Miscellaneous Expenses	102 10 2	
		1,791 19 0
" WISLEY GARDENS—		
Rates and Taxes	6 4 0	
Labour	111 11 0	
Garden Implements	24 11 0	
Miscellaneous Expenses	13 2 5	
Repairs	11 17 6	
		167 5 11
" BALANCE, carried to Balance Sheet		3,641 10 10
		£12,418 2 10

TURAL SOCIETY.

ACCOUNT for YEAR ending DECEMBER 31, 1903. Cr.

	£ s. d.	£ s. d.
By ANNUAL SUBSCRIPTIONS		8,297 4 6
„ SHOWS AND MEETINGS—		
Temple Show	1,400 11 10	
Holland House Show	591 16 9	
Fruit and Vegetable	266 18 0	
Drill Hall Meetings	74 19 0	
		2,334 5 7
„ ADVERTISEMENTS IN "JOURNAL"	689 11 8	
„ SALE OF "JOURNALS"	109 3 4	
MISCELLANEOUS RECEIPTS	46 5 0	
		845 0 0
„ DIVIDENDS—		
Davis Bequest	50 8 2	
Consols	206 19 9	
Local Loans	165 6 2	
Rupee Paper	80 10 7	
		503 4 8
„ INTEREST ON DEPOSIT ACCOUNT		35 10 7
„ PRIZES and MEDALS		78 14 9
„ CHISWICK GARDENS—		
Produce sold	185 18 6	
Students' Fees	15 15 0	
Admissions	4 10 0	
Inspection of Gardens	43 1 0	
Miscellaneous Receipts	62 6 3	
		311 10 9
„ WISLEY GARDENS—		
Donations		12 12 0
		£12,418 2 10

ALFRED C. HARPER, F.C.A., *Auditor* (HARPER BROTHERS),
Chartered Accountant, 10 Trinity Square, E.C.

ROYAL HORTICULTURAL SOCIETY.

BALANCE SHEET, DECEMBER 31, 1903.

	£ s. d.	£ s. d.
To SUNDRY CREDITORS—		
Chiswick	56 0 5	
Painting Orchid Certificates	41 16 9	
		97 17 2
,, SUBSCRIPTIONS, 1904, paid in Advance ...	256 14 6	
,, ADVERTISEMENTS, 1904, paid in Advance	0 18 9	
		257 13 3
,, LIFE COMPOSITIONS, Dec. 31, 1902 ...	2,040 16 6	
Do. do. do. 1903 ...	229 19 0	
		2,270 15 6
,, GENERAL REVENUE ACCOUNT—		
Balance, January 1, 1903	13,958 5 3	
Less Bad Debts	2 19 5	
	£13,955 5 10	
,, Balance for the Year 1903, as per Revenue and Expenditure Account	3,641 10 10	
		17,596 16 8
		£20,223 2 7

	£ s. d.	£ s. d.
By SUNDRY DEBTORS—		
Annual Subscriptions outstanding, estimated at	5 5 0	
Garden Produce	11 4 4	
Advertisements	100 19 9	
Rates and Taxes (Chiswick) paid in advance	27 8 2	
Interest on Investments	114 16 11	
		289 14 2
,, CHISWICK SCHOLARSHIPS—		
Amount expended, Dec. 31, 1902	41 13 4	
,, ,, ,, 1903	43 15 0	
		85 8 4
,, INVESTMENTS—		
$2\frac{1}{2}$ % Consols £2,122 8*s.* 9*d.* ... ... *cost*	1,892 11 3	
(£2,022 8*s.* 9*d.* of this sum is held by the Society subject to the provisions of the will of the late J. Davis, Esq.)		
$2\frac{1}{2}$ % Consols £8,310 13*s.* 9*d.* ... *cost*	8,067 13 6	
3 % Local Loans £5,800 ... ... ,,	6,006 16 6	
37,000 Rupees, Indian Rupee Paper... ,,	2,462 14 4	
		18,429 15 7
,, DEPOSIT ACCOUNT		1,000 0 0
,, CASH AT LONDON AND COUNTY BANK—		
Current Account	408 9 5	
Petty Cash (Head Office)	9 15 1	
		418 4 6
		£20,223 2 7

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 December 31, 1903.

ALFRED C. HARPER, F.C.A., *Auditor* (HARPER BROTHERS),
Chartered Accountant, 10 Trinity Square, E.C.

GENERAL MEETING.

FEBRUARY 23, 1904.

Mr. BUNYARD, V.M.H., in the Chair.

Fellows elected (40).—John Aitchison, Miss M. F. Arbuthnott, Mrs. E. Barber, William Bell, F.R.C.I., Mrs. H. Bennett, H. Rowsell Blaker. W. Hamilton Bradford, Robert Brown, Mrs. Victor Buxton, T. Gilbert Carver, K.C., R. H. Chillcott, Mrs. Harold Cobb, William Cooke, Mrs. Cornwallis-West, Mrs. H. G. Cumming, Mrs. Dunning, Charles W. Emson, R. M. Fisher, Commander C. E. Gladstone, R.N., Henry Hedges, Miss Maud Kent, Thomas H. Lamb, Marchioness of Linlithgow, John McKerchar, Mrs. W. E. Martyn, Mrs. Needham, Rt. Hon. the Earl of Northesk, Mrs. R. A. Powell, Mrs. V. L. Quinton, Miss W. Seaton, Arthur Shillitoe, F.R.C.S., Robert Spence, R. E. T. Stone, Mrs. W. J. Stuart, Miss A. M. Swanzy, Mrs. C. B. Trollope, Mrs. Gerald Walker, Edwin White (New Zealand), Mrs. White-Spunner, Rev. H. Wiseman, M.A.

A paper on "Pomology as a Study," by Mr. R. Lewis Castle, was read by the Assistant Secretary (see p. 146).

GENERAL MEETING.

MARCH 8, 1904.

Mr. A. H. PEARSON in the Chair.

Fellows elected (43).—Charles C. Allom, Charles F. Ball, B. E. H. Bircham, Mrs. Brett, Leonard G. Boor, Miss A. M. Burge, Mrs. Kendal Bushe, Arthur J. Butler, Mrs. R. Clarke, Miss Agnes Coles, Dr. E. Marriott Cooke, William Downes, Mrs. C. H. Firth, Mrs. A. J. Fraser, Mrs. M. M. Hermon, Miss M. B. Hudson, Miss J. L. Hunt, T. Ikeda (Japan), David King, Mrs. Ley, Colonel Mark Lockwood, M.P., Lady Lyall, Miss N. H. Morison, Henry T. Ommanney, G. Clive Parker, Sir Henry Pottinger, Alfred Pullein, Mrs. S. G. Rathbone, Mrs. E. C. Rawlinson, A. T. Silvers, Lady Slack, C. F. Slater, F.S.I., Miss A. M. Smith, G. H. Street, H. Macrae Tennant, F. C. Thomson, Mrs. Twemlow, Mrs. Alfred Tyrer, Mrs. Waddell, Miss D. M. Wade, H. C. Wales, Captain Williams, Mrs. Charles Wright.

Associates (4).—Miss E. Bennett, Miss A. A. Brown, H. Milam, V. Shepherd.

Societies affiliated (3).—Feltham, Belfont, and Hanworth Horticultural Society, Heywood and District Floral and Horticultural Society, Wolverton Horticultural Floral Beekeepers' Society.

A paper on "Cottage and Allotment Gardens," by Mr. Alexander Dean, was read by the Assistant-Secretary (see p. 128).

GENERAL MEETING.

March 22, 1904.

Mr. Bunyard, V.M.H., in the Chair.

Fellows elected (56).—Harry Allan, Frank Allen, Lionel Baker, Samuel Barrow, H. B. Bell, Mrs. C. Bertram, H. C. Bolingbroke, Mrs. H. A. Bright, W. J. Collis, H. T. Cookson, Hon. Darea Curzon, J. G. Davis (New Zealand), Miss Dawson, Joseph Fallows, Miss E. Farrant, Lady Finlay, George Groves, A. Hemsley, Mrs. H. Hudson, Miss S. L. D. Kinnersley-Hooper, S. L. Kinnersley-Hooper, Arthur H. Lavie, Miss M. Leach, Lady Leese, Robert Low, Mrs. E. Lynch, Mrs. G. MacCaul, Thomas Maddison, F. J. Marnham, W. Menzies, Mrs. A. Norman, Miss Hylda Paget, Mrs. Walter Parrott, Thomas Phelps, E. O. Preston, Marlborough Pryor, J. Stewart Remington, F.L.S., J. Hall Renton, A. M. Robertson, Mrs. Saltmarsh, J. Sargeaunt, Arthur R. Searle, Mrs. W. P. Sinclair, Lady Katherine Somerset, Captain W. P. Standish, H. Stanly, Rt. Hon. the Earl of Tankerville, F. J. Tomlinson, Earl Waldegrave, A. C. Walter, Mrs. Weiss, T. W. Wheatley, Robert Winlo, Arthur Winstanley, Mrs. L. Woodhead, James Allen Young.

A lecture on "Heredity of Acquired Characters" was given by the Rev. Professor G. Henslow, M.A., V.M.H. (see p. 77).

At the close of the Lecture the following letters were read amid acclamation:

Royal Horticultural Society, 117 Victoria Street, S.W.
March 8, 1904.

To the King's Most Excellent Majesty.

May it please Your Majesty,—We, the President and Council of the Royal Horticultural Society, sitting this day for the first time in the second century of the Society's existence, most dutifully approach Your Majesty with the prayer that you may be pleased to grant to our Society the favour of Your Majesty's most gracious patronage.

The Society is already happy in the support afforded by the patronage of Her Majesty the Queen, and it ever cherishes the recollection of the patronage bestowed upon it by her late Majesty Queen Victoria during the greater part of her glorious reign, and of the arduous labours so ungrudgingly bestowed by His Royal Highness the late Prince Consort, who as President directed and controlled its destinies for several years.

We ever pray that the Almighty will grant Your Majesty long life and peace and happiness, and trusting you will be pleased to grant this our prayer, we humbly sign ourselves,

Your Majesty's obedient servants,
(*Signed*) Trevor Lawrence, *President.*
„ J. Gurney Fowler, *Treasurer.*
„ W. Wilks, *Secretary.*

Buckingham Palace, March 10, 1904.

Gentlemen,—I am commanded by the King to acknowledge the receipt of your letter of the 8th instant, sent to His Majesty through the Home

Secretary, and to inform you that His Majesty is pleased to accede to the request of the President and Council of the Royal Horticultural Society—to become Patron of the Society.

I have the honour to be, Gentlemen,

Your obedient servant,

D. M. PROBYN, *General,*

Keeper of His Majesty's Privy Purse.

Sir Trevor Lawrence, Bart., K.C.V.O.
J. Gurney Fowler, Esq.
Rev. W. Wilks, M.A.

This letter was unanimously ordered to be entered on the minutes, and the following reply was directed to be sent to His Majesty :

Royal Horticultural Society, March 22, 1904.

TO THE KING'S MOST EXCELLENT MAJESTY.

May it please Your Majesty,—We, the President, Council, and Fellows of the Royal Horticultural Society, being this day in General Meeting assembled, would most humbly and dutifully convey to Your Majesty our most grateful thanks for bestowing on us the favour and support of your most gracious Patronage conjointly with that of Her Majesty the Queen in commemoration of the completion of the first century of our Society's efforts for the benefit and improvement of British Horticulture.

At the same time we would also venture to approach Your Majesty with the expression of our deep sense of grief at the heavy loss which Your Majesty's Royal House has sustained by the death of His Royal Highness The Duke of Cambridge, K.G., beside whose grave the whole nation mourns at heart to-day.

No class of Your Majesty's subjects are more devotedly attached to your throne and person than the Horticulturists of this Country, who will ever pray that Your Majesty may long be spared to reign over this happy realm.

Signed on behalf of the Fellows,

TREVOR LAWRENCE, *President.*
J. GURNEY FOWLER, *Treasurer.*
W. WILKS, *Secretary.*

GENERAL MEETING.

APRIL 5, 1904.

MR. BUNYARD, V.M.H., in the Chair.

Fellows elected (40).—C. Allen, G. F. O. Bagnall, Miss Gertrude Boulter, Alfred Brisco, Mrs. H. de V. Brougham, Mrs. A. H. Burton, John Butler, D. A. Christie, Mrs. C. F. Churchill, Lady Cowell, Andrew Crane, Howard Dickinson, Eric Drabble, W. Emerton, Hon. K. Forbes-Sempill, Mrs. H. F. Fox, A. Freeland, Ruben Frogbrook, S. W. Fryett, F. A. Hooper, Lawrence Johnston, Sir William Johnston, Bart., Mrs. H. Lamotte, Colonel H. C. Legh, Mrs. Norman Leslie, A. H. Louis, Miss I. Maudsley, Mrs. A. Meysey-Thompson, Lady Nicholson, B. Othmer

(Bavaria), Mrs. T. A. Roberts, Miss Stiff, the Countess of Strathmore, B. Suzuki (U.S.A.), Mrs. R. Taylor, Mrs. D. A. Thomas, Miss Scott Turner, Alfred Waldy, M. E. W. Widegren, G. J. B. Woolley.

A lecture on "Design in the Suburban Garden" was given by Mr. H. P. C. Maule (see p. 68).

GENERAL MEETING.

April 19, 1904.

Dr. Masters, F.R.S., in the Chair.

Fellows elected (49).—R. H. Adams, W. H. Aggett, Miss G. L. Beckton, David L. Beddington, T. G. Binney, Miss K. L. Broke, Philip Vere Broke, Lady Brunner, Robert B. Colley, Miss S. Cooper, W. Cooper, Norman Daniel, B. Lewis Day, Miss E. A. Day, E. A. De Mouilpied, Miss M. French, James Goodchild, Arthur Greenstreet, Mrs. Halkett, Dudley M. Hole, Mrs. G. Isaac, Harry A. Kilham, Miss B. Jones (U.S.A.), E. Kraftmeier, H. G. Langton, Miss E. Leaf, The Viscountess Mountgarret, Samuel James Musson, Ernest Noble, R. S. Pasley, James W. Partridge, F. Pym, Miss E. Quinton, L. Stafford Shallard, F.N.A.M., James Smith, M. Stephenson, Alfred Sturt, B. Thomas, Miss M. E. Treble, Mrs. R. Tronton, Hon. Mrs. W. Warren Vernon, Madame P. von Holthoir, H. G. Welchman, H. V. Wells, Mrs. Willesford, Hon. Mrs. Raymond White, T. P. Wilkes, Marchioness of Winchester, Mrs. F. T. Wright.

Associate (1).—Miss Gertrude Kalisky.

Societies affiliated (2).—Crewe Cottage Hospital Horticultural Society, Westerham Gardeners, Amateurs, and Cottagers' Mutual Improvement Society.

A lecture on "Diseases of the Potato" was given by Mr. George Massee, V.M.H. (see p. 139).

GENERAL MEETING.

May 3, 1904.

Sir John T. D. Llewelyn, Bart., F.R.S., in the Chair.

Fellows elected (54).—J. D. Gurney Aggs, Miss C. Baillie, Douglas Baird, Mrs. Baldry, Kenneth Balfour, Mrs. Barker, Mrs. L. Barlow, Miss A. Benson, W. T. Bird, Mrs. H. F. Birley, Mrs. Bertram Blount, Mrs. Clifton Brown, Miss H. Caddy, Lady Evelyn Cobbold, H. Compton, C. F. Elston, Raoul H. Foa, John M. Frost, J.P., Mrs. C. B. Godman, J. M. Gorham, Rev. G. Hadow, John Heal, V.M.H., E. Hill, John Julian, Mrs. G. Liddell, Com. Arthur Lingham, R.N., Mrs. E. Lowis, Mrs. A. C. McCorquodale, J. A. Mahood, Alfred Marnham, Mrs. Cecil Mills, Mrs. Gardiner Muir, Robert Murrell, James Nash, Sir Nathaniel Nathan, F. Nathan, Mrs. H. W. Peal, Alfred Pearce-Jones, F. W. Peerless, Harry Portway, J. Crofts Powell, Mrs. J. Crofts Powell, C. J. Rivett-Carnac, Samuel Roberts, Lady Mabel Sievier, Mrs. Wyatt Smith, Mrs. C. M. Stables, Hon. Mrs. Stirling, Capt. G. G. Traherne, A. M. C. van der Elst (Holland), Miss E. C. Wallace, Mrs. L. de L. Wells, Charles Wright, Jones Yates.

Society affiliated (1).—Hugglescote Horticultural Improvement Society.

A paper on "Enemies of the Apple Tree," by Mons. Charles Baltet, was read by the Assistant Secretary (see p. 135).

GENERAL MEETING.

May 17, 1904.

Sir John T. D. Llewelyn, Bart., F.R.S., in the Chair.

Fellows elected (86).—Mrs. Abdy, Mrs. J. Addison, Mrs. H. Ady, Mrs. Allan, Mrs. K. F. Anderson, Hugh Andrews, D.L., J.P., A. C. Armitage, D.L., J.P., Sir Francis Astley-Corbett, Sir Charles S. Bagot, Mrs. Eldon Bankes, J. F. N. Bartlett, M. H. Beaufoy, J.P., A. H. Brampton (Transvaal), James Buchanan, Mrs. Burgess, J. T. Campion, F. C. Clayton, J. Cowan Cobley, Richard Cobley, J. E. Corbould, S. A. Courtauld, J.P., F. H. Cripps, James Cuthbert, Mrs. Dun-Waters, Mrs. Ebsworth, H. Emmons, George Fagg, J. Fidler, Miss E. Finch, Major Foot, Lady Fowler, Mrs. J. H. Freeman, Dr. L. Fuller, A. Gilbertson, W. J. Gallon, Mrs. D. Galton, Miss E. Game, G. Garner, Mrs. G. Goodlake, Mrs. H. R. Haines, Rev. A. A. Harland, H. R. Hay, Capt. Heneage, Mrs. E. Hills, Mrs. C. Howard, D. Howell, H. Inglis, Miss A. C. Innes, O. H. Jones, Mrs. A. Keightley, Mrs. Maurice Kirk, H. R. Knott, Miss C. S. Layard, Mrs. M. A. Logan, A. Lynn, B. B. Maller, George Manger, John O. Martin, Miss C. H. Maxwell, W. C. Modral, William Morris, jun., Lady Musgrave, R. A. Notley, Mrs. R. A. Notley, G. A. Parton, Miss H. Perkins, Thomas Rattray, L. M. Reed, John Russell, Mrs. Salt, Mrs. Sandbach, G. Curnock Sawday, the Countess of Scarborough, Mrs. M. A. Scott, Mrs. J. A. Sellar, Mrs. F. Shuttleworth, T. W. Skelton, Mrs. Steele, Lady E. Taylor, T. C. Thomas, Mrs. R. E. Vernède, A. B. Warboys, C. T. Waters, William Welchman, Walter Morgan Willcocks, William Wiles.

Associate (1).—A. Wilson.

Affiliated Society (1).—Bath and District Gardeners' Mutual Improvement Association.

A lecture on the "Horticultural Phase of Nature Study" was given by Mr. R. Hedger Wallace (see p. 111).

THE TEMPLE SHOW, 1904.

May 31, June 1 and 2.

JUDGES.

Orchids.

Chapman, H. J.
Douglas, Jas., V.M.H.
Fowler, J. Gurney
Little, H.

Roses.

Jennings, John
Lindsell, E. B.
Mawley, E.
Pemberton, Rev. J. H.

Fruit and Vegetables.

Challis, T.
McIndoe, J., V.M.H.
Norman, G., V.M.H.
Pearson, A. H.

Groups in Open Air.

Chapman, A.
Crump, W., V.M.H.
McLeod, J.
May, H. B.

Herbaceous, Rock Plants, and Alpines.

Beckett, E.
Page-Roberts, Rev. F.
Shea, Charles E.
Thomas, Owen, V.M.H.

Foliage Plants.

Bain, W.
Hudson, J., V.M.H.
Ker, R. Wilson

Flowering Plants.

Dean, R., V.M.H.
Howe, W.
Paul, G., V.M.H.
Salter, C. J.

Miscellaneous.

Dixon, C.
Molyneux, E., V.M.H.
Odell, J. W.
Veitch, Peter

Veitchian and Special Cups.

Bennett-Poë, J. T., V.M.H.
Ilchester, The Earl of
Lawrence, Sir Trevor, V.M.H.
Methven, J.
Pearson, C. E.
Tallack, J. C.
Tidy, W.

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 recommendation of the Fruit, Floral, and Orchid Committees will be found under their respective reports.

Veitchian Cup.

Messrs. William Paul, Waltham Cross.

Gold Medal.

Baron Sir H. Schröder, Bart., for Orchids.
Sir Frederick Wigan, Bart., for Orchids.
Messrs. James Veitch, for stove and greenhouse plants.

Messrs. Sander, for Orchids.
Mr. A. J. A. Bruce, for Sarracenias.
Messrs. Fisher, Son, & Sibray, for trees and shrubs.
Mr. G. Mount, for Roses.
Messrs. Rivers, for fruit trees.
Messrs. Wallace, for Lilies, Iris, Tulips, &c.

Special Silver Cups for Arrangement.

Sir Frederick Wigan, Bart.
Messrs. James Veitch.
Messrs. Wallace.

Silver Cup.

Captain G. L. Holford, C.I.E., C.V.O., for Orchids.
Sir Alexander Henderson, Bart., M.P., for vegetables.
Jeremiah Colman, Esq., for Orchids.
S. Heilbut, Esq., for pot Vines and Cherries.
R. Irwin Lynch, Esq., for hybrid Gerberas.
Messrs. H. Cannell, for vegetables, Cannas, &c.
Mr. John Russell, for stove, greenhouse plants, &c.
Messrs. W. Cutbush, for clipped Yews and herbaceous plants.
Messrs. Paul & Son, for Roses and herbaceous plants.
Messrs. Cuthbert, for Azaleas, &c.
Messrs. Hill, for Ferns.
Messrs. Jackman, for Clematis and herbaceous plants.
Messrs. Sutton, for Cinerarias, Gloxinias, &c.
Messrs. Cheal, for trees and shrubs.
Messrs. R. Smith, for Clematis and herbaceous plants.
Messrs. Chas. Turner, for Roses.
Messrs. Blackmore & Langdon, for Begonias.
Messrs. Charlesworth, for Orchids.
Messrs. Backhouse, for alpine and rock plants.
Messrs. A. Dickson, for Tulips.
Messrs. Hugh Low, for Figs, Carnations, and Orchids.
Messrs. Barr, for pigmy trees and herbaceous plants.
Messrs. Cripps, for Acers and flowering shrubs.

Silver-gilt Lindley Medal.

Monsieur Vuylsteke for *Odontioda Vuylstekeæ,* a very extraordinary hybrid Orchid. See pp. ci, cii, ciii.

Silver-gilt Flora Medal.

R. Farrer, Esq., for rock garden with Alpines.
R. Ashworth, Esq., for Orchids.
Messrs. J. Laing, for Begonias and Caladiums.
Messrs. Ware for Roses, Begonias, &c.
Messrs. Peed, for Caladiums and Begonias.
Mr. H. B. May, for Ferns, &c.
Mr. Amos Perry, for herbaceous plants.
Messrs. Bull, for Orchids (fig. 104) and foliage plants.
Mr. M. Prichard, for herbaceous plants.

Messrs. Hobbies, for Roses and Carnations.
Messrs. John Waterer, for Rhododendrons.
Messrs. Cowan, for Orchids.

FIG. 104.—LÆLIA PURPURATA 'QUEEN ALEXANDRA.' (*The Garden.*

Messrs. Cypher, for Orchids.
Messrs. Carter, for Calceolarias, Gloxinias, &c.
Messrs. Fromow, for trees and shrubs.

Silver-gilt Knightian Medal.

Mr. Ritchings, for Melons and Tomatos.

Silver-gilt Banksian Medal.

J. Rutherford, Esq., M.P., for Orchids.
E. Ascherson, Esq., for Calceolarias, &c.
Messrs. Balchin, for Leschenaultias and Ericas.
Mr. H. C. Pulham, for rock plants.
Guildford Hardy Plant Co., for herbaceous and alpine plants.
Messrs. Dobbie, for Dahlias, Violas, &c.
Mr. H. J. Jones, for Sweet Peas, Begonias, &c.
Mr. W. J. Godfrey, for Pelargoniums, Poppies, &c.
Mr. G. Reuthe, for herbaceous and alpine plants.
Messrs. Frank Cant, for Roses.
Messrs. Ladhams, for hardy perennials.

Silver Flora Medal.

Lord Aldenham, for Streptocarpus.
Leopold de Rothschild, Esq., for Geraniums.
Hon. A. H. T. de Montmorency, for Tulips.
N. L. Cohen, Esq., for *Calla Elliottiana.*
Mr. R. C. Notcutt, for herbaceous flowers, &c.
Messrs. Jones, for Sweet Peas, Irises, &c.
Messrs. B. R. Cant, for Roses in pots.
Messrs. B. S. Williams, for Rhododendrons, &c.
Mr. A. F. Dutton, for Tree Carnations.
Messrs. Webbs, for Gloxinias, Calceolarias, &c.
Mr. T. Jannoch, for Lilies of the Valley, Lilacs, &c.
Messrs. B. R. Davis, for Begonias.
Mr. John R. Box, for Begonias.
Mr. Robert Sydenham, for Sweet Peas.
Messrs. Reamsbottom, for Anemones.
Messrs. Hogg & Robertson, for Tulips and Irises.
Mr. John Robson, for Orchids.
Mr. W. Iceton, for Lilies of the Valley and foliage plants.

Silver Knightian Medal.

Mr. S. Mortimer, for Cucumbers and Tomatos.
Mr. R. Stephenson, for Asparagus.

Silver Banksian Medal.

Lady Warwick College, for Vegetables.
Mr. T. R. Cuckney, for Strawberries.
Mr. A. J. Harwood, for Asparagus.
Mr. W. Godfrey, for Asparagus.
The Ranelagh Nurseries Co., for foliage plants and Crotons.
Messrs. Storrie & Storrie, for Auriculas and Streptocarpus.
Mr. Vincent Slade, for Pelargoniums.
Messrs. Boyes, for Carnations.
Misses Hopkins, for Alpines and rock plants.

Messrs. Watkins & Simpson, for collection of annuals in pots.
Messrs. Kelway, for Pyrethrums.
Messrs. Gilbert, for Anemones.
Messrs. W. & J. Brown, for greenhouse plants.
Messrs. R. Anker, for Cacti.
Mr. L. J. Draps Dom, for Begonias, foliage plants, &c.
Mr. A. Ll. Gwillim, for Begonias.

Cultural Commendation.

Mr. J. Hudson, V.M.H., for Roses.

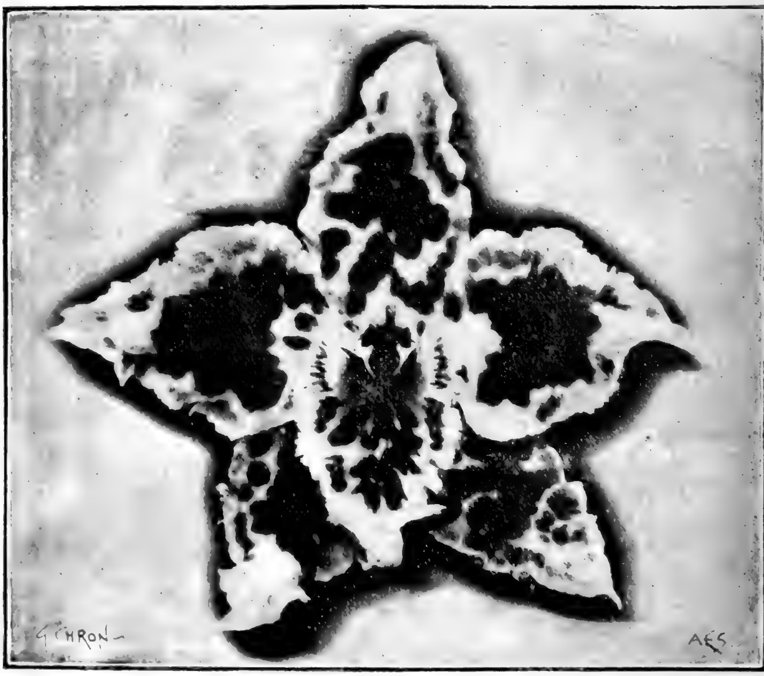


FIG. 105.—ODONTOGLOSSUM CRISPUM 'BOLTONI.' (*Gardeners' Chronicle.*)
Shown by R. G. Thwaites, Esq., at the Temple Show.

GENERAL MEETING.

June 14, 1904.

Mr. A. Dean in the Chair.

Fellows elected (246).—H. Alabaster, P. H. Aldrich, Wilton Allhuson, Otto S. Andreae, Dowager Duchess of Argyll, Sir George J. Armitage, Bart., Miss G. Arnold, Major G. R. Ashley, R. H. Atkin, W. B. Avery, Percy Baldwin, W. H. Banks, W. P. Barnaart (Holland), F. H. Barnett, Lady Battie-Wrightson, John C. Beck, Mrs. Ballairs, Isaac E. Bennett, Joseph Bettinson, Miss E. Birnstinge, Miss A. Birt, John Bowden, E. S. Bowdler, G. B. Boxall, Mrs. W. S. Briand, Miss E. N. Brock, Howard Brooks, C. A. L. Brown, Major-General W. V. Brownlow, C.B., Miss Buxton, Baroness Campbell, Lady Campbell-Dede, V. D. Carey-Elwes, D.L., J.P., George Chambers, Dr. W. F. Clark, Mrs. Cleverly, H. F. Clifford, Mrs. Climenson, Capt. the Hon. R. Coke, Mrs. M. Cooper, Col. R. J. Cooper, M.V.O., L. Copijn (Holland), H. E. Cox, Sir Homewood Crawford, Viscount Cross, Lieut.-Col. R. Pearson Crozier, R. S. Curling, William A. Darbishire, W. H. Daun, W. C. Dawes, Countess de Grey, Mrs. A. Dendy, Mrs. F. Denny, Major F. W. Dent, the Lady de Ros, the Rt. Hon. the Earl of Desart, W. F. De Vismes Kane, C. Wriothesly Digby, Commander Gerald Digby, Mrs. Ashley Dodd, Lord Dormer, Alexander L. Duncan, Col. R. W. Edis, C.B., the Rt. Hon. the Earl of Essex, Lady Estcourt, Mrs. E. Everson, Miss Violet Fane, W. L. Fenwick, Major A. T. H. Ferguson, Lieut.-Col. Fergusson-Buchanan, Roger Fison, W. H. W. FitzGerald, J.P., Godfrey FitzHugh, Mrs. R. Fleming, B. E. Fletcher, Richard Foley, H. C. Fortescue, Mrs. Bonville Fox, G. A. Gammie, F.L.S. (India), John S. Gardiner, M.A., H. B. Gaskell, Sir Charles Gibbons, Bart., Clement S. Gibbs, Sydney R. Gold, Henry P. Goodbody, Charles Goring, C. W. Graham, W. Mason Greenip, Mrs. Greenwood, Francis Gubbins, Mrs. Gubbins, Eustace Gurney, W. H. Hall, F. Harrild, General Sir R. Harrison, Sir Robert G. Harvey, T. F. Hazlehurst, R. H. Hedderwick, John Henderson, Mrs. Heywood Jones, T. G. Hill, A.R.C.S., Thomas Hoar, Arthur Hodgson, Jun., Lady Hopkins, Mrs. E. Horne, Albert Howard, Henry Howard, W. Hudson, Lady Hughes, A. C. Humphreys-Owens, Mrs. Curling Hunter, Mrs. Hutton Rindell, the Hon. Lady Ingilby, Mrs. R. H. Jackson, John Jeffreys, C. Jenking, Sir E. G. Jenkinson, K.C.B., Sir Hubert Jerningham, K.C.M.G., Trehawke H. Kekewich, Lieut.-Col. George Kemp, M.P., J. Kemp-Welch, the Hon. W. Justice Kennedy, J. A. Kenrick, H. King, T. J. Knight, C. S. Kynnersley, H. G. Lakin, H. C. M. Lambert, Lieut.-Col. Lambton, Sydney Lanyon, Countess of Lathom, C. W. Lawrence, Sir Elliott Lees, Bart., D.S.O., M.P., Sir William Lee-Warner, K.C.S.I., Rev. A. K. Legge, W. A. Le May, Miss Lempriere of Pelham, Charles J. Letts, the Rt. Hon. the Earl of Lindsey, Rev. H. C. Littlewood, R. G. E. Locke, Mrs. R. Lombe, H. H. Longman, Mrs. Lorsellis, Henry Loyd, Miss Lushington, Lieut.-Gen. Sir A. Lyttelton-Annersley, K.C.V.O., Miss M. McCashie, Mrs. J. McConnel, Mrs. J. McGaw, John Maclachlan of Maclachlan, A. C. Maclachlan, Lady Macleay, H. H. Mann (India), C. J. Maples, Viscount Masserene-Ferrard, A. V. Mellor (Cape Colony), Archibald Merry, Mrs. A.

Merry, Mrs. A. Mitchell, Herbert Moir, A. J. Monro, John Musgrave, J.P., F. Naylor, W. Negus, W. J. W. Nicol, J. R. T. Nind, H. S. O'Brien, Mrs. Ogilvy, Mrs. Alex. Part, Rev. W. H. Peers, Mrs. Phillips, Stanley P. Phillips, Sir G. A. Pilkington, Mrs. Pope, Major P. Powell-Cotton, J.P., Mrs. Preston, R. T. Raikes, H. Rudston Read, Lady Renshaw, Col. Horace Ricardo, C.V.O., S. Robinson, F. J. Robinson, Rev. J. Ross, M.A., Miss M. Ryan, Lord St. Oswalds, Lady St. Oswalds, Lord Saltoun, Sir Marcus Samuel, Bart., Mrs. C. Sanderson, Dr. F. M. Sandwich, Mrs. Savill-Onley, Sir Charles Scarisbrick, H. W. Scriven, Mrs. L. Scrivener, R. C. D. Shafte, Col. T. B. Shaw-Hellier, Sir John C. E. Shelley, Bart., William Sidebottom, Miss A. Sillem, Mrs. H. Seymour, R. Silvester, Mrs. E. Simmons, Thomas Simpson, Rev. H. N. Squire, M. J. Stapylton, Col. Stewart-Mackenzie, Mrs. Strange, Hon. M. G. Stuart-Gray, Mrs. Sturdy, C. W. Tayleur, C. H. Taylor, Miss A. Thrupp, P. E. Tillard, J.P., Mrs. Tod, H. Tollemache, Miss G. Townley, Lieut.-Col. A. Tremayne, Mrs Tubb, Rev. W. Twining, S. A. van Konynenburg (Holland), J. M. V. van Zanten (Holland), T. S. Vernon-Cocks, H. H. Vivian, Prof. R. Wallace, A. C. Ward, Mrs. Wardle, W. P. Warner, Mrs. Warrington, S. T. Watkinson, Mrs. W. H. Watson, Alfred Wear, W. H. Weatherley, Miss Weber, William Weir, P. N. Wesson, J. B. Westropp, W. J. Whitaker, Mrs. Wigan, Lieut.-Col. T. A. Wight-Boycott, D.S.O., Mrs. S. Williamson, Mrs. H. Williamson, Darcy A. Wilson, Sir Lindsay Wood, Bart., Kenneth Wood, P. Wright, J.P.

Associates (2).—A. Brown, W. H. Hillier.

Societies Affiliated (4).—Andover and District Horticultural Society, Handsworth Horticultural Society, Lydbrook and District Cottages, Flower, Fruit, and Vegetable Show, Uitenhage Horticultural Society (Cape Colony).

A lecture on "Floral Metamorphoses" was given by the Rev. Professor Henslow, M.A., V.M.H. (see p. 93).

GENERAL MEETING.

JUNE 28, 1904.

Mr. BUNYARD, V.M.H., in the Chair.

Fellows elected (71).—Charles Acplin, D. T. Arnott, J. Anebach, W. H. Baddeley, A. R. Bagley, Miss M. Barwell, Mrs. G. H. Bone, Mrs. Buddicorn, Rev. C. R. Carter, W. E. Churcher, J. Cleghorne, G. R. D. Clephane, Miss E. Conant, J. Lyon Corser, Charles W. Crosby, Mrs. Cunliffe, Mrs. Dams, T. Davies, Lady Isabel Dent, Capt. E. Ellice, H. M. Ellis, the Lord Elphinstone, Mrs. W. M. Farmer, F. France, Andrew T. Gage (India), Mrs. E. A. Gale, A. Grubb, Mrs. Gwytherne-Williams, Lieut.-Col. W. H. Harfield, J.P., D.L., Sir Robert M. Hensley, J.P., Vice-Admiral S. C. Holland, Miss Holt, Col. J. M. Hunt, Mrs. Hutchinson, Baron Inverclyde, Mrs. H. W. Jefferson, Mrs. H. P. Kirkpatrick, Lady Knowles, F. Lloyd, Ninian Lours, Mrs. W. L. Lucas, Miss Macnamara, W. J. Mann, Rear-Admiral Sir Berkeley Milne, Bart., Col. W. Kenyon Mitford, Miss A. L. Money, H. C. Monro, C.B., J. H. Oglander, C. T. Orford, Owen Parry, Mrs. J. H. Pease, Sir Patrick Playfair, Cecil Polhill,

H. R. Rathbone, F. Reeve, R. Ritchley, Mrs. Vernon Royle, Mrs. Ruck-Keene, Mrs. A. Rutson, John A. Shirer, C. Locke Smiles, Mrs. Stotherd, D. Vickers, James Wann, Mrs. J. Wann, Capt. T. G. Whistler, Miss E. B. White, Miss M. A. White, Miss M. Witham, J. Medley Wood (South Africa), C. H. Wood.

A paper on "Hybridisation of Roses," by Monsieur Viviand Morel, was read by the Assistant-Secretary (see p. 38).

HOLLAND HOUSE SHOW, 1904.

JULY 12 and 13.

JUDGES.

ORCHIDS.

Chapman, H. J.
Douglas, J., V.M.H.
Fowler, J. Gurney
Little, H.

ROSES AND SHERWOOD CUP.

Burrell, J.
Mawley, E.
Nicholson, G., V.M.H.

FRUIT AND VEGETABLES.

Challis, T.
Norman, G., V.M.H.
Pearson, A. H.

GROUPS IN OPEN AIR.

Chapman, A.
Jennings, John
McLeod, J.

HERBACEOUS, ROCK PLANTS, AND ALPINES.

Divers, W. H.
Pearson, C. E.
Shea, Chas. E.

FOLIAGE PLANTS.

Bain, W.
Fielder, C. R.
Ker, R. Wilson.

FLOWERING PLANTS.

Bates, W.
Howe, W.
Reynolds, G.

MISCELLANEOUS.

Dixon, C.
Molyneux, E., V.M.H.
Odell, J. W.

IMPLEMENTS, &c.

Beckett, E.
Dean, A.
Poupart, W.
Wythes, G., V.M.H.

ARRANGEMENT PRIZES.

Bennet-Poë, J. T., V.M.H.
Philbrick, Miss.
Wilks, Rev. W.
Willmott, Miss, 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 under their respective reports.

Gold Medal.

T. A. Dorrien Smith, Esq., for a wonderful plant of *Furcræa longæva.* (Fig. 106.)

Messrs. Jas. Veitch, for stove, greenhouse, hardy, and flowering plants.
Messrs. Sander, for Orchids.
Messrs. T. Cripps, for Acers and hardy plants.

Fig. 106.—Furcræa longæva.

Messrs. Dicksons, for Roses.
Messrs. Blackmore & Langdon, for Begonias.
Messrs. Waveren & Krujff, for Astilbes.

Sherwood Cup Competition.

Messrs. Paul & Son, Cheshunt, for Roses.

Silver Cup.

Jeremiah Colman, Esq., for Orchids.
H. Partridge, Esq., for fruit.
Laurence Currie, Esq., for hardy Nymphæas.
John Bradshaw, Esq., for hardy plants and flowers.
Mr. G. Mount, for Roses.
Mr. H. B. May, for Ferns and flowering plants.
Mr. L. R. Russell, for trees, shrubs, &c.
Messrs. G. Bunyard, for herbaceous flowers and fruits.
Messrs. T. S. Ware, for Alpines and herbaceous flowers.
Messrs. W. Cutbush, for Carnations, Irises, &c.
Messrs. J. Peed, for Gloxinias and Caladiums.
Messrs. R. Wallace, for herbaceous and bulbous plants.
Mr. Amos Perry, for herbaceous plants, &c.
Messrs. Charlesworth, for Orchids.
Mr. H. J. Jones, for Sweet Peas, &c.
Messrs. J. Laing, for Begonias.
Messrs. J. Hill, for Ferns.
Messrs. W. Bull, for stove and greenhouse plants.
Mr. M. Prichard, for Alpines and herbaceous plants.
Messrs. Barr, for hardy flowers and pigmy trees.
Mr. C. W. Breadmore, for Sweet Peas.

Silver-gilt Flora Medal.

Sir F. Wigan, Bart., for Orchids.
Mr. D. Russell, for hardy trees.
Messrs. B. R. Cant, for Roses.
Messrs. Dobbies, for Pansies, &c.
Monsieur C. Vuylsteke, for Orchids.
Messrs. B. S. Williams, for Gloxinias.
Messrs. Jackman, for Roses and herbaceous plants.
Mr. G. Mount, for Roses.
Messrs. J. Bentley, for insecticides.
Messrs. Pulham, for Pulhamite stone vases and rock garden.
Messrs. W. Wood, for sundries.
Messrs. Osman, for sundries.
Mr. G. W. Riley, for rustic work.

Silver-gilt Banksian Medal.

Reginald Farrer, Esq., for Alpines.
Mr. G. Reuthe, for Alpines and herbaceous plants.
Messrs. R. & G. Cuthbert, for flowering plants.
Messrs. B. R. Davis, for Begonias.

Silver Flora Medal.

Mr. A. L. Gwillim, for Begonias.
Messrs. H. Low, for Orchids.
Messrs. Cheal, for herbaceous plants and shrubs.

Messrs. G. & A. Clark, for hardy flowers.

Messrs. H. Castle, for Man-o'-war Teak garden-seats.

The Anglo-Continental Guano Works, for guano and fertilisers.

The Four Oaks Nursery and Garden Sundries Co., for syringes, garden pumps, tree pruners, &c.

Messrs. Champion, for tubs for shrubs.

Messrs. Doulton, for garden vases.

Messrs. Fenlon, for hot-water apparatus, radiators, and geyser.

Mr. James George, for sundries.

Messrs. T. Syer, for ladders, garden tools, and work-benches.

Silver Banksian Medal.

J. B. Joel, Esq., for Strawberries.

Mr. J. Forbes, for hardy flowers.

Messrs. Jones, for Sweet Peas, &c.

Messrs. Fromow, for hardy trees.

Messrs. Ladhams, for herbaceous plants.

Mr. V. Slade, for Pelargoniums.

Mr. R. Anker, for Cacti.

Messrs. Hobbies, for Sweet Peas, &c.

Messrs. Valls, for beetlecute.

Messrs. Corry, for insecticides.

Messrs. de Luzy Frères, for sprayers, knapsacks, and bellows.

Messrs. D. Dowel, for Orchid pottery and sundries.

Messrs. W. Herbert, for sundries.

Mr. H. Pattisson, for lawn boots.

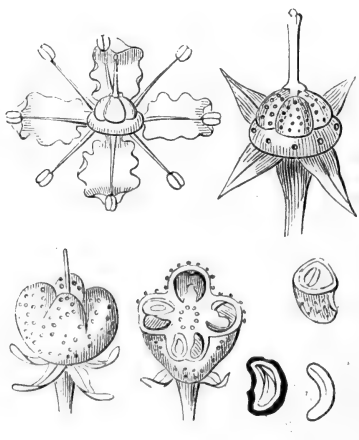
Mr. R. Pinches, for Acme labels.

Bronze Banksian Medal.

Messrs. W. Poore, for hot-water apparatus.

Special Prize for Arrangement.

Mr. Rassell, Kensington (second).



SCIENTIFIC COMMITTEE.

JANUARY 5, 1904.

Dr. MASTERS, F.R.S., in the Chair, and twelve members present.

Proposed Scientific Investigations at Wisley.—The following is the substance of the reply received from the Council to the renewed communication addressed to them by the Scientific Committee on this subject: the Council appreciate the desirability of almost all that was urged therein, and they hope that the day is not far distant when much of it may be accomplished. They feel sure, however, that the Scientific Committee will understand that all the desirable things cannot be carried out simultaneously, and that financial considerations compel them to see the New Hall finished and paid for and the Garden properly laid out before embarking on new projects.

The following reply was drafted and carried unanimously:—"The Scientific Committee beg to thank the President and Council for their reply to their communication, and to say that they are unanimous in regarding the Council's suggestions to secure the establishment of the Hall and of the Garden at Wisley as of primary importance; they trust, however, that the time may not be far distant before the Council may be enabled to take the recommendations of the Scientific Committee into consideration."

Pear-shoots diseased.—Dr. Cooke, V.M.H., reported upon some samples sent by Mrs. Cure, of Coombe, Oxon. They were attacked by *Cytospora* in patches. This fungus would subsequently pass into the *Eutypella* stage. The trees should be sprayed with Bordeaux mixture at intervals, and if this was unsuccessful the places should be cut out and burnt, and the wounds well protected with tar.

The Codlin-moth.—Mr. Hooper raised the question as to whether the grease bands, if kept on till the end of May, would catch the caterpillars at that time. It was the opinion of Mr. Saunders that the caterpillars would not have left the Apples in May. Mr. Massee, V.M.H., observed that there is a spring brood in America, but he was not aware of its existence in England, and recommended observations being made to ascertain the fact.

Camellia Leaf diseased.—Mr. Saunders, F.L.S., showed specimens badly attacked by *Pestalozzia Guepini*, a fungus which damages the Tea plant. It has been known for the last fifty years. Spraying would only partially arrest it, as the fungus is below the epidermis.

Orchids malformed.—Mr. Bidgood, Gateshead, sent some excellent coloured photographs of Orchids, showing certain peculiarities: (1) An *Odontoglossum citrosmum* had the basal flower of a raceme with two well-formed columns, three labella, and eight other perianth segments. The ovarian section had no ovary cells, but numerous clusters of fibro-vascular cords, showing that it was a "multifold" flower, the cords of each perianth-segment branching and entering two instead of a single segment; so that, excepting one, all the parts of the perianth were doubled. (2) *Phaius Humblotii × P. Wallichii*, received from Mr. Cookson's collection. One photograph showed the inflorescence, one flower of which had the lower portion of one of the lateral sepals petaloid like a labellum; the placenta of the ovary next to the position of the labellum was absent. A second flower had no labellum, the lateral sepals were fused, making one wide median sepal, and both the lateral petals were slightly labellate.

Scientific Committee, January 26, 1904.

Dr. Masters, F.R.S., in the Chair, and fourteen members present.

Codlin-moth in May.—Mr. Saunders, F.L.S., made the following contribution to this subject, discussed at the last meeting:—"I cannot find that more than one brood of the codlin-moth has ever been noticed in England, though two broods are common on the Continent and in America; and on the other side of the Atlantic even three broods have been known. In this country the moth leaves the chrysalis in May, and lays her eggs very soon afterwards. The caterpillars are hatched in the course of a week or ten days, and remain in the Apple three weeks or a month; being fully fed, they leave the fruit to fall to the ground, and make their way to the nearest tree stem, and crawl up it until they find a suitable place to pupate in. If they cannot find a tree, a post or paling or even dead leaves will provide them with a shelter. The object in putting bands round the trees is to provide the caterpillars with hiding-places, where they may be found and destroyed. Such bands are not sticky, but are made of folded canvas or sacking, or even hay or straw, and should be put on as soon as any 'windfalls' are found."

Maggots in Moss Litter.—Mrs. Horseley sent samples with inquiries. Mr. Saunders reported as follows:—"The grubs found in the moss-litter manure were those of a fly belonging to the genus *Bibio*, but I cannot tell the name of the species, several of which are very common; perhaps the one best known is the St. Mark's fly (*Bibio Marci*), so called from its generally appearing about St. Mark's Day (April 25). These flies are quite black, and are rather more than half an inch in length; their bodies are rather thin, and the wings are not very transparent; they measure about 1¼ inch from tip to tip. They fly in a very clumsy manner, and may be found crawling over plants, &c., in great numbers for a day or two, and then they disappear altogether. The flies may be easily caught in a butterfly-net. If fowls are kept, I should spread the manure about and let them pick and scratch it over, for they will soon pick out the grubs. Mixing nitrate of soda with the manure might be tried, but I am not sure whether it would have much effect upon the grubs, as I have not heard of any experiments having been made on them. The grubs are undoubtedly injurious to the roots of plants at times."

Coloured Photograph of an Orchid.—Mr. Odell exhibited a colour-photograph of *Cypripedium insigne Sanderæ*, executed by a new method. The yellow colour was very characteristic. It was received from Mr. A. S. Hickley, Southampton.

Ixia diseased.—Mr. Shea showed leaves of *Ixia crateroides*, with the foliage discoloured. There was no fungus present, the appearance being thought to be due to hereditary predisposition.

Eucalyptus with Nodules.—Mr. Saunders showed small plants with nodules on the stem close to the ground. Nothing could be found inside. Mr. Massee, V.M.H., observed that ants can cause similar nodules on Roses, the formic acid acting as an irritant; knots can also be produced artificially.

Scientific Committee, February 9, 1904.

Dr. Masters, F.R.S., in the Chair, and eleven members present.

Beans defective.—Mr. Horsley, Winsford, sent some mould in which Beans had been grown under glass, but failed. The Beans were old. It was thought that the soil was too light, with possibly deficient sunlight, and the Beans being old might have made them difficult to germinate. Mr. Baker undertook to investigate the matter.

Coloured Photos of Orchids.—Mr. Hickley, Bassett, Southampton, exhibited some very beautiful transparent illustrations of Orchids in their natural colours. They were effected by a special process on plates sensitive to the primary colours—red, green, and violet—but the special treatment by which the excellent results were secured is not yet patented.

Tropæolum tuberosum as edible.—Mr. Bowles reported that the result of his trial was that while they were certainly edible he could not recommend them as palatable.

Scientific Committee, February 23, 1904.

Dr. Masters, F.R.S., in the Chair, and fifteen members present.

Coloured Photos.—Mr. Hickley exhibited some more miscellaneous transparent photographs of vases and bouquets, done by his new process.

Cyclamen malformed.—Mr. Odell showed specimens in which the petioles and peduncles were fused together, but not fasciated. The condition was remarkable, having been persistent for six years on the same plant.

Silver Fir diseased.—Mr. Massee, V.M.H., showed a branch attacked by *Æcidium elatinum*. The *Uredo* form known as *Melampsorella Cerastii* attacks members of the order *Caryophyllaceæ*. He observed that the disease of the Birch caused by *Phytoptus* is spreading greatly in the neighbourhood of Kew.

Cypripedium malformed.—Dr. Masters described an unusual form of a blossom, which had four sepals, two petals, one column, with two staminodes, but a three-lobed stigma and three parietal placentas. It was thus a case of increased numbers of parts, or an attempt at forming a multifold flower.

Cineraria, supposed Disease.—Dr. Cooke reported upon some leaves sent by Mr. Voss, of Norwood:—"I could find no parasitic mould upon the leaves; and although I examined the tomentum of the under surface as completely as it seemed possible to examine such a substance, I could find no mycelium mixed with the filaments of the tomentum, and no fragments of fungus hyphæ or fungus spores. Subsequent examination of other leaves, which had brownish and dead spots near the margin, furnished from these spots a few delicate fungus hyphæ with a few spores or conidia, evidently belonging to some species of *Cladosporium*. But as *Cladosporium* is so commonly found as a saprophyte on all kinds of dead vegetable matter, and so very rarely as a parasite, and in this instance occurred cnly upon dead spots, I came at once to the conclusion that it was not connected with any disease. However, I ventured to state that I should never be surprised to find some species of *Oidium*, with its chains of conidia, on leaves of *Cineraria* as well as on other composite plants."

The Failure of Beans in Houses.—Mr. Baker reported as follows upon this matter brought before the last meeting :—" Mr. Horsley writes that the plants and the unsown seed have been destroyed, and the earth thrown away. I have therefore to form an opinion from the long record. Assuming this to be correct, there is very little, if any, doubt that the failures were due to, first and chiefly, unbalanced sunlight and fire-heat. The period of failure was the end of October to January, an unusually dull sunless time this season, even for these months, and it seems no allowance was made for this. This has been a fruitful source of trouble this season elsewhere, and should teach the importance of regulating the heat in accord with the sunlight available. Secondly, the soil was chiefly of humus and too light, and almost certainly very deficient in available lime, phosphate, and potash.

Scientific Committee, March 8, 1904.

Dr. Masters, F.R.S., in the Chair, and eight members present.

Lobelia nicotianæfolia.—A fine plant was exhibited by Messrs. Paul & Son, Cheshunt—a native of the Neilgherry Hills and Ceylon. The flowers were white, but the figure (*Botanical Magazine* tab. 5587) shows them pale violet. A Botanical Certificate, proposed by Mr. Veitch and seconded by Mr. Chittenden, was unanimously awarded.

Jasmine with Tuberous Growths.—Specimens received from Mrs. Street, Caterham, were examined by Mr. Saunders, F.L.S., who reported: "It is difficult to account for the growths, as there are no signs of insect or fungus. Growths of a similar appearance occur on the roots of Roses, being caused by the irritation set up by ants."

Palms and Scale Insects.—Mr. Hall, Sunderland, sent some specimens upon which Mr. Saunders reported :—" The insects unfortunately arrived in a bad condition. (1) a parasitic fly (?), nearly allied to the ichneumons; (2) undiscoverable; (3 and 4) two-winged flies (fam. *Mycetophilidæ*), or 'fungus gnats,' as the grubs feed on fungi or decaying vegetable matter; they are of no importance; (5) scale insects, but so covered with germs as not to be identifiable."

Scientific Committee, March 22, 1904.

Dr. Masters, F.R.S., in the Chair, and ten members present.

Springtails.—Mr. Allan, Tunbridge Wells, sent specimens, observing that he always found them on the ground round about the glasshouses in spring and summer during showery weather. Mr. Saunders, F.L.S., reported:—"The little insects are specimens of one of the 'springtails' or *Poduridæ,* and belong to the genus *Podura.* These little creatures may often be found together in very large numbers. Out of doors they are not, as a rule, the cause of much mischief to plants. They sometimes, however, injure the roots of Potatos, Carrots, Cabbages, &c. In Mushroom beds they are often the cause of much injury to the Mushrooms when they are quite young; in Cucumber-frames they attack the young Cucumbers, gnawing off the outer skin and causing the fruit to shrivel. They are difficult to destroy, as it is impossible in many cases to apply an insecticide without injuring the plant on which they are found. Where it is possible to use such a remedy the simplest way of destroying them would be to pour very hot water over them. A strong solution of salt or nitrate of soda would probably be just as efficacious. The springtails are very intolerant of drought, and are generally only found in damp situations."

Acari in Bark.—Mr. Barclay, of Stevenage, sent specimens, describing them as being "under every bit of loose bark, and in all crevices of the fruit trees." Mr. Michael, F.L.S., observed:—"They belong to the genus *Oribata,* possibly *O. orbicularis* or *O. lapidaria.* From a gardener's point of view they are practically harmless, and may be disregarded."

Scientific Committee, April 5, 1904.

Dr. Masters, F.R.S., in the Chair, and sixteen members present.

Richardia with Coloured Leaf.—Mr. Shea exhibited a specimen of *R. Elliottiana* with the leaf half yellow and half green. The question as to the cause was raised; but at present there is no known explanation.

Daffodil with Fringed Trumpet.—Mr. Jenkins sent flowers exhibiting this peculiarity. It is analogous to "cresting," but was confined to the edge of the corona only.

Scientific Experiments at Wisley.—A prolonged discussion took place on this subject, many valuable suggestions and communications being made by several of the members. Finally a subcommittee was formed to present a report to the Council, consisting of Dr. Masters, Professor Marshall Ward, Professor G. S. Boulger, Dr. Rendle, Messrs. Chittenden, Bateson, Massee, Farmer, and Hurst, and Professor Henslow, with power to add to their number.

Scientific Committee, April 19, 1904.

Dr. Masters, F.R.S., in the Chair, and ten members present.

Pear-tree and Scale Insect.—Mr. Saunders, F.L.S., reported as follows on a specimen received from Mr. Ward, Falmouth :—" The insect on the spur of the Pear tree is one of the scale insects, 'the mussel scale' (*Mytilaspis pomorum*), a very common pest on Apple trees. They may be got rid of by painting the infested parts with eight ounces of soft-soap dissolved in a gallon of water rubbed well into any inequalities of the bark. Do not only paint just the parts where the insects are, but for some distance up and down the stem or shoot, for these insects when young are active, and crawl freely about the trees ; they are then so small and inconspicuous that they may readily be overlooked."

Pear-scab.—Dr. Cooke, V.M.H., replied to inquiries on the two following subjects :—" One of the many forms of Pear-scab, *Fusicladium pyrinum*, is now attacking young Pear-shoots in some localities, forming black patches, but at present without any production of the mould. This is so well known on Pear and Apple, both on foliage and fruit, that it needs no description. Freely spraying with a solution of sulphate of iron should not be omitted at this season of the year."

American Violet Disease.—" The American Violet disease, culminating in *Alternaria*, which has been fully described in the Journal R.H.S. vol. xxvii. p. 27, pl. ii., fig. 25, is again appearing in several localities, and is a most dangerous and destructive parasite. At present we have found no conidia on the spots, so that the destruction of the diseased plants will assist in checking its dissemination."

Biological Analogy.—Dr. Cooke read the following interesting note on diseases :—" I venture to call the attention of the Committee to a remarkable instance of what I have termed 'biological analogy.' The Board of Agriculture, in a circular recently issued, states that a contagious disease affecting horses, called epizootic lymphangitis, has made its appearance in this country. After describing its principal features it goes on to say that 'an organism is the cause of the malady, and it is easily transferred from the wound of a diseased horse to a wound on another horse not affected. The most common means of such transfer is by the agency of sponges, rubbers, brushes, &c.' This is precisely analogous to what takes place with the wound parasites of trees of fungoid origin, and it is interesting to observe and watch such cases, since the treatment which succeeds in one may be equally successful in the other. It may be added as suggestive that in the case of diphtheria in the human subject treatment with sulphur has proved eminently successful ; in like manner is the same remedy applied to the Vine *Oïdium* and the Rose mildew, both of which in habit bear a resemblance to diphtheria."

Cabbage-leaf with Funnel-shaped Excrescences.—Mr. Holmes, F.L.S., sent an example of this not uncommon phenomenon ; it is outgrowth analogous to those on " crested " corollas, and is comparable with ovules when metamorphosed into foliaceous appendages.

Wood Sorrel with deep Rose-coloured Flowers.—Mr. Holmes also sent a plant of *Oxalis Acetosella* " growing among the ordinary form with

Wood Anemones, Dog's Mercury, &c., in a wood. The Wood Anemones were also frequently pink, especially on the outside. The soil is green sand, and contains, I believe, both iron and magnesia."

Rhododendrons.—'Glory of Penjerrick,' a very handsome flower, shown by Mr. Robert Fox; a miscellaneous collection of Sikkim species, by Mr. Graham Vivian; and both rose and white trusses from the same tree of *Rhododendron Falconeri*, by Mr. J. M. Rogers, of Sevenoaks. He observes:—"Of late years the buds have been getting less and less white." The Rev. W. Wilks remarked that it was not at all uncommon with this species to produce very differently coloured flowers. Dr. Masters observed that *R. ciliatum* was originally figured by Sir J. D. Hooker as Lilac; but cultivated plants of to-day always bore white flowers.

Cedars at Chelsea.—Dr. Masters showed an old lithograph of two of the original Cedars in the Physic Garden. They were planted in 1688, when three feet high; the last of them has recently been removed.

Injury to Roses by the Use of the French Sécateurs.—Mr. Hudson, V.M.H., showed a number of shoots pruned with this instrument, and all had died in consequence. It appears that it makes a horizontal cut, and the pith shrinking water fills the cup, decays the pith, and the adjacent shoot is killed. Mr. Hudson adds that he has abandoned its use and returned to the knife, making a slanting section. Mr. Baker added that it was most important that the instrument used, whatever it may be, should be perfectly sharp, as blunt ones injured the stems. Mr. Lynch also added that he had abandoned the use of the sécateur at Cambridge for the same reason.

Scientific Committee, May 3, 1904.

Dr. Masters, F.R.S., in the Chair, and twelve members present.

Rockets attacked by Insects.—Mr. Saunders, F.L.S., reported upon plants sent by Mr. Holmes:—"The Rockets are attacked by the caterpillar of a small moth, one of the *Tineina*, probably *Plutella porrectella*, which Stainton says is a quiet garden insect, always to be found amongst *Hesperis matronalis*. The moth measures rather more than half an inch across the wings when they are fully expanded; the wings are whitish streaked with brownish-yellow."

Arabis albida proliferous.—Mr. Chittenden showed sprays illustrating this form of "doubling" in which the calyx and corolla only are repeated on an elongated axis. It was mentioned that such occurred also in *Ranunculus amplexicaulis, Helianthemum* sp., the 'Harpur-Crewe' yellow Wallflower, Mr. Balchin's Mignonette, &c.

Capsicum without Pungency.—Mr. Holmes, F.L.S., exhibited a depressed globular form of fruit from Spain, the usual form being oblong: though possessing the scent of Cayenne pepper it has none of the pungency. It is the Pabrika of the Hungarians.

Bulbophyllum saurocephalum.—Mr. Odell showed a spike of this remarkable Orchid; the flower-stem is very thick, fleshy, and purple, carrying small sessile flowers.

Osmanthus ilicifolia dimorphic.—Dr. Masters showed a branch bearing both entire and spinescent leaves, proving that they were not different species, as some had supposed. The Holly is not infrequently similarly dimorphic.

Scientific Committee, May 17, 1904.

Mr. Michael, F.L.S., in the Chair, and seven members present.

Buttercup fasciated.—Dr. Cooke exhibited a specimen of this peculiarity.

Nerine proliferous.—Mr. Worsdell, F.L.S., reported on some specimens sent by Mr. Jackson :—"It is a case of germination of bulbiferous seeds, as has been described in other Amaryllises. The seed becomes so swollen and fleshy that a differentiation into endosperm and integuments can scarcely if at all be made; while the ovary falls away from around the seeds, leaving them exposed. Imbedded in the seed is a cotyledonary sucker, while at the other end the cotyledonary sheath forms a bulbil from which a new plant is developed."

Fasciated Stem with a multifold flower of Narcissus.—Mr. Hawkins sent a specimen, the stem showing a flower with seven times the usual number of parts.

Double Cherry with Caterpillar.—Mr. Saunders, F.L.S., reported upon specimens received from Miss Verner, Bournemouth :—"The caterpillars infesting the buds of the double Cherry are those of a small moth, one of the Tortrices, I believe *Penthina cynosbatella*; but without rearing the moth I cannot be quite sure, as these little caterpillars are often so much alike that it is impossible to be certain as to which species they belong. Spraying the tree with a solution of paraffin emulsion, 'Abol,' 'Paranaph,' or any insecticide which contains paraffin and soft-soap, is a good remedy; even plain water with a little soft-soap in it would be useful."

Tulips diseased.—Mr. Massee, V.M.H., reported on plants brought by Mr. Holmes :—"The Tulip bulbs are attacked by *Botrytis vulgaris*. Numerous sclerota are present, imbedded in the bulb-scales; hence it would not be advisable to again plant those from the same patch of ground that even appear to be sound."

Pears diseased.—Dr. Cooke reported upon some fruit sent by Mr. Rogers, Launceston :—"I have no doubt that the disease is the 'Black Spot,' *Fusicladium*. See Journal R.H.S. xxviii. p. 14. It is in an undeveloped state as yet, no hyphæ or sporules being present. It is very common on Pears this year. In early spring it is recommended to spray with a solution of sulphate of iron, and later on with Bordeaux mixture, of a strength not to kill the Pears. It is a common error to use the solutions of the sulphates upon the young and tender foliage of too great a strength."

Scientific Committee, June 14, 1904.

Dr. Masters, F.R.S., in the Chair, and seven members present.

Death of R. McLachlan, Esq., F.R.S.—Dr. Masters made a few remarks upon the loss to science occasioned by the death of this eminent member of the Scientific Committee. He was one of the very few left of the earliest members of it, and until failing health prevented him, he was a most regular attendant at its meetings. He was always most courteous and willing to give his assistance whenever questions arose in the department of entomology, in which he was an expert; the suggestions he made for the treatment of insect attacks were marked by caution and sound judgment.

Oak Tree "Spangles."—To an inquiry from Purnell Purnell, Esq., Streatham, as to the origin of these galls, Mr. Saunders, F.L.S., supplied the following life-history:—"They are formed by the grubs of one of the many kinds of gall-flies which infest the Oak. Most of the species, this one (*Spathegaster baccarum*) among the number, do not complete their life-cycle until they have gone through two generations; this peculiarity is generally spoken of as 'the alternation of generations.' In the case of the species which forms the galls sent, the flies which are hatched from them are of both sexes; and, after pairing, the females pierce the under-sides of the leaves and lay their eggs just below the surface. The grubs hatched from these do not form spherical galls, as the grubs of the last generation did, but make the little flat brown galls which are so common on the under-sides of Oak leaves, and are commonly known as 'spangles.' The flies from these galls emerge in the following spring, but, strange to say, in appearance they are quite unlike the flies of the previous generation which laid the eggs; and there are no males, only females. These 'parthenogenetic females' for many years were known as *Neuroterus lenticularis*, and were considered to be a distinct species; they lay their eggs more commonly on the male flowers of the Oak, when they are known as 'Currant galls' on account of their resemblance to a small bunch of Currants; but they often lay them on the leaves. The life-cycle is now complete, and begins again as soon as the flies emerge. In some species the life-history of the two generations is even more different than that just described, the sexual generation laying its eggs on the roots of the trees, and in due time galls are formed. The asexual generation which emerges from these galls are wingless, crawl up the stems and branches of the trees, and lay their eggs generally in the terminal bud of the shoots; the galls there formed are the well-known 'Oak-apples,' the flies from which are of both sexes: the males are winged, but the females have only rudimentary wings, or are wingless. The only means which I can suggest for preventing the Oaks from being attacked by the *Spathegaster baccarum* is by destroying the galls; this would be almost impossible in the case of the galls formed in the spring; but the second generation of galls, which remain on the leaves till after they have fallen, may easily be destroyed by collecting the fallen leaves and burning them. If this were done thoroughly, there would be a wholesale destruction of this insect, and you would find that very few attacked the leaves the following spring."

Carrots destroyed by Insects.—In reply to a letter from Mr. Bullock, Godalming, Mr. Saunders wrote :—"The Carrots are attacked by *Polydesmus complanatus*, 'the flattened millipede.' It is a very annoying pest, and one which is very difficult to destroy, as these creatures when feeding at the roots of a plant cannot be killed by means of an insecticide without using it of such a strength that it would injure the root; but watering copiously with a strong solution of nitrate of soda or common salt might be tried. They may be often caught by burying small slices of

FIG. 107.—HYBRID DIANTHUS 'LADY DIXON.' (*Gardeners' Chronicle.*)

Turnips, Mangolds, or Vegetable Marrow near the plant, just below the surface of the soil. A small skewer of wood should be stuck into each slice : this will show where each bait is buried, and will also render handling them easier. These traps should be examined every morning, and any millipedes feeding on them may be picked off and the traps replaced." Another method described by Mr. Shea is to make a funnel-shaped vessel with perforations, filling this with pieces of vegetables and burying it. It can then be lifted, and the contents thrown out and the grubs killed.

Hybrid Carnations.—Mr. Douglas, V.M.H., sent fine specimens with dark crimson flowers of a hybrid (fig. 107) between the 'Uriah Pike'

Carnation and a 'Sweet William;' also the Pink *hybridus floribundus*, suggesting that it might be identical with the first hybrid known to have been made artificially by Mr. Fairchild. See JOURN. R.H.S. xxiv. p. 56.

Sawdust.—In reply to an inquiry from Mr. Allen, Putney Hill, as to whether this material can be utilised, the general opinion was that it is worse than useless, but it becomes valuable if burnt. It was suggested to burn it mixed with vegetable rubbish, then to sift the ashes and mix them with sifted earth. This has been proved by experience to be a very valuable top-dressing.

Scots Pine diseased.—Specimens received from Mrs. Turner, Ightham, were examined by Mr. Newstead, who reported:—"The insect is *Chermes pini*, an aphis; the white flocculent matter covers the adult apterous female and her yellowish-brown pedunculated eggs. Soft-soap and quassia is a very good insecticide for this pest; but the paraffin emulsion will give the best results if applied before the trees have made young growths."

I recommend the following recipes for summer (1) and winter application (2):—

(1) For *Aphidæ*: 7 galls. soft water, 5 oz. soft-soap, 8 oz. quassia well boiled and applied cold in dull weather with a "spray" syringe. (2) For *American blight*, &c.: ½ pint soft water, ½ oz. best white soap, 1 pint paraffin. Dissolve the soap by boiling it in water; add paraffin and churn with a syringe for several minutes; add nine times the quantity of warm water and again churn with a syringe. This is to be applied to the bark in winter with a stiff brush.

Picea ajanensis.—Dr. Masters exhibited specimens sent by Mr. Moore, of Glasnevin, showing the apex of the yellow male flower occupied by bracts and ovuliferous scales of the usual purple colour. The foliage leaves, perular scales, and stamens were seen to be in continuous sequence, and the bracts of the female portion were also continuous with the foliage leaves. The ovules were not fully developed.

Hybrid Clematis.—Dr. Masters also showed flowers of a hybrid *Clematis* raised between *C. coccinea*, which has ovoid tubular scarlet flowers, and *C. lanuginosa*, which bears much larger flat lavender-coloured flowers.

SCIENTIFIC COMMITTEE, JUNE 28, 1904.

Dr. MASTERS, F.R.S., in the Chair, and eleven members present.

Vegetable Products of West Indies.—Sir Daniel Morris, K.C.M.G., gave an interesting account of the cultivation and introduction into the English markets of new fruits now being raised. Thus, the Litchi has been brought fresh from Trinidad; its cultivation requires alternations of bright sunshine and water, so that its success depends upon artificial irrigation in the dry season. Mangos can now be also imported fresh, as well as much-improved Smooth Cayenne Pineapples, of the type grown in St. Michael's, the average price being 4*s*. Bananas, usually imported from Jamaica and Costa Rica, are now received from Barbados. The fruit is of the dwarf species, *Musa Cavendishii.* They realise 4*s*. in England, the price at home of a bunch being 1*s*. They are packed in paper and cotton-wool, with the soft part of the leaves. The ship's hold being well ventilated, the moisture evaporates, and the fruit is thus kept cool and fresh. Immense quantities of large Onions are also grown; 84,000*l*. worth were sent in a few weeks to New York. Cotton is also again being cultivated, the Barbados realising the highest prices.

Root Fungi in Orchards.—Dr. Cooke, V.M.H., reported:—"The specimens sent were pieces of bark of an Apple-tree, about a foot in diameter, from an orchard near Bristol. Several trees are reported to be dying away. The disease spreads upwards from the roots and gradually girdles the tree. The interior of the bark was permeated with a dense white mycelium, which ultimately becomes firm like a coating of some *Corticium,* appropriating and consuming the tissues. This is an ordinary form of the development of root fungi, which normally proceed in the first instance from rotten stumps or decayed wood buried in the soil. In most cases this mycelium is that of some Agaric, such as *Pholiota squarrosa,* which may often be seen growing in large clusters at the base of Apple-trees in orchards. The trees which are attacked in this manner are bound to be destroyed, and there is no known method of saving them. Full particulars will be found in JOURN. R.H.S. xxviii. p. 32. If the soil be turned up around the infected trees, it will be found to be permeated with the threads of white mycelium, which attacks the roots, and soon creeps upwards between the bark and the wood, and kills the tree. In cases where the roots are only slightly attacked they may be cleaned and pruned, and then well washed with some fungicide. Ordinarily some immediate and drastic measures must be adopted, or it will spread through the orchard. Infected trees not wholly destroyed should be trenched round, and thus cut off from healthy trees. The soil cast up must be sterilised, and all stumps or decayed wood found in the soil must be dug up and destroyed. If one corner of an orchard is found to contain infected trees, it should be isolated and cut off by deep trenches from the rest of the orchard. Doubtless, in the first instance, the mischief has been caused by leaving dead stumps in the ground when the trees have been planted, or the roots of dead trees have not been thoroughly got out, but left to rot in the ground. For the past fifty years I myself, and before me the Rev. M. J. Berkeley, have been constantly warning fruit-growers against this insidious pest, which may be working underground in the soil for many years before its effects are felt on well-established trees.

Growers of fruit should never permit the capped fungi, or 'Toadstools' as they are called, to flourish in orchards; and by all means should be suspicious of any threads of white mycelium which may be discovered in turning over the soil.

Diseased Tomatos.—Plants received from Berwick-on-Tweed were examined by Dr. Cooke, who observes:—"The symptoms appear to be those of the 'Tomato Wilt,' a kind of bacteriosis to which Potatos are also liable. See JOURN. R.H.S. xxvii. p. 819. Diseased plants should be removed, as they are liable to infect others. There should afterwards be a change of crops on the ground. Nothing will cure the infected plants."

Rose-leaf Black Blotch.—Dr. Cooke reported upon diseased leaves sent from Bicester:—"The blotch on Rose-leaves is a most common disease on Roses of all kinds, and is caused by a fungus named *Actionema rosæ.* See JOURN. R.H.S. xxvii. p. 42, pl. iii. fig. 50. It may be mitigated by spraying, but as yet has not been effectually cured. All fallen diseased leaves should be burnt in order to prevent infection of healthy leaves. The diluted copper sulphate solutions are usually employed. They should be applied early when the leaves are young and but little trace of the disease is seen."

Grape Vine Anthracnose (*Glœosporium*).—Dr. Cooke reported upon diseased fruit received from Wiltshire:—"The disease on the berries is in a very young state, so that there are no conidia at present, and it may succumb to treatment. The use of rich stable manure tends to increase the disease, or render the Vines liable to attack. Try dusting with powder of flowers of sulphur mixed with a little lime. If this does not check the disease, then spray with a solution of sulphate of iron. Let sulphur have the first chance."

Pears attacked by Midges.—Mr. Saunders, F.L.S., reported upon samples received from Newtown:—"The Pears are attacked by the 'Pear Midge,' *Diplosis pyrivora*, or rather by its grubs. The parent insect, which is a small two-winged fly, lays its eggs in the blossoms as soon as they are sufficiently open for it to be able to do so; the grubs are soon hatched, and at once make their way into the centre of the embryo fruit, which they very soon destroy. There does not appear to be any way of effectually dealing with the fly or preventing them laying their eggs in the blossoms. Trees which are in a position and of a size that the fruit can be easily examined should be carefully looked over, and any that are found to be becoming distorted, or showing signs of the characteristic black markings, should be gathered and burnt; any Pears that fall prematurely should also be collected and destroyed. In the course of next month the ground under the infested trees should be given a good dressing of kainit (not less than half a ton to the acre): this will have the effect of killing the grubs which have left the Pears and have buried themselves in the soil beneath the trees. Perhaps a more certain method of obtaining the same end is during the winter, when there is not much work to be done, to remove the soil to the depth of two inches and burn, bury, or scatter it, so that the birds can pick out the little chrysalides formed by the grubs; fresh earth should be used to replace that which was taken away."

Japanese Hop-mildew.—Dr. Cooke, V.M.H., reported upon samples sent from Christchurch, Hants:—"The leaves are suffering from the *Oidium* stage of Hop mildew, probably the common form. The only remedy likely to prove effectual is that employed for the common Hop. Freely dusting with the flowers of sulphur, or sulphur in combination with lime. The same treatment is applied to the Vine-mildew."

Wireworms.—In reply to inquiries by Mr. Hudson, Barnsley, Mr. Saunders observes:—"There are about twelve different kinds of wireworms which attack living plants. They are all the grubs of beetles, belonging to the family *Elateridæ*: these beetles are commonly known by the names of 'Click' or 'Skipjack' beetles, the females lay their eggs at the roots of various plants, and the wireworms, as soon as they are hatched, begin to feed on the roots. Most of the species live for three or four years in the wireworm state before becoming chrysalides; they do not remain long in this condition, but soon emerge as perfect beetles. I cannot imagine that pigeon's manure, as suggested, could encourage these insects more than farmyard manure, but it is quite possible that it would not be distasteful to them, as some artificial manures are supposed to be; there is no manure or insecticide known that will kill them while at the roots of plants without destroying the plants also. Scattering finely broken-up rape cake, a substance they are very fond of, near plants that they are attacking will at times draw them away from a crop, and they may be trapped by burying small pieces of it, or slices of Turnips, Mangolds, or Carrots. The traps should be examined every morning."

Diseased Peach Leaves.—Mr. Saunders reported on specimens sent by Mrs. Bryans, Harrow-on-the-Hill:—"The Peach leaves are attacked by one of the 'shot-hole' fungi, *Cercospora circumscissa*, a very common pest which also infests the leaves of Nectarines, Almonds, Apricots, and Cherries. All the fallen leaves should be collected and burnt, and those which are spotted should be picked off and destroyed before the brown parts fall out, leaving the shot-holes. After all the leaves have fallen, the ground should be turned over beneath the trees, so as to bury any spores which may be on the surface. Next spring spray the trees, just as the leaves are expanding, with a solution of carbonate of copper and ammonia, commonly known as 'cupram,' and afterwards once every ten days or a fortnight if the disease still shows itself."

Gooseberry Disease.—Dr. Cooke reported upon young twigs, leaves, berries, and a portion of an old branch of Gooseberry received from Brentwood:—"The disease first appeared last spring, when one of the bushes suddenly wilted and died in one day. At the time it was bearing a splendid crop of fruit. This year, a week since, a branch of another bush suddenly wilted, and was dead the same day. At once it may be stated that, in past experience, no fungus disease acts in this manner so suddenly, and with healthy fruit at the same time. Examination of the leaves, twigs, and fruit shows no trace of fungus disease. The old branch has several tufts of mould on the dead bark, but these tufts evidently are old and of some weeks' growth, most probably revived from a previous year. This mould is either *Botrytis cinerea*, or a closely allied species, with brown hyphæ and subglobose hyaline conidia. In this case the mould is evidently only a saprophyte, and in no way connected with the death of the plant. The mycelium is confined to the dead bark, does not enter the subjacent wood, and does not appear on twigs, leaves, or fruit. The idea must be abandoned that this mould is in any way the cause of the destruction of the bushes, being merely a development on the dead bark, which was in full growth weeks before any manifestation of wilting or disease in the growing plant.

What, then, is the cause of the sudden failure of the bushes while in full fruit? The portions examined furnish no clue to the mystery. The cause must therefore be sought either at the roots or in the surrounding circumstances, as there is no trace of disease in the healthy tissues.

Possibly careful examination of the roots might reveal something, although even the attacks of mycelium, or root fungi, proceeding from old buried stumps or wood would hardly cause such a sudden collapse.

There are no traces of insect depredations.

From the specimens sent no theory can be formed of the cause of the failure, and consequently no remedy can be suggested.

The local cause can only be ascertained on the spot, for it must be some sudden and local cause to produce such a sudden failure in such healthy bushes, while producing such vigorous fruit and no organic disease.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 5, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Bunyard, Maidstone, for 100 dishes of Apples and Pears.

Silver Banksian Medal.

To W. Shuter, Esq., Hampstead (gr. Mr. Armstrong), for Grapes and Oranges.

Other Exhibits.

The Baroness Burdett Coutts, Holly Lodge (gr. Mr. Willard), sent two fine dishes of 'Easter Beurré' and 'Bergamotte d'Esperen' Pears.

Sir W. D. Pearson, Bart., Paddockhurst (gr. Mr. Wadds), sent a box of 'Winter Beauty' Tomatos.

Mr. G. Schneider, Ifield Road, brought two varieties of Apples, the merit claimed for them being that they blossomed at the end of June, thus escaping all chance of injury by frost, viz. 'Pomme de Flandres' and 'Pomme de Flandres blanche.' Although both varieties flower so late, the trees seldom if ever bear a good crop in this country, and the quality of the fruit is by no means first-rate.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 26, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Rivers, Sawbridgeworth, for a remarkable collection of home-grown Oranges.

Silver Knightian Medal.

To the Earl of Harrington, Elvaston Castle, Derby (gr. Mr. Goodacre), for very fine bunches of 'Muscat of Alexandria' Grapes.

Award of Merit.

To Orange 'The Egg' (votes, unanimous), from Messrs. Rivers. Fruit above medium size, round; skin very bright orange, thin; flesh exceedingly sweet and luscious. One of the best for growing in this country.

Cultural Commendation.

To Mr. Wadds, gr. to Sir W. D. Pearson, Bart., Paddockhurst, Worth, for a box of well-grown 'Winter Beauty' Tomatos.

Other Exhibits.

Mr. Goodacre brought a bunch of 'Imperial Black' Grape raised from the same berry as 'Appley Towers' and 'Lady Hutt,' but the Committee did not consider it so good as either of the two named.

Mr. Watkins, Pomona Farm, Hereford, sent Apple 'Lake's Kernel,' a promising variety which the Committee asked to see again in December.

S. Heilbut, Esq., Maidenhead (gr. Mr. Westropp), staged a magnificent bunch of fruit of *Musa Cavendishii* Bananas.

Fruit and Vegetable Committee, February 9, 1904.

Mr. Bunyard, V.M.H., in the Chair, and twenty-two members present.

Award Recommended :—

Cultural Commendation.

To Mr. Woodward, gr. to Roger Leigh, Esq., Barham Court, Maidstone, for 'Passe Crassane' Pears.

Fruit and Vegetable Committee, February 23, 1904.

Mr. Bunyard, V.M.H., in the Chair, and fourteen members present.

Exhibit.

Mr. W. Boyes, Derby, sent Apple 'Kirk Langley Pippin.'

Fruit and Vegetable Committee, March 8, 1904.

Mr. Bunyard, V.M.H., in the Chair, and seventeen members present.

Exhibit.

Mr. E. J. Vokes, King's Worthy, sent a seedling Apple closely resembling 'Downton Pippin.'

Fruit and Vegetable Committee, March 22, 1904.

Mr. Bunyard, V.M.H., in the Chair, and fourteen members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Dobbie, Rothesay, for a collection of Potatos.

Fruit and Vegetable Committee, April 19, 1904.

Mr. A. Dean in the Chair, and sixteen members present.

Award Recommended :—

Cultural Commendation.

To Hon. A. H. T. de Montmorency, Carrick Mines, for 'Early Puritan' Potatos grown in a cool house.

Other Exhibits.

Mr. Crook, Ford Abbey, sent three dishes of vegetables.

Mrs. Reid, Auchterarder House (gr. Mr. Cameron), sent Brussels Sprouts 'Cameron's Favourite.'

Fruit and Vegetable Committee, May 3, 1904.

Mr. A. Dean in the Chair, and seventeen members present.

Awards Recommended:—

Cultural Commendation.

To Messrs. Sutton, Reading, for 'Early Giant' Peas.

To Mr. Hobday, Romford, for 'Hobday's Giant' Rhubarb.

Other Exhibits.

Messrs. Cannell, Swanley, sent some early Cabbages.

S. Heilbut, Esq., Holyport, Maidenhead (gr. Mr. Westropp), staged 'May Queen' Potatos.

Fruit and Vegetable Committee, May 17, 1904.

Mr. Bunyard, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Silver Banksian Medal.

To J. Hodges, Esq., Fay Gate (gr. Mr. Pelley), for 'Black Hamburgh' Grapes.

Award of Merit.

To Melon 'The Islander' (votes, unanimous), from Mr. Ritchings, Guernsey, raised from 'Ritchings's Perfection' × 'Syon House.' Fruit large, round, pale green, and heavily netted; flesh green, deep, and of first-rate flavour.

Cultural Commendation.

To Mr. Reynolds, gr. to Leopold Rothschild, Esq., Gunnersbury Park, for very fine 'Duke of York' Peaches grown on pot trees. Mr. Reynolds stated that the trees had been started and steadily forced, and the fruit ripened in twenty weeks, and in his opinion it would become a leading variety, as the tree did not cast its buds, and the fruit was of very superior quality.

Other Exhibits.

The French Flint Glass Bottle Co., Long Lane, Aldersgate Street, sent a quantity of jars filled with fruit or vegetables beautifully preserved.

Mr. Hobday, Romford, staged large sticks of Hobday's 'Giant Rhubarb,' which had been forced. The Committee asked to see some from the open ground.

FRUIT AND VEGETABLE COMMITTEE, MAY 31, 1904.

AT THE TEMPLE GARDENS.

Mr. BUNYARD, V.M.H., in the Chair, and twenty-four members present.

[For the Cups and Medals awarded by the Council see page xxii.]

Exhibit.

Mr. Mortimer, Farnham, sent Cucumber 'Aristocrat,' which the Committee asked to see again.

FRUIT AND VEGETABLE COMMITTEE, JUNE 14, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Banksian Medal.

To the Earl of Clarendon, Watford (gr. Mr. Harris), for very fine 'Royal Sovereign' Strawberries.

Award of Merit.

To Cucumber 'Aristocrat' (votes, unanimous), from Mr. Mortimer, Farnham, raised from 'Unique' × 'Sensation.' A deep-coloured variety of moderate length, short neck, almost spineless, and of excellent quality. It is said to be a very free cropper and distinct from any other variety.

Other Exhibits.

Mr. Fabius, Emsworth, sent Tomato 'Redlands,' which the Committee wished tried in the Society's Gardens.

J. W. Benson, Esq., Leatherhead (gr. Mr. Smith), sent Melon 'J. W. Benson.'

J. Watkins, Esq., Withington, sent Apple 'Hoary Morning,' a handsome late keeping variety, but seldom bearing a good crop.

F. A. Bevan, Esq., New Barnet, staged two varieties of Tomatos.

Messrs. Wheeler, Gloucester, sent Melon 'Kelston Knoll,' a very promising variety, which the Committee asked to see again in a little better condition.

FRUIT AND VEGETABLE COMMITTEE, JUNE 28, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Lord Llangattock, The Hendre (gr. Mr. Coomber), for splendid 'Queen' Pineapples and excellent Strawberries.

Award of Merit.

To Strawberry 'Reward' (votes, 10 for), from Messrs. Laxton, Bedford. Raised from 'Royal Sovereign' × 'British Queen.' Fruit very large and resembling 'Royal Sovereign' in shape; colour a rich scarlet; with prominent seeds; flesh firm and excellent in flavour.

To Strawberry 'The Alake' (votes, 9 for, 4 against), from Messrs. Veitch, Chelsea. Fruit very large and very variable in shape; colour very dark red, with seeds moderately prominent; flesh solid, with a rich and decided Pine flavour. Plants exhibited were bearing a very heavy crop of large fruits. Raised from 'Veitch's Pefection' × 'Frogmore Late Pine.'

Cultural Commendation.

To J. Epps, Esq., jun., Norfolk House, Beulah Hill, for large fruits of *Carica Papaya* (the Papaw), a plant very rarely seen in fruit in this country.

Other Exhibits.

Messrs. Cannell, Swanley, brought Peas and Strawberries.

Messrs. Low, Enfield, staged Vines and Figs.

Lord Aldenham, Elstree (gr. Mr. Beckett), sent Melon 'Ideal.'

The Duke of Northumberland, Syon House (gr. Mr. Wythes, V.M.H.), staged Melon 'Victoria.'

Fruit and Vegetable Committee, July 12, 1904.

At Holland House.

Mr. Bunyard, V.M.H., in the Chair, and twenty-one members present.

[For the Cups and Medals awarded by the Council see page xxix].

Awards Recommended :—

Award of Merit.

To Strawberry 'The Latest' (votes, unanimous), from Messrs. Laxton, Bedford. Fruit very large, bluntly wedge-shaped, dark crimson in colour, with prominent yellow seeds which change to bright crimson with age; flesh deep red, solid, and of excellent flavour. A promising late variety.

To Raspberry 'Champion' (votes, unanimous), from Mr. Penwill, Totnes. Fruit large, bluntly round, dark red in colour, very sweet, and produced in great clusters. New and old canes were both shown bearing fruit in various stages of development, indicating that the variety is a vigorous and continuous bearer.

Cultural Commendation.

To Mr. May, gr. to J. B. Joel, Esq., Potter's Bar, for a remarkably fine dish of 'Waterloo' Strawberry.

To Swanley Horticultural College for early well-coloured fruits of 'Beauty of Bath' Apples.

Other Exhibits.

Mrs. Holt, The Grange, Farnborough (gr. Mr. Bundy), sent very fine fruits of *Passiflora edulis.*

The Duke of Northumberland, Albury Park (gr. Mr. Leach), sent Black Currants and Strawberries.

Messrs. Whitmee, Swanley, staged several varieties of Melons.

Hon. A. H. T. de Montmorency, Dublin, staged Strawberries and Artichokes.

FLORAL COMMITTEE.

January 5, 1904.

Mr. Marshall in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Lady Plowden, Aston Rowant, for Chrysanthemums.
To Mr. J. Russell, Richmond, for hardy shrubs.
To Messrs. Ware, Feltham, for rock plants.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for alpines.
To Messrs. Jas. Veitch, Chelsea, for Jacobinias and Coleus.
To Messrs. Cannell, Swanley, for Moschosma, Coleus, and Begonias.

Award of Merit.

To *Moschosma riparium*, from Messrs. Jas. Veitch and Messrs. Cannell (votes, 15 for, 6 against). This plant was first introduced from South Africa some three or four years ago. It is a labiate shrub having hairy stems, with cordate crenate leaves and erect panicles of small whitish Spiræa-like flowers. It is said to be a very valuable winter-flowering plant for a cool greenhouse.

Other Exhibits.

Messrs. Low, Enfield, sent Cyclamen.
Mr. T Allman, Dartford, sent Chrysanthemum 'Allman's Yellow.'
T. F. Harrison, Esq., King's Walden, sent Carnation 'T. Fenwick Harrison.'
From J. T. Hayes, Esq., Witham, came Chrysanthemum 'Mrs. J. T. Hayes.'
Messrs. Cannell sent Chrysanthemum 'White Bonnaffon' and *Bryophyllum crenatum.*
Mr. Duncan, Kendal, sent Chrysanthemum 'Mrs. A. Duncan.'
Mr. J. G. Lowe, Warwick, sent Chrysanthemum 'Winter Cheer.'
From the Botanic Gardens, Glasnevin, came *Lachenalia tricolor superba.*
Mr. Whateley, Kenilworth, sent Chrysanthemum 'Harry Whateley.'

Floral Committee, January 26, 1904.

Mr. May in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Sutton, Reading, for Cyclamen and Primulas.
To Messrs. Jas. Veitch, Chelsea, for winter-flowering plants.

To Mr. Seward, Hanwell, for Cyclamen.

To Messrs. Cutbush, Highgate, for alpine, bulbous, and herbaceous plants.

To Messrs. Cannell, Swanley, for Primulas and *Coleus thyrsoideus.*

Silver Banksian Medal.

To Mr. J. Russell, Richmond, for hardy shrubs.

Award of Merit.

To Chrysanthemum 'Mlle. Louise Charvet,' from Messrs. Henderson, Cheshunt, and Mr. Springbett, Cheshunt (votes, unanimous). A large Japanese flower, of the reflexed section, with long florets borne on very stout stems; the colour is pink with bronzy centre. A very useful variety for cutting.

To Chrysanthemum 'Winter Cheer,' from Mr. Lowe, Hatton (votes, unanimous). A variety of rather tall vigorous habit, free-flowering, having medium-sized flowers with reflexed florets of a rich rosy-purple colour. Said to be a sport from 'Framfield Pink.'

Other Exhibits.

Messrs. Ware, Feltham, sent winter-flowering plants.

Mr. G. Reuthe, Keston, sent Alpines.

From Messrs. Cutbush, Highgate, came Carnation 'William Cutbush' and Iris 'Sind-Pers.'

Messrs. Jas Veitch, Chelsea, sent *Eupatorium vernale* and *Cheiranthus kewensis.*

From Lady Plowden, Aston Rowant (gr. Mr. W. Clark), came Chrysanthemum 'Polar Star.'

Col. Webb, M.P., Stourbridge, sent an unnamed seedling Primula.

Mr. Godfrey, Exmouth, sent Chrysanthemum 'Winter Queen.'

Mr. Seward, Hanwell, sent Cyclamen 'Dorothy Seward.'

FLORAL COMMITTEE, FEBRUARY 9, 1904.

Mr. MARSHALL in the Chair, and twenty-four members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Sutton, Reading, for Primulas.

Silver-gilt Banksian Medal.

To Messrs. Hill, Edmonton, for Ferns.

Silver Flora Medal.

To Mr. J. Russell, Richmond, for hardy shrubs.

To Messrs. Barr, Covent Garden, for bulbous plants.

To Messrs. Cannell, Swanley, for Primulas and Coleus.

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for winter-flowering plants.

To Messrs. Cutbush, Highgate, for alpines, bulbous plants, and Carnations.

To Mr. Mount, Canterbury, for Roses.

Bronze Flora Medal.

To Mr. Palmer, Andover, for Primulas.

Award of Merit.

To Begonia 'Mrs. H. T. Dixson' (votes, 13 for), from Mr. Dixson, Polegate. This is said to be a cross between *B. Schmidtiana* and *B.*

FIG. 108.—TULIPA KAUFMANNIANA AUREA. (*Journal of Horticulture.*)

'Goliath,' and is of shrubby habit, short-jointed, with broad shining green leaves, something like *B. gigantea*; it is very free-flowering, and has clusters of rich pink flowers.

To *Eupatorium vernale* (votes, 15 for), from Messrs. Jas. Veitch. A very useful winter-flowering plant, except for its shrubby habit very much resembling a white *Ageratum.*

To *Tulipa Kaufmanniana aurea* (votes, 8 for), from Messrs. Cutbush. A very early species, of dwarf habit, having long pointed segments; of a rich golden colour, with a broad band of crimson. (Fig. 108.)

Other Exhibits.

From Messrs. Wallace, Colchester, came spring-flowering plants
Miss Hopkins, Knutsford, sent Primulas and alpines.
Messrs. Hugh Low sent Cyclamen.
Messrs. Cheal sent alpines.
From Mr. H. T. Dixson came Cyclamen.
Mr. Geo. Reuthe, Keston, sent alpines.
From Messrs. Ware, Feltham, came alpines and rock plants.
Mr. J. Godfrey, Exmouth, sent Chrysanthemum 'Winter Queen.'
Mr. Burbury, Arundel, sent Primulas.

Floral Committee, February 23, 1904.

Mr. Marshall in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for Azaleas.
To Mr. H. B. May, Upper Edmonton, for Ferns.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for shrubs and alpines.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Primulas.
To Mr. J. May, Twickenham, for Cyclamen.
To Messrs. Ware, Feltham, for spring flowers.
To Messrs. Wills & Segar, South Kensington, for Palms.

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for Primulas and Coleus.
To Messrs. Williams, Upper Holloway, for shrubs.
To Messrs. Barr, Covent Garden, for spring flowers.
To Mr. J. Russell, Richmond, for shrubs.

Award of Merit.

To *Cyrtomium Butterfieldi* (votes, unanimous), from Mr. Percy J. Butterfield, Waltham Cross. A very handsome hardy Fern with long dark-green fronds, similar to *C. falcatum*, but with beautifully crested pinnæ.

To *Pteris Hilli* (votes, 14 for), from Messrs. Hill, Lower Edmonton. A distinct and beautiful variety, introduced from Brazil by Messrs. Hill, with long broad glossy fronds, the pinnæ being grooved and the margins nearly erect. As the plant is of good habit, it should prove a decided acquisition.

To *Eupatorium petiolare* (votes, 10 for, 5 against), from Messrs. Cannell. A slender-growing variety, producing abundance of pinky-white flower-heads from growths at most of the leaf axils. The foliage is rather broader than most of the Eupatoriums, giving the plant a bold appearance. A very useful plant for winter flowering.

Fig. 109.—An Allamanda Fruit-capsule. (*Gardeners' Chronicle.*)

Other Exhibits.

The Guildford Hardy Plant Co. staged hardy plants.

Mr. G. Reuthe, Keston, sent spring-flowering bulbs.

Messrs. Cheal, Crawley, brought alpines.

Messrs. Laing, Forest Hill, sent *Begonia semperflorens gigantea carminata.*

Messrs. Sutton, Reading, staged Giant Italian Hyacinths.

Messrs. Wallace, Colchester, brought alpines.

Messrs. Henderson, Cheshunt, sent Chrysanthemum 'Market Pink.'

F. W. Moore, Esq., V.M.H., Botanic Gardens, Glasnevin, sent *Albuca filifolia major.*

Messrs. Cutbush brought *Skimmia rubella, Daphne Dauphini,* and *Shortia galacifolia rosea.*

A seed pod of the *Allamanda* was exhibited. (Fig. 109.)

FLORAL COMMITTEE, MARCH 8, 1904.

Mr. MARSHALL in the Chair, and thirty-one members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for shrubs and Carnations.

Silver-gilt Banksian Medal.

To Mr. J. Russell, Richmond, for shrubs.

Silver Flora Medal.

To Messrs. Hill, Edmonton, for Ferns.

To Messrs. Cannell, Swanley, for cactaceous plants.

To Messrs. Wallace, Colchester, for alpines, among them being the lovely little bulbous *Iris Hausskneehtii.* (Fig. 110.)

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for winter-flowering plants.

To Messrs. Cuthbert, Southgate, for shrubs.

To Mr. H. B. May, Edmonton, for Gardenias and Ferns.

To Messrs. Barr, Covent Garden, for bulbous plants.

To Mr. Upton, Guildford, for Veronicas.

To Messrs. Williams, Holloway, for shrubs.

Cultural Commendation.

To Mr. Douglas, V.M.H., Bookham, for *Saxifraga Burseriana major.*

Other Exhibits.

Lord Aldenham, Elstree (gr. Mr. Beckett), sent catkin-bearing trees and shrubs.

Mr. Anker, Kensington, staged hardy Cacti.

Messrs. Ware, Feltham, brought Alpines.

Messrs. Cheal, Crawley, sent miniature rockwork and shrubs.

Mr. Reuthe, Keston, staged hardy plants.

Messrs. Bull, Chelsea, sent Azaleas.

Miss Hopkins, Knutsford, brought Primulas.

Messrs. Eggett, Thames Ditton, sent a portable fernery.

Mr. Box, West Wickham, staged Begonias.

From the Botanic Gardens, Glasnevin, came several new Lachenalias.

Mrs. Pilkington, Wollaton, sent *Primula Forbesii* full of blossom.

Messrs. Cripps, Tunbridge Wells, brought Begonia 'Perle de Lorraine.'

The Countess of Arran, Windsor, sent *Rosa rugosa* in full blossom. Her ladyship wrote that the spray was cut off a bush on November 5, for the sake of its coloured foliage, and mixed with foliage in a room. About

FIG. 110.—IRIS HAUSSKNECHTII. (*Gardeners' Chronicle.*)

the middle of February green shoots appeared, which grew steadily, and produced the first flowers on March 5, and several other shoots had unopened buds. No particular care had been taken in the matter.

Mr. Cull, Edmonton, sent *Pteris Wimsettii plumosa.*

Messrs. Paul, Cheshunt, brought *Lobelia nicotianæfolia.*

FLORAL COMMITTEE, MARCH 22, 1904.

Mr. MARSHALL in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Wm. Paul, Waltham Cross, for Camellias.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for flowering plants and Carnations.
To Messrs. Cuthbert, Southgate, for shrubs.

Silver Flora Medal.

To Mr. Mount, Canterbury, for Roses.
To Mr. J. May, Twickenham, for Cyclamen.
To Messrs. Cripps, Tunbridge Wells, for Maples.

Silver Banksian Medal.

To Mr. J. Russell, Richmond, for shrubs.
To Messrs. Jas. Veitch, Chelsea, for Rhododendrons.
To Messrs. Turner, Slough, for Violets and Roses.
To Messrs. Williams, Holloway, for shrubs.

Bronze Banksian Medal.

To Mr. Modral, Old Warden Park, Biggleswade, for *Primula Forbesii.*

Award of Merit.

To *Hepatica angulosa alba* (votes, 12 for, 4 against), from Messrs. Barr, Covent Garden. A very pretty semi-double flower, of the purest white and above the average size. A rather rare plant.

Other Exhibits.

Mrs. Denison, Little Gaddesden (gr. Mr. Gentle), sent a group of *Acacia cultriformis* admirably grown.

Messrs. Peed, Streatham, sent alpines.

Mr. H. B. May, Edmonton, staged Clematis.

Messrs. Ware, Feltham, brought hardy plants.

Miss Hopkins, Knutsford, sent spring flowers.

Messrs. Cannell, Swanley, staged *Cineraria stellata.*

From the Society's Gardens, Wisley, came Narcissi and spring flowers.

Messrs. Wallace, Colchester, brought spring flowers.

Mr. Anker, Kensington, sent *Trifolium repens atropurpureum* under the name of 'Shamrock.'

The Hon. Mrs. Brassey, Heythorp (gr. Mr. Jeffries), sent Violet 'Countess of Caledon.'

G. M. Rawson, Esq., King's Lynn, brought Snowdrop 'Mertheringham White.'

Mr. Upton, Guildford, sent hardy plants.

FLORAL COMMITTEE, APRIL 5, 1904.

Mr. MARSHALL in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for alpines and shrubs.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. Mount, Canterbury, for Roses.

Silver Flora Medal.

To Messrs. Cuthbert, Southgate, for shrubs.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Jas. Veitch, Chelsea, for a group of *Xanthoceras sorbifolia.* (Fig. 111.)

To Mr. J. Russell, Richmond, for Clematis and Wistarias.

FIG. 111.—XANTHOCERAS SORBIFOLIA. (*Journal of Horticulture.*)

To H. Little, Esq., Twickenham, for Clivias and Azaleas.

To Messrs. Cannell, Swanley, for zonal Pelargoniums.

To Mr. Reuthe, Keston, for spring flowers.

To Mr. Perry, Winchmore Hill, for hardy flowers.

To Mr. Jackman, Woking, for alpine and bulbous plants.

First-class Certificate.

To *Clerodendron myrmecophilum* (votes, unanimous), from Messrs. Sander, St. Albans. A very handsome stove species introduced from the East Indies. Flowers a very deep orange, borne on long pyramidal spikes in great profusion in whorls; the stems are a dark chocolate colour, forming a pleasing contrast to the flowers; leaves large, dull glaucous colour, ovate, acuminate, and opposite.

Award of Merit.

To Azalea 'Madame Emile Eckhaute' (votes, 11 for, 2 against), from Mr. Turner, Slough. A very pretty Indian Azalea with large rosy-pink flowers edged with white.

Fig. 112.—Iris Haynei. (*Journal of Horticulture.*)

To *Cyrtanthus* × 'Marian' (votes, unanimous), from J. O'Brien, Esq., V.M.H., Harrow-on-the-Hill. An exceedingly handsome variety, raised by Mr. O'Brien from *C. lutescens* × *C. angustifolius*, somewhat resembling the latter, but much finer; the spikes are over a foot in height, with seven or eight orange-red flowers on each. A very beautiful free-flowering cool greenhouse plant.

FIG. 113.—CLIVIA 'LORD BATHURST.'

To *Iris Haynei* (votes, 12 for), from Messrs. Cutbush, Highgate. An exceedingly fine Oncocylus species from Palestine. Flowers large, with soft silky rosy-purple standards, like *Iris atrofusca*, but much finer in all respects. (Fig. 112.)

To Clivia 'Lord Bathurst' (votes, unanimous), from Lord Bathurst, Cirencester (gr. Mr. Arnold). Flowers of great size and perfect shape; of a pale orange colour and very freely produced. One of the best varieties. (Fig. 113.)

To the strain of *Primula obconica alba fimbriata* (votes, unanimous), from Mr. G. Schneider, Ifield Road. Flowers pure white and beautifully fimbriated.

Other Exhibits.

Messrs. Ware, Feltham, staged Clematis.

Messrs. Peed, Streatham, sent alpine and hardy plants.

Messrs. Cheal, Crawley, brought Primulas and alpines.

Messrs. Low, Enfield, sent *Schizanthus wisetonensis.*

Mr. Turner, Slough, staged Azaleas and Roses.

Messrs. Bull, Chelsea, brought foliage plants.

Mr. Potten, Cranbrook, sent Roses.

C. Dawson, Esq., Gulval, Cornwall, sent Primulas.

Mr. Harris, Broxbourne, sent a Pelargonium which the Committee asked to see again.

Mr. van Tubergen, Holland, brought *Freesia Armstrongi,* a pretty pink-flowered variety.

FLORAL COMMITTEE, APRIL 19, 1904.

Mr. MARSHALL in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for flowering shrubs.

Silver-gilt Banksian Medal.

To Mr. H. B. May, Edmonton, for Roses.

To Mr. Mount, Canterbury, for Roses.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cannell, Swanley, for Pelargoniums.

To Mr. Reuthe, Keston, for hardy plants.

To Messrs. Balchin, Hassocks, for hard-wooded plants.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for alpines.

First-class Certificate.

To *Hippeastrum* 'Snowdon' (votes, unanimous), from Mrs. W. H. Burns, North Mymms Park (gr. Mr. Fielder). A magnificent pure white variety, of great size and substance, and probably the first absolutely pure white variety raised. (Fig. 114.)

To *Pteris cretica Summersii* (votes, 13 for), from Mr. H. B. May. The most graceful and beautiful form of the *cretica* type that we have. It should prove a valuable plant for rooms or for table decoration.

Award of Merit.

To *Fritillaria inodora* (votes 11 for, 4 against), from Herr van Tubergen, jun., Haarlem. Flowers very large and broad, of a deep

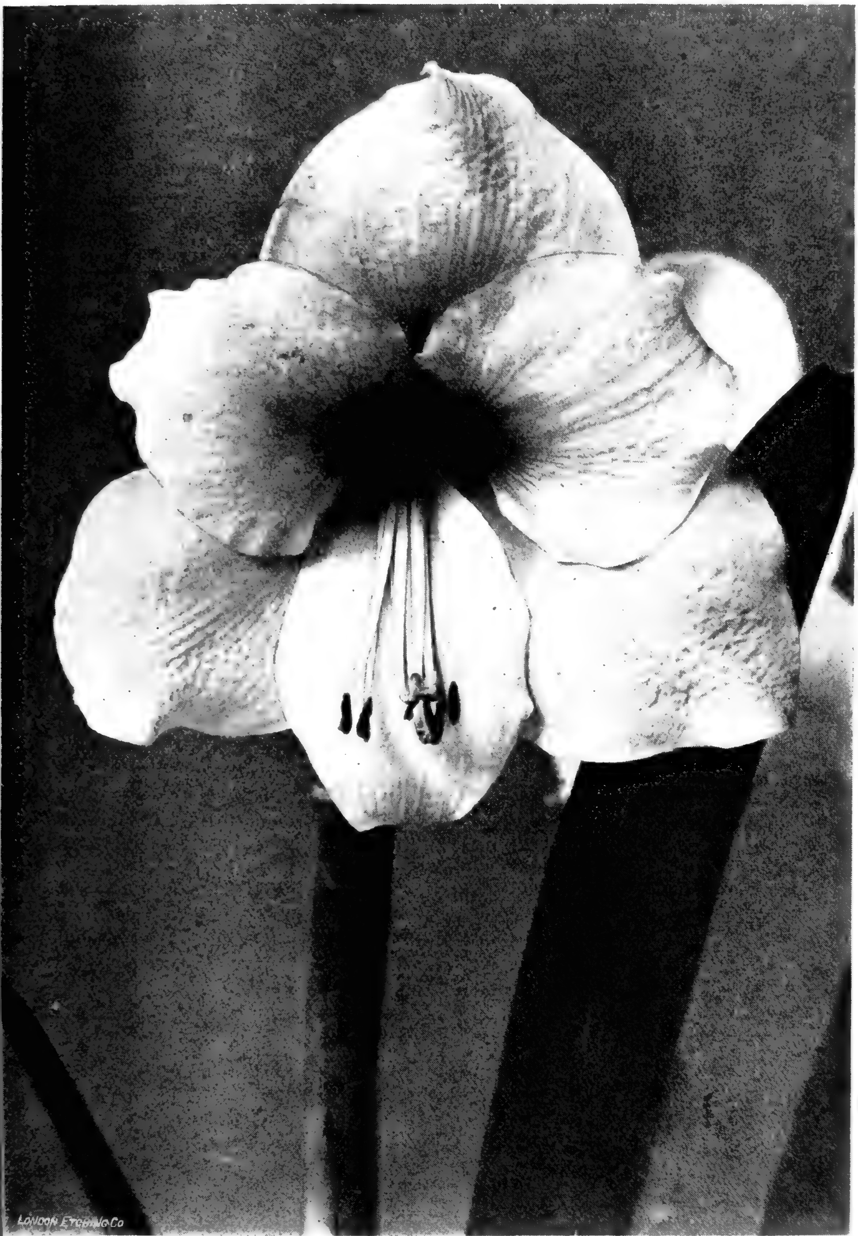


FIG. 114.—HIPPEASTRUM 'SNOWDON.'

crimson shade tinged with brown, and marked with lines of darker crimson. Introduced from Eastern Bokhara.

To *Iris Lortetii alba* (votes, unanimous), from Messrs. Cutbush, Highgate. A handsome variety with white standards shaded with blue and buff-coloured falls with a deep velvety brown centre.

To *Rhododendron* 'Harry Mangles' (votes, unanimous), from H. A. Mangles, Esq., Seale, Farnham. Raised from *R. cinnabarinum* × *R. Maddeni* var. *calophyllum*. Flowers of moderate size, with a long tube of a lovely rosy-pink colour shading to scarlet at the base; truss rather large and loose.

To *Rhododendron* 'Rose Queen' (votes, unanimous), from H. A. Mangles, Esq. This variety is of the same shape, size, and parentage as the last-named, but the colour is a much lighter shade—nearly white in the tube.

To *Rhododendron* 'Glory of Penjerrick' (votes, 11 for), from R. Fox, Esq., Falmouth. A wonderfully beautiful variety, of great size in the flower, with massive truss, and of a charming shade of rose heavily flushed with scarlet. Raised from *R. Aucklandii* × *R. arboreum*.

Other Exhibits.

Reginald Farrer, Esq., Ingleborough, sent alpines.
Messrs. F. Cant, Colchester, sent Roses.
Messrs. Pulham, Elsenham, staged alpines.
Mrs. Holden, Ipswich, brought Anemones.
Messrs. Cripps, Tunbridge Wells, staged Acers.
Messrs. Jas. Veitch, Chelsea, staged Hydrangeas.
Messrs. Paul, Cheshunt, sent Banksia Roses.
Mr. Bennett, Pirbright, sent Roses.
Messrs. Storrie, Dundee, staged *Primula obconica*.
Messrs. Wallace, Colchester, brought spring flowers.
Messrs. Ware, Feltham, staged hardy flowers.
Messrs. Peed, Streatham, brought alpines.
Miss Hopkins, Knutsford, sent spring flowers.
Messrs. Jackman, Woking, staged spring flowers.
Mr. Upton, Guildford, sent hardy plants.
Messrs. Gilbert, Bourne, brought Anemones.
Messrs. Low, Enfield, staged foliage and flowering plants.

Floral Committee, May 3, 1904.

Mr. Marshall in the Chair, and twenty-two members present.

Awards Recommended.

Silver-gilt Flora Medal.

To Mr. Mount, Canterbury, for Roses.

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for flowering shrubs and greenhouse plants.

To Lord Aldenham, Elstree (gr. Mr. Beckett), for flowering trees and shrubs.

To Messrs. Carter, High Holborn, for Cinerarias.
To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. H. B. May, Edmonton, for Pelargoniums.
To Messrs. Cuthbert, Southgate, for foliage and flowering plants.
To Messrs. Cutbush, Highgate, for Roses and rock plants.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for Pelargoniums.
To Messrs. Sander, St. Albans, for *Nicotiana Sanderæ*.
To Messrs. Gilbert, Bourne, for Anemones.
To Messrs. Ware, Feltham, for Primulas and alpines.
To W. G. James, Esq., West Dean Park (gr. Mr. Smith), for *Schizanthus*.
To Messrs. Cheal, Crawley, for shrubs and alpines.
To Messrs. Cripps, Tunbridge Wells, for Roses and Maples.
To Messrs. John Waterer, Bagshot, for Rhododendrons.

Bronze Flora Medal.

To Messrs. Peed, Streatham, for Acacias and Maples.

Bronze Banksian Medal.

To Messrs. Hobbie, Dereham, for Roses.
To Mr. Prichard, Christchurch, for alpines.
To Mr. Upton, Guildford, for herbaceous plants.
To Sir T. F. Barry, Bart., St. Leonard's Hill, for Camellias.

First-class Certificate.

To *Nicotiana Sanderæ* (votes, unanimous), from Messrs. Sander, St. Albans. Raised by crossing *N. affinis* with *N. Forgetiana*. A much-branched crimson-red flowered species not yet in commerce. The flowers are as abundantly produced as in *N. affinis*, and vary in colour from pale red to deep purplish-red; the habit of the plant is similar to that of *N. affinis*, but it branches more freely. This should prove a valuable greenhouse plant in winter, as well as for the same purpose as *N. affinis* outside in the summer.

To *Lomaria Mayii* (votes, 13 for), from Mr. H. B. May, Edmonton. A seedling from *L. ciliata*, but much handsomer. The pinnæ are beautifully crenated, and the fronds over two feet long and more than one foot across.

Onosma alba (votes, 13 for), from Mr. Prichard, Christchurch. In habit this variety is similar to all the Onosmas, but the flowers are pure white and freely produced. It is said to be perfectly hardy.

Award of Merit.

To *Clivia miniata aurea* (votes, 9 for), from Mrs. Powys Rogers, Perranwell. The truss of flowers is large and quite yellow in colour, but except for its unique colour it is no improvement on *C. miniata*.

To *Saxifraga Rhei superba* (votes, unanimous), from Mr. Reuthe and Messrs. Ware, Feltham. A deep rosy-pink form of the *Rhei* type.

To *Tritonia* 'Prince of Orange' (votes, 15 for), from Miss Willmott, V.M.H., Great Warley. The finest form we have seen, as the flowers are not only of immense size, but of a deep rich orange-red colour, borne in great profusion on long spikes.

To Auricula 'Triumph' (votes, unanimous), from Mr. Douglas, V.M.H., Great Bookham. A very fine green-edged variety.

To Auricula 'Vesta' (votes, unanimous), from Mr. Douglas. A pretty white-edged variety.

To Auricula 'Gold Crown' (votes, unanimous), from Mr. Douglas. An alpine variety of great beauty and substance.

To Carnation 'Leander' (votes, 11 for, 1 against), from Messrs. Felton, Hanover Square. The flowers have broad petals, are of a rich deep salmon colour, and are highly perfumed; the calyx showed no signs of splitting, but the stems are rather weak for such fine blooms, and need artificial support.

Botanical Certificate.

To *Isoplexis* (*Digitalis*) *canariensis*, from Messrs. Ware, Feltham. An evergreen greenhouse species, with small deep yellow flowers.

Other Exhibits.

Mr. Reuthe, Keston, staged alpines.

Miss Easterbrook, Fawkham, sent a lovely basket of Roses.

Mr. Anker, Kensington, brought Ericas and Cacti.

Mr. Jackman, Woking, exhibited alpines.

Mr. J. Russell, Richmond, sent Clematis and flowering shrubs.

Mr. Box, West Wickham, staged rock plants.

Mr. Potten, Cranbrook, brought Roses.

W. A. Watts, Esq., St. Asaph, sent Primroses.

Lady Plowden, Aston Rowant (gr. Mr. Clark), sent Algerian Sweet Peas of great size in the flower and vigorous in growth.

Mr. Tayler, Hampton, sent Roses.

Mr. Perry, Winchmore Hill, exhibited hardy plants.

Miss Cicely Dorien-Smith, Tresco Abbey, sent some exceedingly fine spikes of Echiums.

Mr. Bennett, Pirbright, brought Roses.

Lady Wantage, Lockinge (gr. Mr. Fyfe), sent 'Fortune's Yellow' Rose in grand condition.

From the Society's Gardens at Wisley came hardy flowers.

F. J. S. Foljambe, Esq., Worksop (gr. Mr. Allsopp), sent Viola 'Mrs. G. Dennison.'

Mr. Cull, Edmonton, exhibited Ferns.

Frank Lloyd, Esq., Coombe House, Croydon (gr. Mr. Mills), staged Pansies.

Sir Trevor Lawrence, Bart., Burford (gr. Mr. Bain), sent *Philadelphus Lemoinei purpureo-maculata,* which the Committee asked to see again from outside.

J. T. Bennett-Poë, Esq., Holmwood, Cheshunt (gr. Mr. Down), exhibited *Scutellaria Ventenatii.*

H. Mangles, Esq., Seale, Farnham, sent Rhododendrons.

F. House, Esq., Westspringfield, Clapton, brought Hippeastrums.

Messrs. Cooper & Taber, Southwark Street, sent Pansies.

Floral Committee, May 17, 1904.

Mr. Marshall in the Chair, and twenty-one members present.

Awards Recommended :-

Silver-gilt Flora Medal.

To Herr van Tubergen, Haarlem, for a marvellous group of hybrid *Onco-Regeli Iris.* (Fig. 115.)

Silver-gilt Banksian Medal.

To Mr. H. B. May, Edmonton, for Gymnogrammas.
To Mr. Mount, Canterbury, for Roses.

Silver Flora Medal.

To Mr. Upton, Guildford, for hardy plants.
To Messrs. Gilbert, Bourne, for Anemones.
To Messrs. Cutbush, Highgate, for hardy Orchids and Alpines.
To Mr. Perry, Winchmore Hill, for herbaceous plants.
To Mr. Prichard, Christchurch, for hardy plants.

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for *Schizanthus* and ornamental Crabs.

Bronze Flora Medal.

To Messrs. Ware, Feltham, for Roses.
To Messrs. Laing, Forest Hill, for stove plants.
To Messrs. Cannell, Swanley, for Calceolarias.
To Messrs. Cheal, Crawley, for ornamental shrubs.

Bronze Banksian Medal.

To J. A. Young, Esq., Stone House, Putney (gr. Mr. Street), for Gloxinias and Calceolarias.
To Messrs. Peed, Streatham, for herbaceous flowers.

First-class Certificate.

To Iris 'Iphigenia' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen, jun., Haarlem. Flower very striking, having large dark-purple falls tinged with red, deeply marked with bright-gold veins and a dark blotch at the base, the standards being a beautiful shining purple.

To Iris 'Artemis' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. A very beautiful variety with deep violet falls with a darker blotch at the base; the standards are a clear and lovely shade of purple.

To Iris 'Charon' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. Raised from *I. Korolkowi* × *I. atropurpurea.* A charming variety with falls a rich brown, striped with gold, and a very dark blotch at the base; the standards are of similar colour, but more heavily marked with gold.

To Rhododendron 'Beauty of Littleworth' (votes, unanimous), from H. A. Mangles, Esq., Littleworth Cross, Seale, Farnham. Flower of

Fig. 115.—Iris Onco-Regeli. (*The Garden.*)

immense size, pure white except the upper petal, which is spotted with dark purple. A truly magnificent variety.

To Rhododendron 'Dawn' (votes, unanimous), from Mrs. J. H. Mangles, Valewood, Haslemere. A very large and beautiful flower of a pale cerise-pink without any spots—somewhat like 'Pink Pearl,' but quite distinct.

Award of Merit.

To Iris 'Eos' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. Falls a rich chocolate-crimson, heavily marked with bright gold, and standards of a deep velvety purple.

To Iris 'Isis' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. Falls a palish purple covered with a silvery sheen, and standards of a deeper shade.

To Iris 'Psyche' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. A very pleasing variety with deep gold-coloured falls veined with chocolate-crimson; standards white with brown veins.

To Iris 'Antigone' (*Onco-Regeli*) (votes, unanimous), from Herr van Tubergen. All the flower of this lovely variety is a palish grey, faintly suffused with mauve.

All the Iris hybrids sent by Herr van Tubergen were of great size and substance, and they were said to be perfectly hardy and free-growing.

To Rhododendron 'Gertrude Jekyll' (votes, unanimous), from H. A. Mangles, Esq., Seale. A very handsome variety with large flowers, the inside of the petals being white, and the outside and margins a deep pinkish-red.

To *Pteris cretica capitata* (votes, 7 for, 3 against), from Mr. H. B. May, Edmonton. A nearly hardy variety with extraordinarily large crests at the ends of the pinnæ. All the fronds are very stiff and erect.

Other Exhibits.

Lady Cathcart, Titness Park (gr. Mr. Scouse), staged double Primroses.

Mr. Box, West Wickham, staged Begonias.

Miss Hopkins, Knutsford, brought hardy plants.

Messrs. Paul & Sons, Cheshunt, sent Roses.

Messrs. Bull, Chelsea, brought stove plants.

Messrs. Stark, Great Ryburgh, staged hardy plants.

Messrs. Jackman, Woking, sent herbaceous plants.

Messrs. Low, Enfield, staged flowering plants.

Messrs. Waterer, Bagshot, brought Rhododendrons.

Mr. Modral, Old Warden Park, sent Carnations.

Mr. Douglas, Great Bookham, staged Auriculas.

Messrs. Brown, Stamford, sent Cactus-flowered Pelargoniums.

Mr. Wood, Dartford Heath, sent Ivy-leaved Pelargoniums.

Floral Committee, May 31, 1904.

At the Temple Gardens.

Mr. Marshall in the Chair, and twenty-six members present.

[The Cups and Medals awarded by the Council will be found at page xxii.]

Awards Recommended :—

First-class Certificate.

To *Gloriosa Rothschildiana* (votes, unanimous), from Hon. Walter Rothschild, Tring Park. A magnificent variety from Uganda, having flowers of extraordinary size, with deep rosy-purple segments margined with gold. (Fig. 116.)

Award of Merit.

To *Pteris Binotii* (votes, 9 for), from Messrs. Hill, Edmonton. A distinct variety with thick robust palmate-lobed fronds. It was collected and sent to Messrs. Hill by Monsieur Binot from Brazil.

To Pelargonium 'Lady Decies' (votes, unanimous), from Messrs. Turner, Slough. A very pretty decorative variety with large trusses of pale pink flowers with scarlet spots on the upper segments.

To *Wahlenbergia serpyllifolia* (votes, unanimous), from R. Farrer, Esq., Ingleborough. A very handsome rock plant with very deep blue Campanula-like flowers borne in great profusion ; dwarf plants having long narrow leaves. A native of Dalmatia.

To Begonia 'Mr. W. H. Edwards' (votes, unanimous), from Messrs. Ware, Feltham. Flowers very large and double, of a pretty shade of salmon, with a distinct white margin to all the petals.

To Begonia 'Avalanche' (votes, unanimous), from Messrs. Blackmore and Langdon, Bath. A very handsome and beautifully formed double white variety.

To Begonia 'Lady Curzon' (votes, unanimous), from Messrs. Blackmore and Langdon. Flowers of great size and substance, double, and a rich reddish-crimson colour.

To Rose 'Perle de Neige' (votes, unanimous), from Messrs. W. Paul, Waltham Cross. This is described by the exhibitor as a perpetual flowering *multiflora*. The flowers are perfectly white, very double, and produced in great clusters.

To *Dodecatheon* 'Dame Blanche' (votes, unanimous), from Messrs. Wallace, Colchester. A remarkably free-flowering variety with pure-white blossoms borne in profusion. A bold and beautiful plant.

To *Campanula rupestris* (votes, unanimous), from Messrs. Cutbush, Highgate. A most beautiful rock plant, the dwarf procumbent shoots being covered with pretty violet-coloured flowers of medium size ; the foliage is round and downy, forming a splendid 'setting' for the blossoms.

To the strain of *Lupinus polyphyllus* (votes, unanimous), from Messrs. Barr, Covent Garden. A very fine strain, ranging in colour from pure white and pale yellow to mauve and deep blue.

To *Lupinus polyphyllus rosea* (votes, unanimous), from Messrs. Cheal, Crawley. A very handsome rosy-pink variety.

To *Rhododendron* (*Azalea*) *mollis* × *sinensis* ' Ellen Cuthbert ' (votes, unanimous), from Messrs. Cuthbert, Southgate. Trusses very large, the individual flowers being also of great size, and a rich orange, the upper segments being spotted with dark red.

FIG. 116.—GLORIOSA ROTHSCHILDIANA. (*Journal of Horticulture.*)

Other Exhibits.

Mr. Glendinning, Wimbledon, sent Carnations.

From J. T. Bennett-Poë, Esq., V.M.H., Cheshunt, came *Rhododendron Smithii aureum.*

The Countess of Lathom, Ormskirk (gr. Mr. Ashton), sent Carnations.

Mr. Vert, Saffron Walden, staged Lobelia ' Blue Gem.'

From Mr. W. B. Hartland, Cork, came Tulips.

Mr. Beardmore, Winchester, sent Sweet Pea 'Lady Aberdare.'

Miss Alice de Rothschild, Waddesdon (gr. Mr. Walters), sent blue flowered Nymphæas.

Mr. White, Worcester, staged *Lupinus polyphyllus atropurpureus.*

Mr. Phillips, Edinburgh, sent Lobelia 'Warnley Blue.'

FLORAL COMMITTEE, JUNE 14, 1904.

Mr. MARSHALL in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To W. James, Esq., West Dean Park (gr. Mr. Smith), for Carnations.
To Messrs. Jas. Veitch, Chelsea, for Gloxinias and Aquilegias.
To Mr. F. Cant, Colchester, for Roses.
To Mr. H. B. May, Edmonton, for *Nephrolepis.*

Silver-gilt Banksian Medal.

To Messrs. Cannell, Swanley, for Gloxinias and Aquilegias.
To Messrs. Cutbush, Highate, for herbaceous plants.
To Messrs. Kelway, Langport, for Pæonies.

Silver Flora Medal.

To Mr. Prince, Longworth, for Roses.
To Mr. Perry, Winchmore Hill, for hardy plants.
To Messrs. Paul, Cheshunt, for Roses.
To Mr. Turner, Slough, for Carnations.
To Mr. Pritchard, Christchurch, for hardy plants.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Wallace, Colchester, for hardy plants.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for Pæonies.
To Messrs. Jackman, Woking, for hardy plants.
To Mr. Notcutt, Woodbridge, for hardy flowers.
To Mr. L. R. Russell, Richmond, for Codiæums.
To Messrs. Ware, Feltham, for hardy plants.

Bronze Flora Medal.

To Messrs. Bull, Chelsea, for Spanish Iris.
To Mr. Reuthe, Keston, for German Iris.
To Messrs. Dobbie, Mark's Tey, for Aquilegias.
To Messrs. Bath, Wisbech, for Pæonies.

Award of Merit.

To *Begonia Morrisiana speciosa* (votes, 14 for, 5 against), from G. J. Morris, Esq., St. Dunstan's, Hendon (gr. Mr. Simmonds). A distinct variety raised from *B. Boliviensis* × *B.* 'Glory of Stanstead.' The plant is of rather slender growth, but produces large double bright scarlet flowers from the axils of every leaf; the flowers are usually single on long slender stalks, which, being pendent, should make the plant valuable for baskets.

To Carnation 'Yellow Gal' (votes, 16 for, 3 against), from Martin R. Smith, Esq., Warren House, Hayes (gr. Mr. Blick). Flowers of great size, almost like a 'Malmaison,' but quite distinct from that type in the foliage, which is long and narrow; the colour is a very pale yellow, and the flower is scentless.

To *Dianthus Cal-alpinus* (votes, unanimous), from Mr. Reuthe, Keston, Kent. A remarkably pretty variety, raised from *D. alpinus* × *D. callizonus.* The flowers are of medium size, of a deep red colour suffused with purple, with a bright brownish ring in the centre. The plant is very dwarf, and was covered with blossom, and ought to be a valuable addition for the rockery.

To *Hesperis matronalis lilacina plena* (votes, unanimous), from Lord Aldenham, Elstree (gr. Mr. Beckett). A form of 'Sweet Rocket' with double flowers of a deep mauve colour.

To Pæony 'Nellie' (votes, unanimous), from Messrs. Kelway, Langport. One of the herbaceous varieties with immense single flowers of a lovely rosy-pink shade, with a mass of bright yellow stamens in the centre.

To Pæony 'Mrs. French Sheldon' (votes, 14 for, 6 against), from Messrs. Kelway. Another herbaceous variety, with large double flowers, white, shading to yellow in the centre, the outer segments tipped with rose. A very handsome variety.

To *Rosa austriaca striata* (votes, unanimous), from A. Tate, Esq., Downside, Leatherhead (gr. Mr. Mease). One of the most beautiful of the Austrian Briars, the flowers being deep yellow in the centre, shading off to deep brownish-red at the margins.

To Rose 'Maharajah' (votes, 18 for), from Messrs. B. R. Cant, Colchester. A Hybrid Perpetual with very large single dark crimson flowers shaded with purple, said to be an excellent pillar Rose, making long growths which flower profusely.

Other Exhibits.

Lady Margaret Bickersteth, Cottingham, Yorks., sent some very fine double Aquilegias, unfortunately much damaged in transit.

Hon. Mrs. Evelyn Cecil, Lytchett Heath, sent a pretty unnamed Scilla collected in Zululand.

Mr. Disbrowe, Bennington, Lincolnshire, sent *Tulipa ignota*, the latest flowering of all Tulips.

Mr. Anthony Waterer, Knaphill, Woking, staged Kalmias.

Mr. Unwin, Histon, brought Sweet Peas.

Mr. Douglas, Great Bookham, sent Pinks.

Mr. Morris, Hendon, staged Begonias.

Floral Committee, June 28, 1904.

Mr. Marshall in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Lord Aldenham, Elstree (gr. Mr. Beckett), for Streptocarpus.

Silver-gilt Banksian Medal.

To Mr. H. B. May, Edmonton, for Codiæums.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Wallace, Colchester, for herbaceous plants.
To Messrs. Cutbush, Highgate, for *Eremurus* and Verbenas.

Silver Flora Medal.

To Messrs Jas. Veitch, Chelsea, for Iris and Streptocarpus.
To F. Lloyd, Esq., Coombe House, Croydon (gr. Mr. Mills), for hybrid Begonias.
To Messrs. Dobbie, Essex, for Violas and Pansies.
To Messrs. Paul, Cheshunt, for Roses.
To Mr. Perry, Winchmore Hill, for herbaceous plants.
To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for dwarf Sweet Peas.
To Messrs. Laing, Forest Hill, for stove plants.
To Messrs. Kelway, Langport, for Delphiniums.
To Messrs. Barr, Covent Garden, for herbaceous plants.

Bronze Flora Medal.

To Messrs. Cuthbert, Southgate, for Gladioli.
To Mr. Prichard, Christchurch, for herbaceous plants.

First-class Certificate.

To *Philadelphus Lemoinei maculatus* (votes, 13 for, 6 against), from Sir Trevor Lawrence, Bart., Burford, and Mr. Prichard, Christchurch. A very distinct and handsome variety; the flowers, which are of large size and apparently freely produced, have each petal marked at the base with pale purple, so forming a circle of purple in the centre.

Award of Merit.

To *Codiæum* 'Mrs. H. B. May' (votes, 9 for, 2 against), from Mr. H. B. May, Edmonton. A very graceful variety with long narrow leaves which recurve and are marked with green and yellow.

To Carnation 'Joan' (votes, 16 for), from S. Morris, Esq., Wretham Hall, Thetford (gr. Mr. Henley). A handsome border variety with large sulphur-yellow flowers which do not split its calyx.

To Delphinium 'Mrs. J. Bradshaw' (votes, unanimous), from J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whitelegge). A lovely variety raised from seed of 'King of the Delphiniums.' The flowers are pale blue, single, and borne on long spikes that are not so overcrowded as is so often the case.

To Delphinium 'Norman Hirst' (votes, 18 for, 4 against), from Messrs. Kelway, Langport. Spikes of great length, densely covered with very dark blue flowers, heavily shaded with purple, showing a pale yellow eye.

To *Pimpinella magna rosea* (votes, 11 for, 4 against), from Mr. Prichard, Christchurch. A pale rosy form of the well-known Pimpinella which should prove an acquisition for the rock garden.

To the strain of Dwarf Sweet Peas (votes, 11 for), from Messrs. Cannell, Swanley. A remarkably floriferous strain with a great variety of colour.

Other Exhibits.

Viscountess Enfield, Barnet, sent *Dianthus barbatus* 'Elizabeth.'

Hon. Walter Rothschild, Tring Park, sent *Nymphæa zanzibariensis rosea.*

C. Beavan, Esq., Trowbridge, staged Rose 'Maisie Ellison.'

Messrs. Bull, Chelsea, sent a large group of English Iris.

Messrs. Peed, Streatham, staged Roses and Alpines.

Messrs. Bunyard, Maidstone, brought Roses and Delphiniums.

Messrs. Cheal, Crawley, staged trees and shrubs.

Messrs. Ladhams, Shirley, sent Pinks.

Messrs. Turner, Slough, sent Pinks.

Messrs. Brown, Peterborough, brought Roses and Pelargoniums.

Mr. Notcutt, staged herbaceous plants.

The Guildford Hardy Plant Co. sent Roses.

Messrs. Sander, St. Albans, staged hybrid Begonias.

Messrs. Low, Enfield, sent Malmaison Carnations.

Mr. Douglas, V.M.H., brought Pinks and a new hybrid *Dianthus* raised by crossing a Sweet William with a Clove Carnation.

Messrs. Gibson, Bedale, sent Poppies and Delphiniums.

Mr. Reuthe, Keston, sent flowering shrubs.

Floral Committee, July 12, 1904.

At Holland House.

Mr. May in the Chair, and twenty-seven members present.

[A list of the Cups and Medals awarded by the Council will be found at page xxix.]

Awards Recommended:—

First-class Certificate.

To *Alpinia Sanderæ* (votes, unanimous), from Messrs. Sander, St. Albans. A remarkably handsome stove plant with long lanceolate leaves, heavily striped and marked with white. A high temperature and generous applications of dilute liquid manure are appreciated by these plants.

Award of Merit.

To Begonia 'Canopus' (votes, unanimous), from Messrs. Davis, Yeovil. Flowers of great size and very double, of a deep yellow colour.

To Begonia 'Margaret Gwillim' (votes, unanimous), from Messrs Gwillim, New Eltham. Somewhat similar to 'Canopus,' but a paler shade of yellow.

To Carnation 'Glowworm' (votes, unanimous), from Mr. Douglas, V.M.H., Great Bookham. A magnificent border variety of a rich scarlet colour, with petals of excellent form and substance, and no sign of the calyx splitting.

To Carnation 'King Solomon' (votes, unanimous), from Mr. Douglas, V.M.H. A handsome border variety, with its colours of red, white, and pale purple beautifully mingled.

To Carnation 'Lady Linlithgow' (votes, 11 for, 5 against), from Martin R. Smith, Esq., The Warren, Hayes (gr. Mr. Blick). A border variety of good form, with rich rose-coloured flowers.

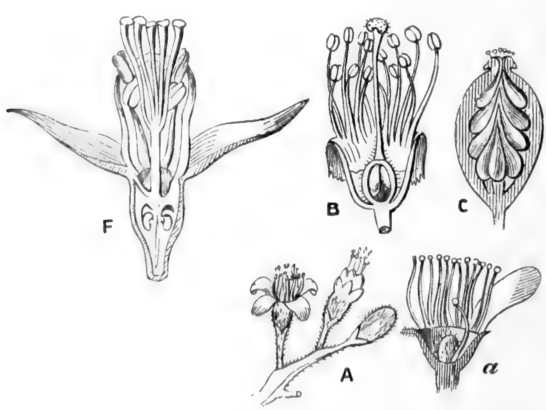
To *Glaucium flavum tricolor* (votes, 8 for, 4 against), from Messrs. Wallace, Colchester. Flowers of a deep orange shaded with a darker hue, and a brown blotch at the base of each petal. A very handsome Poppywort.

To Rose 'Chas. J. Grahame' (votes, unanimous), from Messrs. Dickson, Newtownards. A lovely rich crimson Hybrid Tea Rose, with fine form and strong habit.

To Rose 'Countess of Annesley' (votes, unanimous), from Messrs. Dickson, Newtownards. Another new Hybrid Tea of fine shape and bright pink colour shading to rose.

To Rose 'Duchess of Westminster' (votes, unanimous), from Messrs. Dickson, Newtownards. This is probably a Hybrid Tea, as it is like a fuller and glorified 'La France.'

To Rose 'Mrs. F. W. Flight' (votes, unanimous), from F. W. Flight, Esq., Winchester. A beautiful variety with large clusters of bright pink flowers having a white centre. It should make a good companion to 'Crimson Rambler,' which it resembles in growth.



ORCHID COMMITTEE

JANUARY 5, 1904.

Mr. VEITCH in the Chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Jas. Veitch, for hybrid Lælias and Lælio-Cattleyas.
To Messrs. Sander, for Cypripediums.
To Messrs. Charlesworth, for hybrids.

Silver Banksian Medal.

To C. J. Lucas, Esq., Horsham (gr. Mr. Duncan), for spikes of Calanthes and Cypripediums.

Botanical Certificate.

To *Maxillaria macrura* (syn. *M. longisepala*) (votes, unanimous), from the Botanic Gardens, Glasnevin (curator F. W. Moore, Esq., V.M.H.). A rare species with narrow, elongated, purplish segments to the flowers, and yellowish, red-veined lip.

To *Maxillaria cucullata* (votes, unanimous), from Glasnevin. Flowers one inch across, reddish-brown with dark purple lip.

To *Bulbophyllum micropetalum* (votes, unanimous), from Glasnevin. Flowers in racemes on slender flower stalks; greenish, striped with purple.

To *Epidendrum Cooperianum* (votes, unanimous), from Glasnevin, Flowers in dense clusters; sepals and petals whitish; the large conspicuous labellums bright rose.

Other Exhibits.

Francis Wellesley, Esq., Westfield (gr. Mr. Hopkins), showed a hybrid *Cypripedium* and *Lælia autumnalis* 'Westfield variety.'

H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood), showed three distinct forms of *Cypripedium insigne.*

Mr. Whateley, Kenilworth, sent *Cypripedium* × 'Amy Robsart.'

Messrs. Stanley, Ashton, showed *Miltonia* × *Cogniauxiæ Stanleyi*, a natural hybrid of *M. Regnelli* and *M. spectabilis Moreliana.* Nearest to *M. Regnelli* in shape, but of the purple colour of *M. spectabilis Moreliana.*

Mrs. Haywood, Woodhatch, Reigate (gr. Mr. Salter), sent *Cypripedium* × 'Mrs. Haywood' (*C.* × 'T. B. Haywood' × *C. Charlesworthii*); and *C.* × *Hitchinsiæ maculata.*

Messrs. Hugh Low sent rare Cypripediums.

Orchid Committee, January 26, 1904.

Mr. Veitch in the Chair, and twenty-three members present.

Awards Recommended:—

Gold Medal.

To Jeremiah Colman, Esq., Gatton Park (gr. Mr. Bound), for an extensive group of finely grown Orchids, principally Dendrobiums.

Fig. 117.—Lælia anceps Schröderæ 'Theodora.'

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Bradford, for hybrids.

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for Lælio-Cattleyas and Cypripediums.
To Messrs. Sander, St. Albans, for hybrids.

Silver Banksian Medal.

To Lady Chichele Plowden, Aston Rowant (gr. Mr. Clark), for *Lælia anceps*, each plant with seven or eight spikes of flowers.

Award of Merit.

To *Lælia anceps Schröderæ* 'Theodora' (votes, 13 for, 2 against), from F. Wellesley, Esq., Westfield (gr. Mr. Hopkins). A handsome flower of the *L. a. Amesiana* class. Sepals and petals white, tinged with

FIG. 118.—CYPRIPEDIUM × MORTENI. (*Journal of Horticulture.*)

magenta-rose, darkest at the tips. Lip with yellow disc and dark lines on each side; front dark claret-purple. (Fig. 117.)

To *Lælio-Cattleya* × 'Myra' *Charlesworthii* (*L. flava* × *C. Trianæi*) (votes, unanimous), from Messrs. Charlesworth. Flowers bright yellow; front of lip ruby-purple.

To *Cypripedium* × *Morteni* (*Leeanum Masereelianum* × *Chamberlainianum*) (votes, 14 for, 3 against), from W. M. Appleton, Esq., Weston-super-Mare. Habit of *C. Chamberlainianum*; flowers several on a spike; dorsal sepal green at the base with chocolate lines and white margin;

petals greenish, striped chocolate; lip rose colour with yellow margin. (Fig. 118.)

Other Exhibits.

Baron Schröder (gr. Mr. Ballantine) showed spikes of the purple-blotched *Odontoglossum Pescatorei Schröderianum, O. P. Veitchianum* and *O. crispum Stevensii.*

Lord Rothschild (gr. Mr. Hill) sent a spike of *Phalænopsis amabilis Rimestadiana.*

Geo. Singer, Esq., Coundon Court (gr. Mr. Collyer), showed hybrid Cypripediums.

J. Rutherford, Esq., M.P., Blackburn (gr. Mr. Lupton), sent *Odontoglossum* × *Hallio-crispum.*

C. J. Lucas, Esq. (gr. Mr. Duncan), sent *Cypripedium* × *Lathamianum* 'Warnham Court variety' and *C.* × 'Almos.'

W. M. Appleton, Esq., showed *Cypripedium* × *Edithiæ* and two others.

M. Chas. Vuylsteke, Ghent, sent *Odontoglossum* × *Vuylstekei* and *O.* × *loochristyense* varieties.

M. Jules Hye de Crom, Ghent, sent *Cypripedium* × 'Madame Jules Hye.'

Messrs. Hugh Low staged a group.

ORCHID COMMITTEE, FEBRUARY 9, 1904.

Mr. VEITCH in the Chair, and twenty-six members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sander, St. Albans, for a very extensive group.

Silver Flora Medal.

To Norman Cookson, Esq., Oakwood, Wylam (gr. Mr. Chapman), for Odontoglossums.

To Messrs. Charlesworth, Bradford, for hybrids.

Silver Banksian Medal.

To G. F. Moore, Esq., Bourton-on-the-Water (gr. Mr. Page), for Cypripediums.

To Mr. Cypher, Cheltenham, for Dendrobiums and Cypripediums.

To Messrs. Hugh Low, for a group.

To Messrs. Williams, Holloway, for Cypripediums.

Award of Merit.

To *Cypripedium* × *aureum* 'Œdippe' (*Sallieri Hyeanum* × *Spicerianum*) (votes, unanimous), from Captain Holford, C.I.E., C.V.O., Westonbirt (gr. Mr. Alexander), and Messrs. Charlesworth. A fine hybrid; upper sepal dark rose with a green blotch at the base and white margin. Petals and lip yellow marked with purple.

To *Cypripedium* × *aureum virginale* (*Sallieri Hyeanum* × *Spiceria-*

num) (votes, unanimous), from G. F. Moore, Esq. (gr. Mr. Page). Dorsal sepal large, white with a green base; petals and lip greenish, the petals tipped with white.

To *Cypripedium* × *Thompsoni* (*villosum aureum* × 'Calypso') (votes, 10 for, 3 against), from G. F. Moore, Esq. Lower half of the dorsal sepal rose-purple, upper half white. Petals and lip yellowish tinged and veined with purple.

To *Cypripedium* × 'Graceæ,' var. 'W. H. Page,' (*niveum* × *Boxallii atratum*) (votes, unanimous), from G. F. Moore, Esq. Flowers white tinged with purple, the upper sepal having broad irregular lines of chocolate-purple.

Other Exhibits.

Baron Schröder (gr. Mr. Ballantine) showed a fine inflorescence of *Odontoglossum* × *elegans*, 'Eastwood Park variety,' and two forms of *Cypripedium* × *Lathamianum*.

M. C. Beranek, Paris, sent two hybrid Cypripediums.

J. Taylor, Esq., Reigate, exhibited fine spikes of *Dendrobium speciosum*.

H. T. Pitt, Esq. (gr. Mr. Thurgood), sent *Cypripedium Pittianum*.

Mr. Tracy, Twickenham, showed *Cattleya Trianæi* 'Bessie.'

De B. Crawshay, Esq. (gr. Mr. Stables), sent *Odontoglossum* × *Wilckeanum* 'Argus.'

M. Chas. Vuylsteke, Loochristi, Belgium, showed two fine *Odontoglossum* × *Wilckeanum*, and *O.* × *Vuylstekei*.

J. T. Bennett-Poë, Esq. (gr. Mr. Downes), again showed *Ipsea speciosa*, finely flowered.

H. Little, Esq. (gr. Mr. Howard), sent *Lycaste costata*.

Messrs. Jas. Veitch staged hybrids.

Orchid Committee, February 23, 1904.

Mr. Veitch in the Chair, and twenty-three members present.

Awards Recommended.

Silver-gilt Flora Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. White), for rare Orchids.

To Jeremiah Colman, Esq., Gatton Park (gr. Mr. Bound), for Dendrobiums.

To Messrs. Sander, St. Albans, for Odontoglossums, Dendrobiums, and Cypripediums.

Silver Flora Medal.

To R. G. Thwaites, Esq., Streatham (gr. Mr. Black), for hybrids.

To Mr. Cypher, Cheltenham, for Dendrobiums and Cypripediums.

Silver Banksian Medal.

To Messrs. Jas. Veitch, for hybrids.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whitelegge), for a group.

To Messrs. Hugh Low, for a group.

First-class Certificate.

To *Cypripedium* × *Beekmanii* (parentage uncertain, votes unanimous), from R. Briggs-Bury, Esq., Accrington (gr. Mr. Wilkinson). A massive flower, dorsal sepal emerald-green with white margin and many chocolate-purple spots. Petals and lip yellowish, marked and tinged with purple. (Fig. 119.)

FIG. 119.—CYPRIPEDIUM × BEEKMANII. (*Journal of Horticulture.*)

Award of Merit.

To *Cymbidium* × *Ballianium* (*eburneum* × *Mastersii*) (votes, unanimous), from Captain Holford, C.I.E., Westonbirt (gr. Mr. Alexander). Flowers as large as those of *C. eburneum*, but with more on a spike, as in *C. Mastersii* ; white with yellow crest to the lip. The spike of the plant shown had four flowers.

To *Cymbidium Wilsoni* (votes, 11 for, 2 against), from Messrs. Jas. Veitch, Chelsea. A remarkable plant, in habit like a pigmy *C. gigantum*, but with flowers as large as that species and closely allied to it ; the scape, however, is more slender and the labellum less downy ; sepals and petals green with some indistinct dotted lines of purple extending half-way up; lip creamy-white with sepia-brown marks on the side lobes and reddish spotting in front. Imported from Yunnan, China. (Figs. 120 and 121.)

To *Sophro-Cattleya* × 'Saxa' (*S. grandiflora* × *C. Trianæi*) (votes, 11 for, 2 against), from Messrs. Jas. Veitch. Flowers rose colour, darkest on the lip, which has a yellow disc.

Botanical Certificate.

To *Dendrobium Williamsoni*, from the Botanic Gardens, Glasnevin. A rare Himalayan species of the nigro-hirsute section; flowers white with yellow discs to the lip.

FIG. 120.—CYMBIDIUM WILSONI. (*Gardeners' Chronicle.*)

Cultural Commendation.

To Mr. King, gr. to Kennedy Jones, Esq., Finchley, for finely flowered *Cœlogyne cristata.*

Other Exhibits.

R. Briggs-Bury, Esq., sent *Cypripedium* × 'Minos,' 'Young's variety.'

F. Du Cane Godman, Esq., showed fine Lycastes and *Platyclinis glumacea.*

M. Chas. Vuylsteke, Ghent, showed hybrid Odontoglossums.

F. W. Moore, Esq., V.M.H., Botanic Gardens, Glasnevin, sent a magnificent inflorescence of *Cymbidium grandiflorum*, 'Glasnevin variety.'

J. C. F. Ramsden, Esq., Guildford, sent a greenish form of *Cypripedium* × *Harrisianum.*

G. W. Law-Schofield, Esq., sent *Cypripedium* × *aureum* 'Surprise.'

J. Gurney Fowler, Esq., showed *Cypripedium* × 'J. Davis,' a supposed hybrid of *C.* × *Leeanum* and *C.* × *Dauthieri*.

Fig. 121.—Cymbidium Wilsoni. (*The Garden.*)

F. Wellesley, Esq., showed *Cypripedium villosum pulchellum*.
Mr. Henkel, Darmstadt, sent a white *Cattleya labiata*.

FIG. 122.—LÆLIO-CATTLEYA HAROLDIANA MAGNIFICA.

(To face page lxxxvii.)

Orchid Committee, March 8, 1904.

Mr. Veitch in the Chair, and twenty-six members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Baron Schröder (gr. Mr. Ballantine), for a fine group.

Silver Flora Medal.

To Jeremiah Colman, Esq., Gatton Park (gr. Mr. Bound), for Dendrobiums.

To R. G. Thwaites, Esq., Streatham (gr. Mr. Black), for hybrid Dendrobiums.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Charlesworth, Bradford, for hybrids.

To Messrs. Cypher, Cheltenham, for Dendrobiums.

Silver Banksian Medal.

To W. Thompson, Esq., Walton Grange (gr. Mr. Stevens), for hybrid Odontoglossums.

To Messrs. Hugh Low, for a group.

First-class Certificate.

To *Lælio-Cattleya* × *Haroldiana magnifica* (*L. tenebrosa* × *C.* × *Hardyana*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals bronzy-yellow, with the greater part of the surface veined and tinged with claret-purple ; lip intensely dark claret-purple. (Fig. 122.)

Award of Merit.

To *Odontoglossum crispum Kinlesidianum* (votes, unanimous), from Norman C. Cookson, Esq. (gr. Mr. Chapman). A variety of the *O. c.* 'Lady Jane' and *O. c.* 'Oakfield Sunrise' class. Flowers white, the slightly stalked petals having closely arranged cinnamon-brown lines on the inner halves.

To *Odontoglossum crispum* 'Rossendale' (votes, 18 for, 1 against), from J. Wilson Potter, Esq., Croydon. Flowers white, tinged with purple, and heavily blotched with red-brown.

To *Dendrobium* × *melanodiscus gloriosum* (*Findlayanum* × *Ainsworthii*) (votes, 10 for, 1 against), from Mrs. Haywood, Woodhatch. Flowers large and well rounded, white, tipped with carmine-rose, the base of the lip being claret colour with an orange band.

Cultural Commendation.

To Mr. White, gr. to Sir Trevor Lawrence, Bart., for a finely flowered specimen of *Dendrobium* × 'Luna.'

To Mr. Howes, gr. to Walter Cobb, Esq., for a strong specimen of *Tetramicra* (*Leptotes*) *bicolor.*

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for a finely flowered mass of *Dendrobium aggregatum majus.*

Other Exhibits.

Lord Rothschild (gr. Mr. Hill) sent a fine branched inflorescence of *Phalænopsis* × *intermedia Portei.*

Captain Holford, C.I.E. (gr. Mr. Alexander), sent *Odontoglossum* × *Adrianæ* 'Lady Crawford.'

Norman C. Cookson, Esq., sent *Dendrobium* × 'Mac-jap' (*Mc-Carthiæ* × *japonicum*) and *D.* × *nobile-Wiganiæ*.

F. A. Rehder Esq. (gr. Mr. Norris), sent *Cypripedium villosum excelsum*.

F. Wellesley, Esq. (gr. Mr. Hopkins), showed *Cypripedium* × *Memoria Jerninghamiæ*.

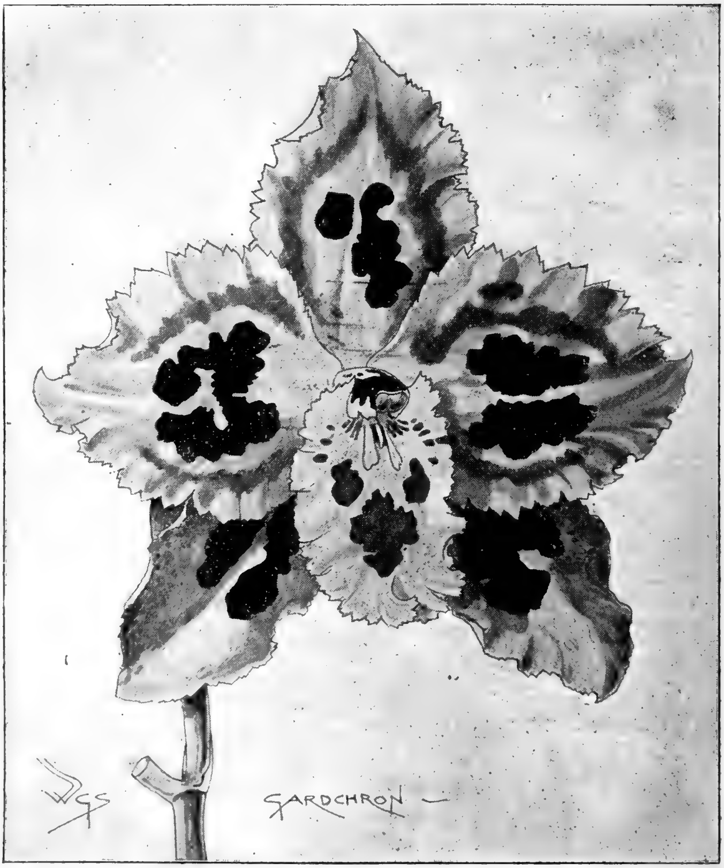


FIG. 123.—ODONTOGLOSSUM CRISPUM 'DE BARRI.' (*Gardeners' Chronicl*

De B. Crawshay, Esq. (gr. Mr. Stables), showed *Odontoglossum* × 'De Barri,' a finely blotched form (fig. 123), and *O.* × *waltoniense rosefieldiense* (*crispum* × *polyxanthum*) in which *O. polyxanthum* was more evident than in the original form.

Messrs. Bull sent varieties of *Lælio-Cattleya* × 'Myra.'

Messrs. Jas. Veitch showed *Cypripedium* × *Harri-Leeanum* and a good *Lælio-Cattleya* × 'Myra.'

Orchid Committee, March 22, 1904.

Mr. J. Gurney Fowler in the Chair, and twenty-one members present.

Awards Recommended:—

Gold Medal.

To Norman Cookson, Esq., Oakwood, Wylam (gr. Mr. Chapman), for rare Odontoglossums.

To W. A. Bilney, Esq., Weybridge (gr. Mr. Whitlock), for finely flowered Dendrobiums.

Silver-gilt Flora Medal.

To Messrs. Sander, St. Albans, for Odontoglossums and hybrids.

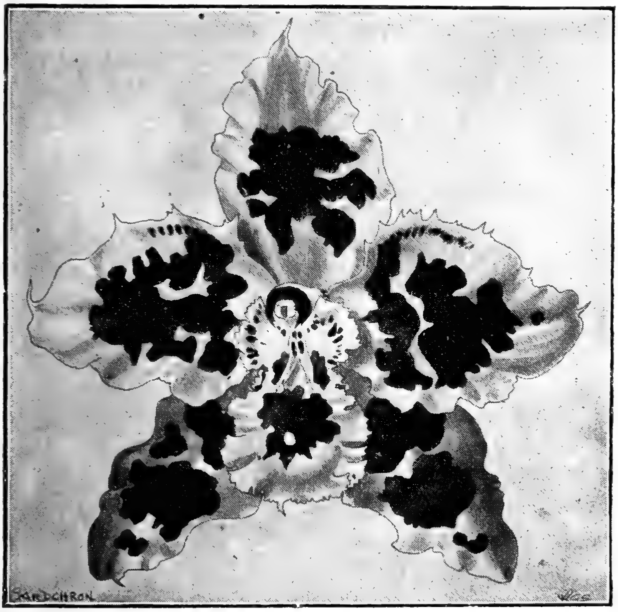


Fig. 124.—Odontoglossum × ardentissimum 'Cooksoniæ.' (*Gardeners' Chronicle.*)

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for hybrid Lælio-Cattleyas.
To Messrs. Hugh Low, Enfield, for a group.
To Messrs. Charlesworth, Bradford, for hybrids.

First-class Certificate.

To *Odontoglossum* × *ardentissimum Cooksoniæ* (votes, unanimous), from Norman Cookson, Esq. (gr. Mr. Chapman). A showy example of this brilliant hybrid. Flowers white, tinged with purple and heavily marked with mauve-purple. (Fig. 124.)

To *Lælio-Cattleya* × *Luminosa* 'The Mikado' *L. tenebrosa* × *C. Dowiana aurea*) (votes, unanimous), from Messrs. Sander. One of the largest and finest in colour of its section. Sepals and petals reddish-orange veined purple; lip claret-purple.

Award of Merit.

To *Odontoglossum crispum* 'Sibyl' (votes, 16 for), from Norman Cookson, Esq. (gr. Mr. Chapman). Flowers broad, white heavily tinged with purple at the back, each segment being decorated with clusters of purplish-red blotches.

To *Odontoglossum crispum* 'Prebendary Bevan' (votes, 10 for, 4 against), from H. T. Pitt, Esq. (gr. Mr. Thurgood). A fine white flower blotched with claret-purple. (Fig. 125.)

FIG. 125.—ODONTOGLOSSUM CRISPUM 'PREBENDARY BEVAN.' (*Journal of Horticulture.*)

To *Odontoglossum Pescatorei* 'Kathleen' (votes, 13 for), from Messrs. McBean, Cooksbridge. Flowers large and of good substance, white tinted with rose, and bearing a distinct purple spot on each of the segments. (Fig. 126.)

To *Odontoglossum* × *waltoniense rosefieldense* (*crispum* × *polyxanthum*) (votes, 11 for, 5 against), from De B. Crawshay, Esq. (gr. Mr. Stables). Flowers canary-yellow, the sepals and petals bearing a few cinnamon-brown blotches as in *O. polyxanthum.*

To *Lælio-Cattleya* × 'Mme. M. Fournier,' var. 'W. H. Young' (*C. labiata* × *L. Digbyana*) (votes, 13 for, 3 against), from Messrs. Sander. Similar in size and shape to others of its class, but white tinged with rosy-lilac; disc of lip yellow with a few purple lines; margin deeply fringed.

Botanical Certificate.

To *Cypripedium japonicum* from Messrs. T. S. Ware. Sepals and petals greenish, the large inflated labellum white and rose.

Other Exhibits.

Sir Trevor Lawrence, Bart. (gr. Mr. White), staged hybrid Masdevallias.

Baron Schröder (gr. Mr. Ballantine) sent sprays of rare Orchids.

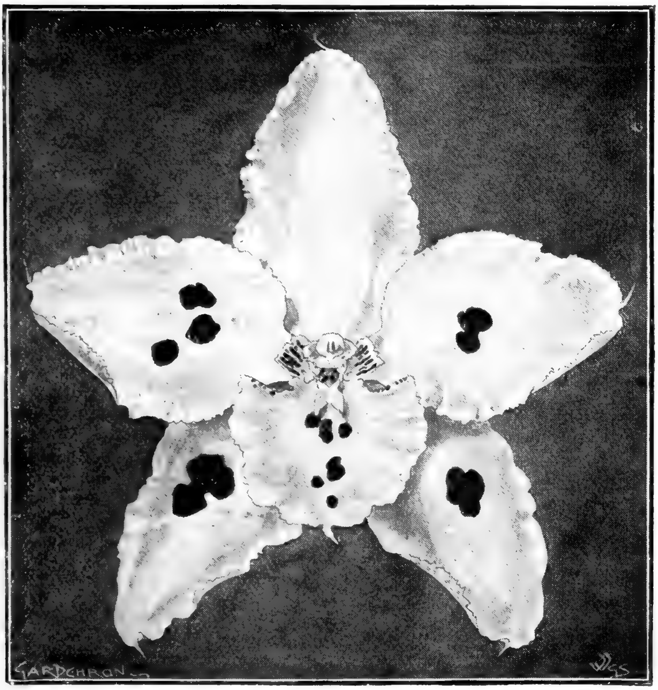


FIG. 126.—ODONTOGLOSSUM PESCATOREI 'KATHLEEN.' (*Gardeners' Chronicle.*)

The Hon. Walter Rothschild, M.P. (gr. Mr. Hill), sent a rose-coloured hybrid between *Cattleya Trianæi* and *Lælia rupestris.*

H. L. Bischoffsheim, Esq. (gr. Mr. Ellis), sent Odontoglossums.

R. G. Thwaites, Esq. (gr. Mr. Black), showed *Dendrobium* × *Thwaitesiæ.*

Sir F. Wigan, Bart. (gr. Mr. Young), showed *Odontoglossum crispum marmoratum.*

R. Briggs-Bury, Esq., sent *Odontoglossum crispum* 'Empress of India' and *O.* × 'Empress Frederick.'

M. Ch. Vuylsteke, Ghent, showed hybrid Odontoglossums.

ORCHID COMMITTEE, APRIL 5, 1904.

Mr. NORMAN COOKSON in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for rare Odontoglossums.

Silver Flora Medal.

To W. Thompson, Esq., Stone, Stafford (gr. Mr. Stevens), for Odontoglossums.

To Messrs. Sander, St. Albans, for a group.

FIG. 127.—LÆLIO-CATTLEYA DIGBYANO-SCHRÖDERÆ ALBA.

Silver Banksian Medal.

To Messrs. Hugh Low, Bush Hill Park, for a group.

First-class Certificate.

To *Odontoglossum cirrhosum*, 'Pitt's variety' (votes, unanimous), from H. T. Pitt, Esq. (gr. Mr. Thurgood). Flowers the largest in the species ; segments broad, white with dark purple spots.

Award of Merit.

To *Lælio-Cattleya* × *Digbyano-Schröderæ alba* (*L. Digbyana* × *C. Schröderæ alba*) (votes, 15 for), from J. Bradshaw, Esq. Southgate, (gr.

Mr. Whitelegge). Flowers with a fringed lip similar to others of its section; white tinted with pink on the backs of the sepals; disc of the lip sulphur-yellow. (Fig. 127.)

To *Lælio-Cattleya* × 'Mona' (*C. Schröderæ* × *L. flava*) (votes, 15 for), from Messrs. Jas. Veitch. Flowers shaped like those of *C. Schröderæ* but smaller; cowslip yellow.

To *Cymbidium Lowianum Luciani* (votes, unanimous), from Messrs. Linden, Brussels. A very large variety with a chestnut-red front lobe to the lip.

Cultural Commendation.

To Mr. Davis, gr. to J. Gurney Fowler, Esq., for *Dendrobium Wardianum Fowleri,* grown and flowered several years in succession. The peculiarity of the variety—trilabellia in the lateral sepals—proves constant.

Other Exhibits.

Baron Schröder (gr. Mr. Ballantine) showed spikes of *Odontoglossum crispum* 'Princess Christian.'

Norman Cookson, Esq. (gr. Mr. Chapman), showed a finely blotched *Odontoglossum crispum* in which the two lower flowers were very large, but the other buds were undeveloped.

J. Bradshaw, Esq. (gr. Mr. Whitelegge), sent *Odontoglossum* × *excellens Lowiæ* and *Cattleya Trianæi perfecta.*

H. Little, Esq. (gr. Mr. Howard), showed four good *Cattleya Schröderæ.*

F. A. Rehder, Esq. (gr. Mr. Norris), sent *Cypripedium* × *Harrisianum excelsior.* F. Wellesley, Esq. (gr. Mr. Hopkins), sent *Cypripedium* × *allertonense* 'Westfield variety;' and *Cattleya guttata Prinzii* 'Dom Pedro.'

Walter C. Walker, Esq. (gr. Mr. Bunney), showed *Eriopsis rutidobulbon* and *Odontoglossum luteo-purpureum.*

Orchid Committee, April 19, 1904.

Mr. Veitch in the Chair, and twenty-three members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for Odontoglossums.

Silver Flora Medal.

To J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. Davis), for magnificent specimens of *Dendrobium Devonianum.*

To Messrs. Jas. Veitch, Chelsea, for hybrids.

To Messrs. Sander, St. Albans, for a group.

To Messrs. McBean, Cooksbridge, for Odontoglossums.

First-class Certificate.

To *Dendrobium* × *Thwaitesiæ,* 'Veitch's variety' (*splendidissimum grandiflorum* × *Wiganiæ*) (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Flowers in every respect resembling *D. splendidissimum grandiflorum*, except that they are yellow with a slight buff tint, and with a violet-purple disc to the lip.

FIG. 128.—ZYGOPETALUM × GOTTIANUM.

To *Odontoglossum crispum xanthotes Cooksoniæ* (votes, unanimous), from Norman Cookson, Esq. (gr. Mr. Chapman). Flowers white with several orange spots on the lip and one or two on some of the other segments.

To *Zygopetalum* × *Gottianum* (*maxillare Gautieri* × *Perrenoudii*) (votes, 12 for, 6 against), from Messrs. Sander, St. Albans. Flowers produced on upright spikes; sepals and petals bronzy-purple, with a slight whitish margin; lip white, with blue lines from the base. (Fig. 128.)

FIG. 129.—CYPRIPEDIUM × WELLESLEYANUM.

Award of Merit.

To *Cattleya Schröderæ*, 'Fowler's variety' (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). A very fine flower of peach-blossom colour, the lip being purplish-rose with a large orange-coloured disc; the lateral sepals also bore each an orange-coloured line.

To *Cypripedium* × *Wellesleyanum*, natural hybrid (votes, 14 for, 1 against), from Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins). Said to be between *C. bellatulum album* and *C. concolor*, and much resembling the former, except that its colour is yellow with small purple spots on the petals, the upper part of the lip, and lower part of the dorsal sepal. (Fig. 129.)

To *Odontoglossum crispum* 'Venus' (votes, 14 for, 4 against), from De B. Crawshay, Esq. (gr. Mr. Stables). A very fine typical *O. crispum* with white flowers tinged with purple at the back.

Botanical Certificate.

To *Calanthe discolor*, from Messrs. Cutbush, Highgate. A tolerably hardy Japanese species, with broad plicate leaves and upright spikes of brownish flowers, with white labellum tinged with rose.

Other Exhibits.

Captain Holford, C.I.E. (gr. Mr. Alexander), sent *Odontoglossum* × *Andersonianum*, 'Westonbirt variety.'

Drewett O. Drewett, Esq. (gr. Mr. Renwick), showed *Cypripedium* × *Lowio-Parishii.*

Ludwig Mond, Esq. (gr. Mr. Clarke), sent *Cymbidium Lowianum exquisitum* and *Lælio-Cattleya* × *inter-elegans.*

Messrs. Hugh Low staged a group.

Mr. Chas. Vuylsteke showed Odontoglossums.

Sir Frederick Wigan, Bart. (gr. Mr. Young), showed rare Orchids.

De B. Crawshay, Esq., sent *Odontoglossum triumphans* 'Lionel Crawshay.'

Mr. H. Whateley, Kenilworth, showed varieties of *Odontoglossum crispum.*

Orchid Committee, May 3, 1904.

Mr. Veitch in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Chapman), for Odontoglossums and hybrids.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for Odontoglossums.

Silver Flora Medal.

To J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whitelegge), for varieties of *Lycaste Skinneri.*

To Messrs. Charlesworth, Bradford, for hybrids.

To Messrs. Sander, St. Albans, for hybrids and Odontoglossums.

To Messrs. Cypher, Cheltenham, for a group.

To Messrs. Stanley, Ashton, Southgate, for a group.

To H. S. Goodson, Esq., Putney (gr. Mr. Day), for a group.

Award of Merit.

To *Odontoglossum crispum* 'Clive' (votes, unanimous), from Norman Cookson, Esq. (gr. Mr. Chapman). A distinct form with white flowers heavily tinted at the back with mauve-purple, and blotched on all the segments with reddish-claret.

To *Odontoglossum crispum* 'Clio' (votes, unanimous), from W. Thompson, Esq., Walton Grange (gr. Mr. Stevens). A fine flower of a light lilac tint, some of the segments bearing a cinnamon-brown blotch.

To *Odontoglossum nebulosum* 'Gurney Wilson' (votes, unanimous), from Gurney Wilson, Esq., Hayward's Heath. The finest of the *O. nebulosum pardinum* section. Flowers large and broad in all the parts, white slightly tinged with rose, and profusely spotted with greenish-purple. (Fig. 130.)

FIG. 130.—ODONTOGLOSSUM NEBULOSUM 'GURNEY WILSON.'

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for a splendidly grown plant of *Odontoglossum* × *Wilckeanum Pittiæ*, with sixteen very fine flowers on a spike.

Other Exhibits.

Baron Schröder (gr. Mr. Ballantine) sent spikes of rare Odontoglossums.

Sir Trevor Lawrence, Bart. (gr. Mr. White), showed *Cattleya intermedia Aquinii*.

C. J. Lucas, Esq. (gr. Mr. Duncan), showed Odontoglossums.

H. L. Bischoffsheim, Esq. (gr. Mr. Ellis), sent a fine form of *Lælio-Cattleya* × *bletchleyensis*.

J. Gurney Fowler, Esq. (gr. Mr. Davis), showed *Cattleya* × 'Alfred Fowler' (*granulosa* × *Trianæ*) and the very dark-coloured *Cypripedium* × 'Mary Beatrice,' var. 'Queen of Æthiopia.'

H. Druce, Esq. (gr. Mr. Walker), showed hybrid Cypripediums.

W. Thompson, Esq. (gr. Mr. Stevens), showed *Odontoglossum* × *Vuylstekei*, 'Thompson's variety.'

C. L. N. Ingram, Esq. (gr. Mr. Bond), sent *Lælio-Cattleya* × *splendens*.

Messrs. Hugh Low staged a group.

ORCHID COMMITTEE, MAY 17, 1904.

Mr. VEITCH in the Chair, and twenty-four members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for a group.

To H. S. Goodson, Esq., Fairlawn, Putney Hill (gr. Mr. Day), for Cattleyas and Odontoglossums.

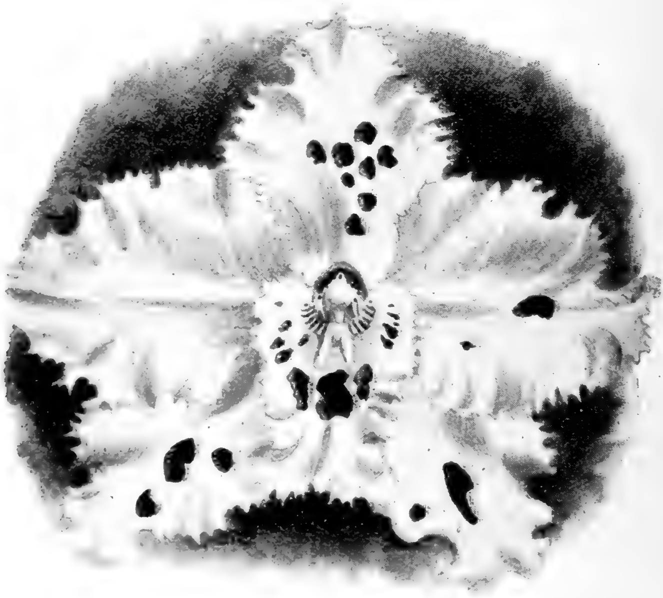


FIG. 131.—ODONTOGLOSSUM CRISPUM 'HAROLD.' (*Journal of Horticulture.*)

Silver Banksian Medal.

To Messrs. Hugh Low, Enfield, for a group.

First-class Certificate.

To *Odontoglossum crispum* 'Harold' (votes, 15 for, 3 against), from Norman Cookson, Esq., Oakwood, Wylam (gr. Mr. Chapman). A fine white flower fringed on all the segments; sepals blotched with brown, the lateral ones exhibiting 'trilabellia,' having a rudimentary yellow crest like the lip; lip spotted with red-brown, an occasional spot being also on the petals. (Fig. 131.)

To *Cymbidium Parishii Sanderæ* (votes, unanimous), from Messrs. Sander, St. Albans. Inflorescence four-flowered; flowers cream-white, the crest of the lip yellow; side lobes streaked, and front lobe heavily blotched with purple. (Fig. 132.)

To *Sobralia Ruckeri* (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. White). Flowers smaller and thicker in texture

FIG. 132.—CYMBIDIUM PARISHII SANDERÆ. (*Gardeners' Chronicle.*)

than *S. macrantha*, deep rose-purple with white throat to the lip. (Fig. 133.)

Award of Merit.

To *Odontoglossum crispum* 'Theodora' (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Stables). A very brightly blotched form, the segments bearing several small and one or two large ruby-purple blotches.

To *Odontoglossum crispum xanthotes*, var. 'Snow Queen' (votes, 15 for, 2 against), from H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood). Flowers pure white, with the orange-coloured markings of the type.

To *Lælia purpurata*, 'Baronshalt variety' (votes, unanimous), from H. Little, Esq., Twickenham (gr. Mr. Howard). Flowers white, with chrome-yellow disc to the lip and pale rose front.

Botanical Certificate.

To *Cypripedium californicum*, from Messrs. Cutbush, Highgate. Flowers on erect leafy stems, the upper part bearing seven flowers with green sepals and petals and white lip.

Other Exhibits.

Francis Wellesley, Esq., Westfield (gr. Mr. Hopkins), showed hybrid Lælias and Lælio-Cattleyas and *Cypripedium* × 'Colossus.'

FIG. 133.—SOBRALIA RUCKERI. (*Journal of Horticulture.*)

Captain Holford, C.I.E., Westonbirt (gr. Mr. Alexander), sent *Odontoglossum* × *Hallio-crispum amabile.*

Sir Trevor Lawrence, Bart. (gr. Mr. White), sent *Odontoglossum crispum xanthotes*, 'Burford variety.'

De B. Crawshay, Esq. (gr. Mr. Stables), showed varieties of *Odontoglossum crispum.*

Norman Cookson, Esq. (gr. Mr. Chapman), showed *Odontoglossum crispum Grairianum.*

C. J. Lucas, Esq. (gr. Mr. Duncan), sent the spotted *Odontoglossum crispum warnhamense.*

C. A. Morris Field, Esq., Sevenoaks (gr. Mr. Edwards), sent a good specimen of *Dendrobium Devonianum.*

ORCHID COMMITTEE, TEMPLE GARDENS, MAY 31, 1904.

Mr. VEITCH in the Chair, and twenty-six members present.

The Cups and Medals awarded by the Council will be found on page xxii.

Awards Recommended :—

First-class Certificate.

To *Odontioda* × *Vuylstekeæ* (*Odontoglossum Pescatorei* × *Cochlioda Noezliana*) (votes, unanimous), from Mr. Chas. Vuylsteke, Loochristy,

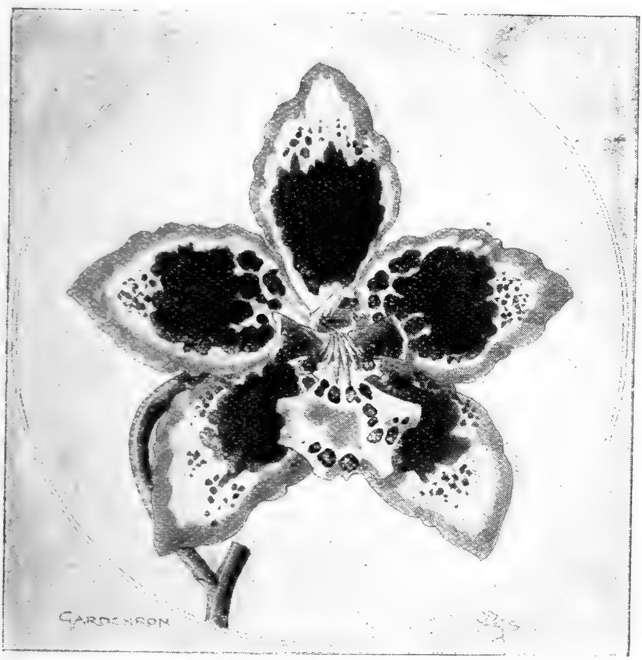


FIG. 134.— × ODONTIODA VUYLSTEKEÆ. (*Gardeners' Chronicle.*)

Ghent. A very remarkable and beautiful bigeneric hybrid. Flowers equal in size to those of *O. Pescatorei* and resembling that species in shape, but with the thicker substance and much of the orange-red colouring of the *Cochlioda*. Sepals and petals broad and flatly displayed; reddish-orange on the inner two thirds, the colour having an irregular banding of white. Margin of sepals and petals rose; lip whitish with yellow crest; side lobes reddish-orange; front lobe spotted with red. (Figs. 134, 135, 136.)

To *Lælio-Cattleya* × *Digbyano-Mossiæ*, 'Westonbirt variety' (*L.*

Digbyana × *C. Mossiæ*) (votes, unanimous), from Captain Holford, C.I.E., Westonbirt (gr. Mr. Alexander). The largest of its class. Flowers clear rosy-lilac with an emerald-green base to the lip, changing to orange towards the centre; lip fringed.

To *Lælio-Cattleya* × 'Fascinator,' 'King Edward' (*L. purpurata* × *C. Schröderæ*) (votes, unanimous), from Messrs. Charlesworth, Bradford.

FIG. 135.—ODONTIODA VUYLSTEKEÆ. (*The Garden.*)

A beautiful blush-white flower with a broad crimped labellum with clear rose colour on each side of the front portion.

To *Lælio-Cattleya* × *Canhamiana,* 'Rosslyn variety' (*L. purpurata* × *C. Mossiæ*) (votes, unanimous), from Messrs. Charlesworth. One of the largest and best Lælio-Cattleyas. Flowers of a bright purplish-rose, the labellum being almost entirely rich claret-crimson.

Award of Merit.

To *Lælio-Cattleya* × *Martineti*, 'Tring Park variety' (*L. tenebrosa* × *C. Mossiæ*) (votes, unanimous), from the Hon. Walter Rothschild, M.P. A fine flower of a bright rosy-crimson, the sepals and petals being the lightest.

To *Lælio-Cattleya* × *Stepmanni* (*L.-C.* × *corbeillensis* × *C. Warscewiczii*) (votes, unanimous), from M. A. Peeters, Brussels. Flowers with light rose-coloured sepals and petals, and with a white tube and crimson front to the lip.

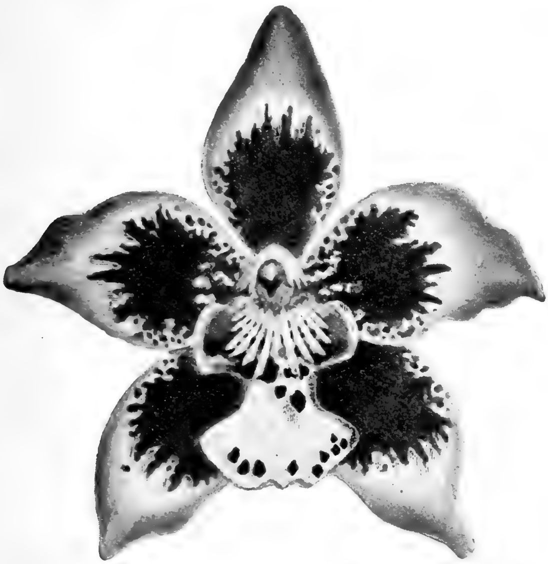


FIG. 136.—ODONTIODA VUYLSTEKEÆ. (*Journal of Horticulture.*)

To *Odontoglossum* × *venustulum* (*Harryano-crispum* × *ardentissimum*) (votes, unanimous), from Mr. Chas. Vuylsteke. Flowers white, tinged with lilac and spotted with purple.

To *Odontoglossum* × *bellatulum concinnum lætum* (*Pescatorei* × *luteo-purpureum sceptrum*) (votes, unanimous), from M. Chas. Vuylsteke. Flowers showing the features of *O. Pescatorei*; white spotted with brown.

Cultural Commendation.

To Mr. Young, Orchid grower to Sir Frederick Wigan, Bart., for a fine specimen of *Cymbidium Devonianum* with six long pendulous racemes of flowers.

ORCHID COMMITTEE, JUNE 14, 1904.

Mr. VEITCH in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Sir Frederick Wigan, Bart., East Sheen (gr. Mr. Young), for a group.

To Messrs. Sander, St. Albans, for hybrids.

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for hybrid Lælio-Cattleyas.

To Messrs. Stanley, Ashton, Southgate, for a group of Cattleyas and Oncidiums.

Silver Banksian Medal.

To Messrs. Hugh Low, for a group.

To Messrs. B. S. Williams, for Cypripediums.

Award of Merit.

To *Lælio-Cattleya* × *Martineti* 'Sunrise' (*L. tenebrosa* × *C. Mossiæ*) (votes, unanimous), from Messrs. Sander. Flowers light purplish-rose with darker veining and a slight bronzy tint on the sepals and petals; lip claret-purple with yellow disc.

Botanical Certificate.

To *Restrepia leopardina rosea*, from the Hon. Walter Rothschild, M.P. (gr. Mr. Dye). A dwarf variety with whitish ground colour; the lower sepals densely spotted with rose, the upper sepal and petals having dark rose lines.

Cultural Commendation.

To Mr. White, gr. to Sir Trevor Lawrence, Bart., for *Cypripedium Stonei platytænium.*

To Mr. White, for a fine branched inflorescence of *Phalænopsis amabilis.*

Other Exhibits.

Sir Trevor Lawrence, Bart. (gr. Mr. White), staged a group of rare Orchids.

H. T. Pitt, Esq. (gr. Mr. Thurgood), showed Lælio-Cattleyas.

De B. Crawshay, Esq. (gr. Mr. Stables), showed *Odontoglossum nebulosum Crawshayanum*; *O. Uro-Skinnerii*, 'Rosefield variety,' and a fine *O. crispum* grown in a glass pot.

The Hon. Walter Rothschild, M.P., sent *Epidendrum confusum.*

Messrs. Keeling, Bradford, showed Odontoglossums and Masdevallias.

Mr. Tracy sent Cattleyas.

R. G. Thwaites, Esq. (gr. Mr. Black), showed a very large form of *Odontoglossum Pescatorei.*

J. Gurney Fowler, Esq. (gr. Mr. Davis), showed *Lælio-Cattleya* × 'Hérode' (*L.-C.* × *elegans* × *C. O'Brieniana*).

ORCHID COMMITTEE, JUNE 28, 1904.

Mr. VEITCH in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To the Hon. Walter Rothschild, M.P., V.M.H. (gr. Mr. Dye), for a very remarkable group of fifty species of Masdevallias and a number of *Pleurothallis.*

To Messrs. Sander, St. Albans, for a group.

Silver Banksian Medal.

To Mrs. Ernest Hills, Penshurst (gr. Mr. Ringham), for *Miltonia vexillaria.*

To Messrs. Jas. Veitch for hybrids.

To. M. Chas. Vuylsteke, Ghent, for hybrid Odontoglossums.

To Messrs. Hugh Low for a group.

Award of Merit.

To *Lælio-Cattleya* × *Dominiana*, 'Tring Park variety' (*L. purpurata* × *C. Dowiana*) (votes, unanimous), from Lord Rothschild (gr. Mr. Dye). Flowers large; sepals and petals light purplish-rose; lip broad, dark, ruby-purple with golden lines at the base.

To *Cattleya Mossiæ alba*, 'Tracy's variety' (votes, 13 for, 3 against), from Mr. Tracy, Twickenham. Flower white with chrome-yellow disc to the lip.

Botanical Certificate.

To *Saccolabium gracile*, from the Hon. Walter Rothschild, M.P. A slender little Ceylon species with a decurved inflorescence of many small white flowers.

To *Cryptophoranthus Lehmanni*, from the Hon. Walter Rothschild, M.P. Allied to *C. Dayanus* but smaller in all its parts. Leaves dark reddish-purple; flowers brownish-claret colour with yellowish markings.

Other Exhibits.

Norman C. Cookson, Esq. (gr. Mr. Chapman), sent *Odontoglossum crispum* 'Britannia' and *Cypripedium* × *vexill-Io.*

Francis Wellesley, Esq., Westfield (gr. Mr. Hopkins), sent *Cattleya Mossiæ* 'Miss Ethelreda Harting.' A fine white flower with light purple markings on the lip.

J. Bradshaw, Esq., Southgate (gr. Mr. Whitelegge), sent *Lycaste tricolor* and its white variety.

C. J. Lucas, Esq., Warnham Court (gr. Mr. Duncan), showed a light form of *Lælio-Cattleya* × *Martineti.*

Messrs. Stanley Ashton, Southgate, showed *Scuticaria Dodgsoni.*

ORCHID COMMITTEE, HOLLAND HOUSE, JULY 12, 1904.

Mr. VEITCH in the Chair, and twenty-two members present.

The Cups and Medals awarded by the Council will be found at p. xxix.

Awards Recommended :—

First-class Certificate.

To *Lælio-Cattleya* × 'Hy. Greenwood' var. 'Imperator' (*L. C.* × *Schilleriana* × *C.* × *Hardyana*) (votes, unanimous), from Messrs Sander, St. Albans. A gigantic form. Sepals and petals white, tinged with rose-purple; front of lip claret-purple.

To *Odontoglossum crispum* 'Oakfield Sunrise' (votes, unanimous), from R. Briggs-Bury, Esq., Accrington (gr. Mr. Wilkinson). The variety received an Award of Merit in 1900. It had now improved, the singularly stalked labelloid petals being now almost entirely chestnut-red with white tips.

To *Cattleya Warscewiczii* 'Frau Melanie Beyrodt' (votes, unanimous), from Mr. Otto Beyrodt, Berlin. Flowers white, with rose-purple front to the lip.

Award of Merit.

To *Cattleya Warscewiczii* 'Rosslyn variety' (votes, unanimous), from H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood). Flowers of a uniform pale pink, the dark colour usually seen on the lip of the species being suppressed.

To *Cattleya* × *triumphans* (*Dowiana aurea* × *Rex*), from Messrs. Sander. A pretty white flower with dark crimson marbling on the front of the lip.

Lælia × *crispo-brosa* (*crispa* × *tenebrosa*) (votes, unanimous), from Messrs. Sander. Flowers pale pink with light purple labellum, veined with dark purple.

Botanical Certificate.

To *Saccolabium longicalcaratum*, from Messrs. Sander. Flowers closely set on an arching inflorescence, pale rose with long, straight, white spurs.

To *Dendrobium bellatulum*, from Messrs Sander. A singular dwarf species of the nigro-hirsute section; flowers ivory-white with red markings on the lip.

Other Exhibits.

Jeremiah Colman, Esq. (gr. Mr. Bound), staged a fine group.

Sir Frederick Wigan, Bart. (gr. Mr. Young), exhibited Sobralias and Cattleyas.

Messrs. Charlesworth, Heaton, Bradford, staged hybrid Orchids.

Messrs. Sander, St. Albans, showed a fine group.

M. Charles Vuylsteke, Loochristy, Ghent, staged hybrid Odontoglossums.

Mr. Otto Beyrodt, Berlin, showed varieties of *Cattleya Warscewiczii.*

M. Jules Hye de Crom, Ghent (gr. Mr. Coen), showed a very large white *Miltonia vexillaria* and *Odontoglossum* × *Rolfeæ*.

NARCISSUS AND TULIP COMMITTEE.

MARCH 8, 1904.

Mr. MAY in the Chair, and eight members present.

Exhibit.

A large double-flowered Jonquil was staged by Messrs. Cutbush, Highgate, under the name of *Narcissus odorus rugulosus plenus*. It was considered identical with the double Campernelle Jonquil.

NARCISSUS AND TULIP COMMITTEE, MARCH 22, 1904.

Mr. MAY in the Chair, and ten members present.

Awards Recommended.

Silver Flora Medal.

To Lady Tate, Streatham (gr. Mr. W. Howe), for Narcissi and Tulips in pots. The varieties were well selected for early flowering, finely cultivated, and pleasingly arranged with Palms and Ferns.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for early Narcissi.

Other Exhibits.

Messrs. Williams, Upper Holloway, exhibited Narcissi and Tulips.

A large vase of magnificent flowers of *Narcissus cyclamineus* was brought from the Society's Garden at Wisley. The flowers were from bulbs that have grown well year after year in a moist situation in peaty soil. The remarkable size of both flowers and stems surprised many growers who were not acquainted with the species as grown under such ideal conditions.

NARCISSUS AND TULIP COMMITTEE, APRIL 5, 1904.

Rev. G. H. ENGLEHEART, V.M.H., in the Chair, and eighteen members present.

Awards Recommended.

Silver Flora Medal.

To Mr. Charles Dawson, Penzance, for a very interesting collection of Daffodils. Some of the finest were 'Weardale Perfection,' 'Flambeau,' 'Redbreast,' 'Blackwell,' 'Albatross,' 'Lucifer,' 'Torchlight,' and 'Homespun.'

To Messrs. Barr, Covent Garden, for Daffodils.

Silver Banksian Medal.

To Miss F. W. Currey, Lismore, Ireland, for Daffodils.
To Messrs. Hogg & Robertson, Dublin, for Daffodils.

Award of Merit.

To Daffodil 'Alert,' from Messrs. Pearson, Lowdham, Notts (votes, 12 for), a very neat and bright 'Ajax' form, a seedling from *Narcissus obvallaris*—the Tenby Daffodil, which it much resembles both in form and colour. It is, however, more robust, and thrives where the Tenby Daffodil is short-lived.

Other Exhibit.

Mr. Jenkins, Hampton Hill, showed 'Golden Crest,' an interesting trumpet Daffodil, heavily crested all round the mouth of the trumpet.

NARCISSUS AND TULIP COMMITTEE, APRIL 19, 1904.

Mr. MAY in the Chair, and twenty-four members present.

Awards Recommended.

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for an exhibit of Daffodils in which 'White Queen,' 'Peter Barr,' 'Hulda,' 'Pyramus,' 'Henri Vilmorin,' and 'Elvira' were conspicuous new varieties.

To Mr. Charles Dawson, Penzance, for a group consisting of the new varieties like 'White Lady,' 'Bullfinch,' 'Penguin,' 'White Pearl,' 'Horace,' and 'White Queen.'

Silver-gilt Banksian Medal.

To Miss F. W. Currey, Lismore, Ireland, for Daffodils.

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for Daffodils.
To Messrs. Pope, King's Norton, for trumpet Daffodils.
To Messrs. Hogg & Robertson, Dublin, for Daffodils.
To Messrs. Bath, Wisbech, for Daffodils.

Silver Banksian Medal.

To Leslie Melville, Esq., Lincoln, for an admirably arranged group of Daffodils.

First-class Certificate.

To Daffodil 'Great Warley' (votes, unanimous), from Miss Willmott, V.M.H., Warley Place, Essex. It has large, substantial, creamy-white perianth segments, and a very fine, rich golden-yellow, broadly bell-shaped crown. It is the finest *incomparabilis* variety yet raised. (Fig. 137.)

Award of Merit.

To Daffodil 'Zenith' (votes, unanimous), from Miss Willmott. A *Burbidgei* variety of great beauty; perianth segments pure white and well filled out; the crown broad and flat, orange, with orange-scarlet rim.

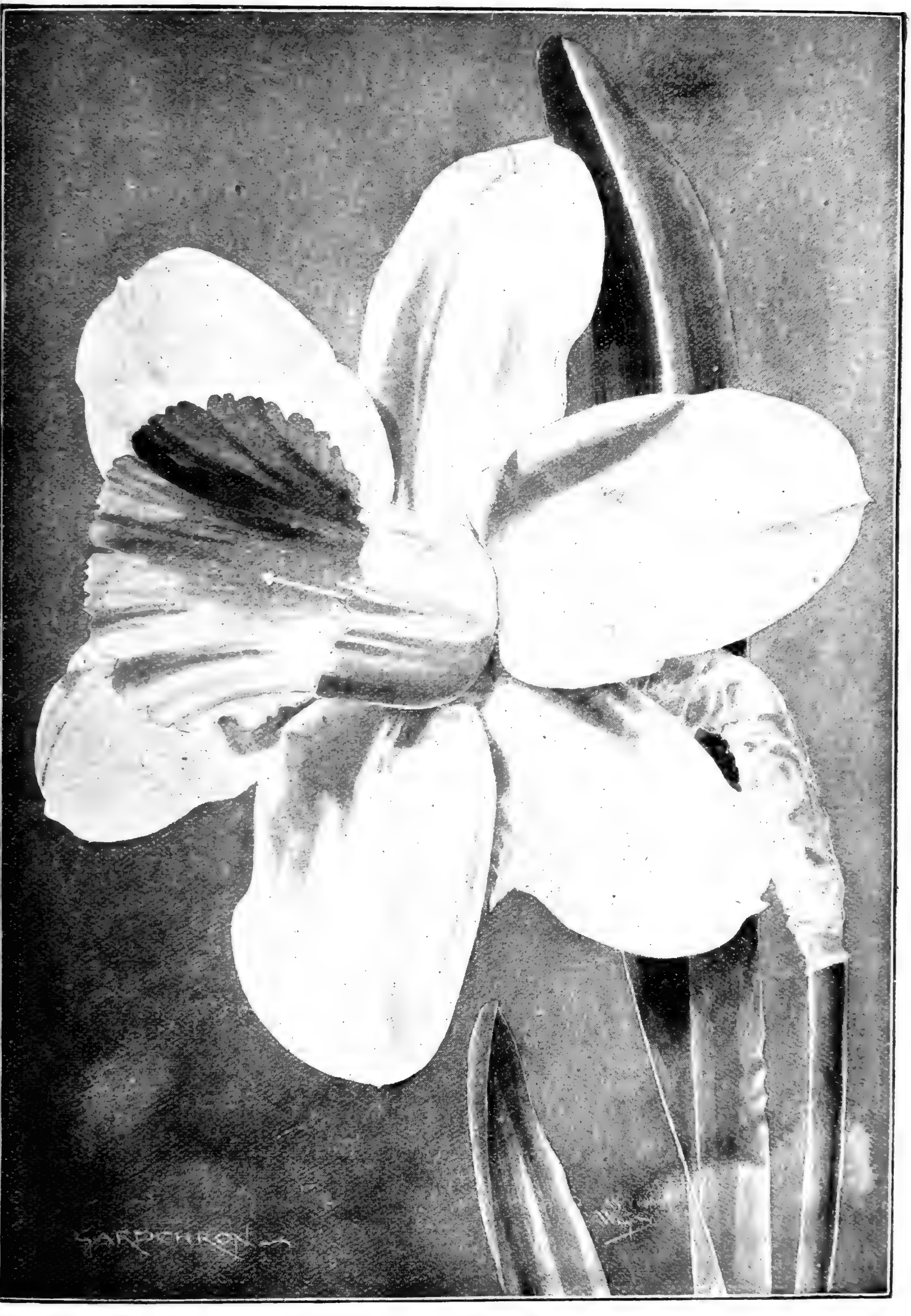


FIG. 137.—NARCISSUS 'GREAT WARLEY.' (*Gardeners' Chronicle.*)

To Daffodil 'Warley Scarlet' (votes, unanimous), from Miss Willmott; a *Burbidgei* variety, belonging to the broad-crowned group. The perianth is creamy-white, and the crinkled crown is orange-scarlet.

To Daffodil 'Henri Vilmorin' (votes, 17 for), from Messrs. Barr, Covent Garden. A medium-sized 'Ajax,' with pale cream-coloured perianth, and a smooth primrose-yellow trumpet.

To Daffodil 'Pyramus' (votes, 15 for), from Messrs. Barr. An 'Ajax' with a large lemon-yellow trumpet and a well-developed ivory-white perianth.

To Daffodil 'Elvira' (votes, 11 for, 4 against), from Messrs. Barr. This is the result of crossing *Narcissus poeticus ornatus* with *N. polyanthus*, and it is a fine garden plant. The fairly large flowers are white, with a golden crown, and borne in good clusters at the apex of very stout stems.

To Daffodil 'Bennett-Poë' (votes, 15 for), from A. Kingsmill, Esq., Harrow Weald. A sulphur-yellow *triandrus* hybrid with large drooping flowers and straight trumpet.

To Daffodil 'Dewdrop' (votes, 12 for, 1 against), from Mrs. Backhouse, Sutton Court, Hereford. A *Leedsii* variety, with a sulphur-coloured crown and finely formed white perianth.

To Daffodil 'Surprise' (votes, 11 for), from Messrs. Pope, King's Norton. A very large bright golden-yellow 'Ajax,' with broad perianth segments and a wide trumpet regularly frilled at the mouth.

To *Tulipa Kaufmanniana coccinea* (votes, 15 for), from Mr. Van Tubergen, jun., Haarlem. A brilliant and handsome Tulip, but somewhat variable. In its best form it is large and has broad segments, but the latter taper rather sharply towards the apex. Vivid orange-scarlet, with green base.

Cultural Commendation.

To Miss Willmott, V.M.H., for some specially fine flowers of *Narcissus cernuus plenus*.

To Mr. Robt. Sydenham, Birmingham, for an interesting exhibit of various Daffodils grown in a mixture of fibre and shell, and in jars without any outlet for water.

Other Exhibits.

The Rev. G. H. Engleheart, V.M.H., Dinton, Wilts, staged a group of new seedlings, all very beautiful and finely grown. 'Will Scarlet,' 'Lancer,' 'Hidalgo,' 'Argent,' and 'Firebrand' were particularly good.

Francis Barchard, Esq., Uckfield, sent new Daffodils.

Messrs. Bull, Chelsea, showed Daffodils.

Mr. James Douglas, V.M.H., Great Bookham, sent a Daffodil under the name of 'Golden Bell,' but the Committee considered it to be 'Glory of Leiden.'

Mr. Van Waveren, Hillegom, Holland, exhibited new trumpet Daffodils.

PRIZES.

Group of Daffodil Blossoms grown entirely outdoors (Polyanthus varieties excluded); must include some of each section, Magni-, Medio-, and Parvi-Coronati; must contain at least 30 varieties distinct, at least three blooms of each must be shown. Not more than nine blooms of any one variety may be put up. To be staged in bottles, vases, or tubes, not exceeding 3 inches in diameter at the top (inside measurement), and all the stems must touch the water. Quality of flower will count more than quantity, and correct naming and tasteful arrangement will be duly considered. Any hardy foliage may be used, Daffodil or otherwise. No prize will be awarded unless there are three competitors at least. Open to amateurs and gentlemen's gardeners only. First Prize, a £7 7*s*. Silver Vase, presented to the Society by Messrs. Barr & Sons. Second Prize, Silver Flora Medal. Third Prize, Silver Banksian Medal.

1. R. H. Danvers, Esq., Charlton (gr. Mr. West).
2. J. A. Nix, Esq., Crawley.
3. H. R. Darlington, Esq., Potter's Bar (gr. Mr. Bignell).

Narcissus and Tulip Committee, May 3, 1904.

Mr. May in the Chair, and twenty-four members present.

Awards Recommended :—

Gold Medal.

To Miss Willmott, V.M.H., Warley Place, Essex, for a group of Daffodils remarkable for the fine development of the flowers and containing the newest varieties splendidly set up, as 'Count Visconti,' 'Countess Grey,' 'White Ensign,' 'Will Scarlet,' 'King Alfred,' 'Cresset,' 'Ada,' 'Betty Berkeley,' 'Elaine,' 'Watchfire,' and 'Oriflamme.' Having regard to the beauty and rarity of the Daffodils, no finer group has ever previously come before the Committee.

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for Tulips and Daffodils, including 'Dorothy E. Wemyss,' 'Weardale Perfection,' 'Ranger Johnson,' 'White Lady,' and 'Duke of Bedford.'

Silver-gilt Banksian Medal.

To Messrs. J. Veitch, Chelsea, for Tulips.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Tulips.

To Messrs. Wallace, Colchester, for Tulips, many being true species.

First-class Certificate.

To Daffodil 'Count Visconti' (votes, 14 for, 5 against), from Miss Willmott. A beautiful *triandrus* hybrid, one of the finest of its section, with bright yellow trumpet and soft pale yellow perianth.

Award of Merit.

To Daffodil 'Flag of Truce' (votes, unanimous), from Miss Willmott. A distinct white *triandrus* hybrid, with a straight medium-sized trumpet. The flowers droop in a most graceful manner.

To Daffodil 'White Ensign' (votes, unanimous), from Miss Willmott.

A splendid *poeticus* variety, of fine shape, size, and substance. The perianth is pure white, and the crinkled crown is citron-yellow. (Fig. 138.)

To Tulip 'Inglescombe Pink' (votes, unanimous), from Messrs. Walter Ware, Inglescombe, Bath. A strong grower, carrying its large bright pink rose-flushed flowers sturdily on tall stems.

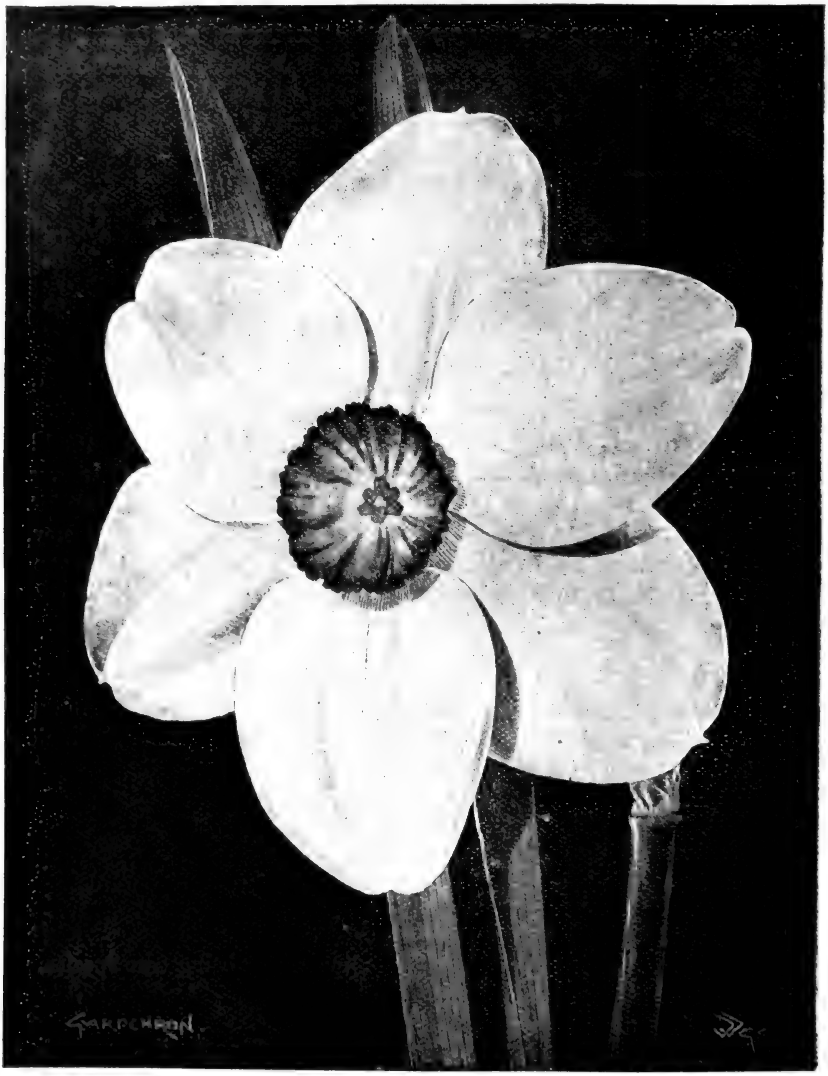


FIG. 138.—NARCISSUS 'WHITE ENSIGN.' (*Gardeners' Chronicle.*)

To Tulip 'De Wet' (votes, 16 for, 2 against), from Messrs. Jas. Veitch. A bold globular flower; old gold colour, shaded with orange.

To Tulip 'Sir Thomas Lipton' (votes, unanimous), from Messrs. Jas. Veitch. A very large flower, rich crimson-scarlet, with a satiny sheen.

To Tulip 'Moucheron' (votes, unanimous), from Messrs. Bath. A big globular deep vivid crimson flower, the segments slightly reflexed at the tips.

Other Exhibits.

Norman C. Cookson, Esq., Wylam-on-Tyne, sent a flower of Daffodil 'Oakwoodiensis,' the result of crossing 'Victoria' with *Narcissus moschatus*.

Mr. Reuthe, Keston, staged Daffodils.

Messrs. Hogg & Robertson, Dublin, sent Tulips.

Mr. P. R. Barr proposed "That a subcommittee be appointed to inquire into the placing, under our present classification, of the new forms of Daffodils now being raised." This was seconded by Mr. Robt. Sydenham, and, after a brief discussion, was carried. Seven members were elected to serve, viz:—Miss Willmott, V.M.H., Rev. G. H. Engleheart, V.M.H., Rev. Eugene Bourne, Messrs. P. R. Barr, F. W. Burbidge, V.M.H., J. T. Bennett-Poë, V.M.H., and J. D. Pearson.

NARCISSUS AND TULIP COMMITTEE, MAY 17, 1904.

Mr. MAY in the Chair, and twelve members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Bath, Wisbech, for a grand display of Tulips.

Silver-gilt Banksian Medal.

To Messrs. Wallace, Colchester, for a group of Tulips, including 'Scarlet Emperor,' 'Inglescombe Pink,' 'Flame' and 'Kathleen.'

Silver Flora Medal.

To Messrs. Dickson, Newtownards, Ireland, for Tulips.

To Messrs. Barr, Covent Garden, for Tulips.

To Messrs. Hogg & Robertson, Dublin, for Tulips.

Silver Banksian Medal.

To Mrs. Benson (gr. Mr. Philpott), Withyham, Sussex, for Darwin Tulips.

To Messrs. Jas. Veitch, Chelsea, for Tulips.

First-class Certificate.

To Tulip 'Scarlet Emperor' (votes, unanimous), from Messrs. Walter Ware, Inglescombe, Bath. A magnificent Tulip, producing its bright scarlet yellow-based flowers on long stout stems.

Award of Merit.

To Tulip 'Suzon' (votes, 4 for, 2 against), from Messrs. W. Ware. A stout-stemmed Darwin variety with substantial flowers; flesh pink, with a bluish-white edged base.

To Tulip 'Cygnet' (votes 6 for, 1 against), from Messrs. Barr, Covent Garden. A good late Cottage variety, white, with prominent black anthers.

To Tulip 'Margaret' (votes, unanimous), from Messrs. Barr. A deep blush-coloured Darwin variety, with rosy interior; flowers globular and very substantial.

To Tulip 'Clara Butt' (votes, unanimous), from Messrs. Barr. Another good Darwin Tulip, with rounded blooms of a salmon-rose shade, flushed with silvery-blush.

To Tulip 'Mrs. Farnecombe Saunders' (votes, unanimous), from Messrs. Barr. A most effective tulip, rich crimson, with a white base.

To Tulip 'Kathleen' (votes, unanimous), from Messrs. Wallace, Colchester. An elegant variety, with sulphur-yellow elongated flowers.

To Tulip 'Flame' (votes, 10 for), from Messrs. Wallace. A bold and showy Tulip, deep crimson-scarlet, feathered and shaded with orange.

To Tulip 'John Ruskin' (votes, 10 for), from Mr. W. B. Hartland, Cork. Elongated flowers with pointed segments of a pleasing combination of salmon and pink, with flames of rose, and yellow margins.

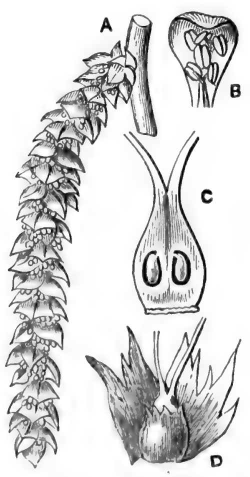
To *Tulipa globosa grandiflora* (votes, 9 for), from Mr. W. B. Hartland. The Committee took exception to this name for a garden variety, but it was allowed to pass because of prior publication. The variety belongs to the *maculata* group, and has elongated flowers of a rich dark crimson colour, with heavy brown blotches on the green base.

To *Tulipa Tubergeniana* (votes, unanimous), from Mr. C. G. Van Tubergen, jun., Haarlem. A new large-flowered species from Bokhara. It has broad but sharply pointed segments which are deep bright scarlet, and pale green at the base.

Other Exhibits.

A. H. T. de Montmorency, Esq., Carrickmines, Dublin, sent Old English Florists' Tulips, brilliantly flamed and feathered.

Mr. W. B. Hartland, Cork, sent a collection of very fine Tulips. The flowers had suffered little during their long journey, but, as they did not arrive until the Committee had almost finished its labours, there was small space or opportunity for displaying them to full advantage.



[*This Form can be easily detached for use.*]

THE ROYAL HORTICULTURAL SOCIETY.

Established A.D. 1804. Incorporated A.D. 1809.

VINCENT SQUARE, WESTMINSTER, S.W.

Telegrams: "HORTENSIA, LONDON." Telephone No.: 5363, Westminster.

Form of Recommendation for a FELLOW of the ROYAL HORTICULTURAL SOCIETY.

Name ....

Description ....

Address ....

....

being desirous of becoming a FELLOW of the ROYAL HORTICULTURAL SOCIETY, we whose Names are underwritten beg leave to recommend him (her) to that honour; he is desirous of subscribing * .... Guineas a year.

Proposed by ....

Seconded by ....

* Kindly enter here the word *four* or *two* or *one*.

It would be a convenience if the Candidate's Card were sent at the same time.

Signed on behalf of the Council, this .... day of .... 190.....

.... CHAIRMAN.

[P.T.O.

THE ROYAL HORTICULTURAL SOCIETY.

Privileges of Fellows.

1.—Anyone interested in Horticulture is eligible for election, and is invited to become a Fellow.

2.—Candidates for election are proposed by two Fellows of the Society.

3.—Ladies are eligible for election as Fellows of the Society.

4.—The Society being incorporated by Royal Charter, the Fellows incur no personal liability whatsoever beyond the payment of their annual subscriptions.

5.—Forms for proposing new Fellows may be obtained from the Offices of the Society, Vincent Square, Westminster, S.W.

6.—If desired, the Secretary will, on receipt of a letter from a Fellow of the Society suggesting the name and address of any lady or gentleman likely to become Fellows, write and invite them to join the Society.

FELLOWS.

A Fellow subscribing Four Guineas a year (or commuting for Forty Guineas) is entitled—

1.—To ONE Non-transferable (personal) Pass and FIVE Transferable Tickets admitting to all the Society's Exhibitions, and to the Gardens.

N.B.—Each Transferable Ticket or Non-transferable personal Pass will admit three persons to the Gardens at Wisley on any day *except* days on which an Exhibition or Meeting is being held, when each Ticket or Pass will admit One Person only. The Gardens are closed on Sundays, Good Friday, and Christmas Day.

2.—To attend and vote at all Meetings of the Society.

3.—To the use of the Libraries at the Society's Rooms.

4.—To a copy of the Society's JOURNAL, containing the Papers read at all Meetings and Conferences, Reports of trials made at the Gardens, and descriptions and illustrations of new or rare plants, &c.

5.—To purchase, at reduced rates, such fruit, vegetables, and cut flowers as are not required for experimental purposes.

6.—To a share (in proportion to the annual subscription) of such surplus or waste plants as may be available for distribution. Fellows residing beyond a radius of 35 miles from London (by the A B C Railway Guide) are entitled to a double share.

7.—Subject to certain limitations, to obtain Analysis of Manures, Soils, &c., or advice on such subjects, by letter from the Society's Consulting Chemist, Dr. J. A. Voelcker, M.A., F.I.C.

8.—To have their Gardens inspected by the Society's Officer at the following fees:—One day, £2. 2*s.*; two days, £3. 3*s.*; *plus* all out of pocket expenses.

9.—To exhibit at all Shows and Meetings, and to send seeds, plants, &c., for trial at the Society's Gardens.

10.—To recommend any ladies or gentlemen for election as Fellows of the Society.

A Fellow subscribing Two Guineas a year (or commuting for Twenty-five Guineas) is entitled—

1.—To ONE Non-transferable Pass and Two Transferable Tickets, and to all the other privileges mentioned in Nos. 2 to 10 above.

2.—To the same privileges as mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.

A Fellow subscribing One Guinea a year, with an Entrance Fee of £1. 1s. (or commuting for Fifteen Guineas), is entitled—

1.—To ONE Transferable Ticket (in lieu of the non-transferable personal Pass), and the privileges mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.

[*Bonâ fide* Gardeners earning their living thereby, and persons living permanently abroad, are exempt from the payment of the Entrance Fee.]

ASSOCIATES.

An Associate subscribing 10s. 6d. a year is entitled—

1.—To ONE Non-transferable Pass, and to privileges as mentioned in Nos. 3, 4, and 9.

N.B.—Associates must be *bonâ fide* Gardeners, or employees in a Nursery, Private or Market Garden, or Seed Establishment, and must be recommended for election by Two Fellows of the Society.

Local Horticultural and Cottage Garden Societies may be Affiliated to the Royal Horticultural Society, particulars as to which may be had on application.

PRIVILEGES OF CHEMICAL ANALYSIS.

(Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.)

THE Council have fixed the following rates of charges for Chemical Analysis to Fellows of the Society being *bonâ fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bonâ fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners, when forwarding samples, are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made.

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s.* 6*d.*
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s.*
3.	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s.*
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s.*
7.	Determination of potash in potash salts, compound manures, &c.	7*s.* 6*d.*
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s.* to £1
9.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s.*
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
14.	Analysis of water of land-drainage, and of water used for irrigation	£1
15.	Analysis of water used for domestic purposes	£1 10*s.*
16.	Consultation by letter	5*s.*

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. AUGUSTUS VOELCKER, 22 Tudor Street, New Bridge Street, London, E.C.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

Instructions for selecting, drawing, and sending samples for analysis will be found on pages 10–16 of "Arrangements, 1905," or can be obtained on application to the Society's Office, Vincent Square, S.W.

ESTABLISHED 1804.

INCORPORATED 1809.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

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1. NOTICES TO FELLOWS.

A page or so of Notices to Fellows is always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number **5363, Westminster.**

"**HORTENSIA, LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be very greatly obliged for any of the following back numbers:—Vol. V., Part 1; Vol. VII., Part 2; Vol. X.; Vol. XIII., Part 1; Vol. XVI., Parts 2 and 3; Vol. XVII., Parts 1 and 2; Vol. XVII., Parts 3 and 4; Vol. XIX., Part 1; Vol. XIX., Part 2; Vol. XX., Part 3; Vol. XXII., Part 3; Vol. XXII., Part 4; Vol. XXV., Part 3; Vol. XXVI., Part 4; Vol. XXVII., Part 4; and Vol. XXVIII., Parts 3 and 4.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1 of each year. To avoid the inconvenience of remembering this, 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. 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.

Fellows who have not already given an order on their bankers for the payment of their subscriptions each year as they fall due, are earnestly invited to do so, as this method of payment is greatly preferred by the bankers on both sides, and saves both the Fellows and the Society considerable trouble. Forms for the purpose may be obtained from the R.H.S. Offices at Vincent Square, Westminster, S.W.

6. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at p. cxvii above, and fuller ones at page 10 in the "Book of Arrangements" for 1905.

7. LIST OF FELLOWS.

A list of all the Fellows of the Society was sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Another use which all Fellows might make of this list is to consult it with reference to their friends' names, and if any of them are not found recorded therein they might endeavour to enlist their sympathies with the Society, and obtain their consent to propose them as Fellows forthwith. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL and the "Book of Arrangements," each year. (See p. cxv above.)

8. NEW FELLOWS.

On March 6 next the Society completes its centennial year, and before that day arrives will all the Fellows do their best to extend the usefulness of the Society, by enlisting the sympathy of all their friends and persuading them to join the ranks of the Society? A list of the privileges of Fellows will be found in the "Book of Arrangements" 1905, and just a line addressed to the Secretary, R.H.S., Vincent Square, Westminster, containing the name and address of the proposed new Fellow, will suffice. Should it be preferred, the Secretary will, upon receipt of a postcard or letter giving the name and address of any persons likely to join the Society, write direct and invite them to allow their names to be proposed for election.

9. AN APPEAL.

What has been accomplished for the Society since 1887 (see page 247) is largely due to the unwearied assistance afforded by a small proportion of the Fellows, but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially in

1. Increasing the number of Fellows;
2. Extinguishing the debt on the Hall, £10,000;
3. Providing a properly equipped Horticultural Research Station at the Wisley Garden.

Plants are wanted at Wisley, and books are required to fill the gaps in the Library. A suitable clock is required for the Council Room, and a microscope for the use of the Scientific Committee. Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, clock, and microscope are all alike needed. The Secretary, therefore, asks those who read these lines to do their best to help in any of the manners above indicated.

10. THE SOCIETY'S GARDEN AT WISLEY.

The Garden is open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 a.m. till sunset, except on Sundays, Good Friday, and Christmas Day. Each Fellow's ticket admits three to the Garden. The public are not admitted. There is much of interest to be seen at Wisley throughout the year. The late Mr. G. F. Wilson's garden included a wild wood-garden, a bank of flowering shrubs, a series of ponds and pools, and a fine collection of Japanese Iris, Primulas, Lilies, Rhododendrons, &c. The Society has added, during 1904, a fine collection of the best varieties of hardy fruit trees and bushes, kindly given by the leading fruit-tree nurserymen. A very large sum of money has also been spent in the erection of a capital series of glass-houses; of a dwelling-house for the Superintendent; a cottage for the Fruit Foreman; and in establishing a complete system of water supply and drainage works, and in road-making.

The Gardens are situated about 2 miles from Ripley; and about 3½ miles from Horsley and 5½ miles from Weybridge, both stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge 10*s*., or to and from Horsley 7*s*. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Garden.

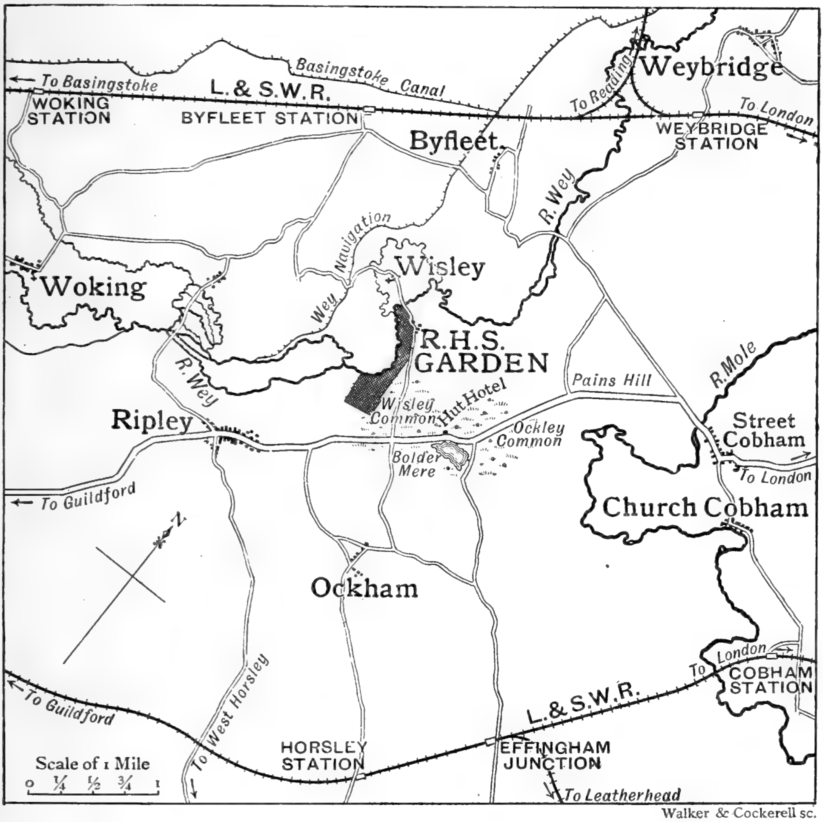


FIG 139.—POSITION OF THE SOCIETY'S GARDEN.

A magnificent collection of rare trees and shrubs has been received from the Royal Gardens, Kew, by the kindness of the Director, Sir William Thiselton-Dyer, K.C.M.G., F.R.S.

It is pleasant to draw the attention of Fellows to this evidence of the kindly feeling of the Royal Gardens towards the Society, as also to that of the principal members of the Horticultural Trade. Very large donations of fruit trees and bushes, and of ornamental and flowering trees and shrubs, for the New Garden at Wisley have recently been received from

Messrs. Geo. Bunyard & Co. Ltd., Maidstone.

Messrs. T. Cripps & Son, Tunbridge Wells.

Messrs. Dicksons, Ltd., Chester.

Mr. John Fraser, South Woodford, Essex.

Messrs. G. Jackman & Son, Woking.

Messrs. H. Lane & Son, Berkhamsted, Herts.

Messrs. Hugh Low & Co., Bush Hill, Enfield.

Mr. R. C. Notcutt, Woodbridge, Suffolk.

Messrs. Paul & Son, Cheshunt, Herts.

Messrs. J. R. Pearson & Sons, Lowdham, Notts.

Messrs. Thomas Rivers & Son, Sawbridgeworth.

Messrs. R. Smith & Co., Worcester.
Messrs. W. Spooner & Sons, Hounslow.
Mr. Anthony Waterer, Knap Hill, Woking.
Messrs. J. Waterer & Sons, Ltd., Bagshot.
Messrs. James Veitch & Sons, Ltd., King's Road, Chelsea.

11. DISTRIBUTION OF PLANTS.

Fellows are particularly requested to note that a list to choose from of all the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." The ballot for order of being served will be made on March 1, and the distribution proceeded with as quickly as possible. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next distribution. The work of the Gardens cannot be disorganised by the sending out of plants at any later time in the year. All Fellows can participate in the Annual Distribution *following* their election.

With regard to the distribution, Fellows are particularly requested to remember, in justice to the Superintendent of the Gardens, the great disability under which he is labouring this year. The Gardens at Chiswick were closed in May, and although one foreman was installed at Wisley in June, the Superintendent could not himself get into his house there till December. Fellows who have any idea of the labour and anxiety of propagating plants by the thousand will make due allowance for this.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

12. POPPY SEED.

The Secretary will be pleased to send a packet of his 1904 crop of Shirley Poppy Seed to any Fellows who like to send to Rev. W. Wilks, Shirley Vicarage, Croydon, a stamped envelope ready addressed to themselves. The seed should be sown as early as possible in March. This is an offer made by the Secretary in his private capacity, and it causes much inconvenience when requests for seed are mixed up with letters sent to the office in London, instead of as above directed. One thousand five hundred packets were given away last year. This year the crop of seed is smaller, and only about 1,000 will be available.

13. THE FINANCIAL POSITION.

Although the Society may be considered to be in a satisfactory position financially, it must not be forgotten that there is a debt of over £10,000 on the Hall Building Fund. We have now 8,250 names on our books, but only 1,300 have given any donation. If every Fellow who could, would double his subscription for two years, the desire of long decades would at last be accomplished and complete. Every Fellow, every

Exhibitor, and every visitor benefits by the improved accommodation for the shows and lectures, and we therefore appeal to all who read this statement to help to wipe out the remaining sum of £10,000, so that before the end of the year the Hall may really belong altogether to the Society, which it cannot be said to do until it is entirely paid for. Small sums from those who can only afford small sums will be gratefully acknowledged by the Treasurer, R.H.S. Offices, Vincent Square, Westminster. Cheques should be made payable to The Treasurer, R.H.S., and be crossed "London & County Bank."

Until this amount is paid, the Council will be trammelled in their work, and unable to extend it in any direction. The expenses of the rent, rates and taxes, upkeep and general expenditure on the new building, including interest on the loan, will be at least £2,000 more than the similar expenses at the old Hall and Offices. And this heavy extra charge on our income shows the impossibility of reducing our little invested capital, as our income would at once shrink in proportion; and the amount to be derived from letting the New Hall will not be large until the building becomes better known, and its great and manifold advantages are fully realised, but in years to come we trust that the cost to the Society will be materially lessened by the rents receivable from letting.

14. THE SOCIETY'S NEW HOME.

The Royal Horticultural Hall is now occupied by the Society for its Shows, Meetings, Library, and Offices. Vincent Square lies straight through Ashley Gardens from Victoria Street, Westminster, and is about

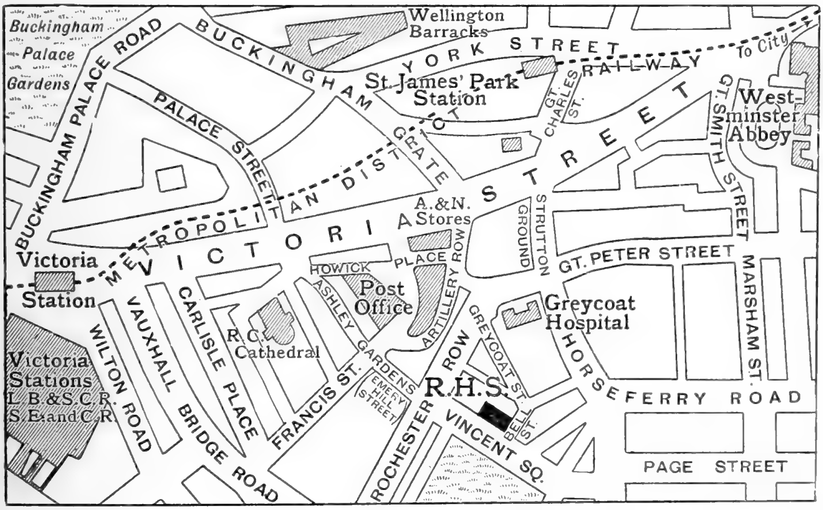


FIG. 140.—POSITION OF THE SOCIETY'S HALL.

five minutes walk from the Victoria and St. James's Park Stations. The accommodation for the Shows is double what it was in the old Drill Hall. The Lectures are delivered in a room specially equipped and devoted to that purpose, and the Library is now housed in a manner worthy of the unique and valuable collection of books which it contains, and as the shelf accommodation is at least double what it was in Victoria Street the Council hope that all Fellows will send such horticultural and botanical books as they can spare from their own shelves, as well as any articles and papers they may themselves publish on such subjects.

15. LETTING OF HALL.

Fellows are earnestly requested to make known among their friends and among other institutions that the Royal Horticultural Hall is available, twelve days in each fortnight, for Meetings, Shows, Exhibitions, Concerts, Conferences, Lectures, Balls, Banquets, Bazaars, Receptions, and other similar purposes. The Hall has a floor surface of 13,000 feet super. It is cool in summer and warm in winter. For a Concert it will seat 1,500, or for a public meeting 2,000. It is undoubtedly the lightest Hall in London, and its acoustic properties have been pronounced perfect by some of our greatest authorities. The charges, which are very moderate, include lighting, warming in winter or cooling of the air in summer, seating, and use of trestle-tabling and platform. The first floor, consisting of four fine rooms, may also be hired for similar purposes, either together with or separately from the Great Hall. This accommodation can also be divided up if desired. Ample cloak rooms for ladies and for gentlemen are available. In fact, the Hall is not only the most suitable Hall in London for similar shows of a high-class character, but it is also second only to the Queen's Hall and the Royal Albert Hall for the purposes of Concerts and Meetings. Reduction is made to Charities, and also to Societies kindred or allied to horticulture. The regulations and charges for hiring the Hall are printed in the "Arrangements" for 1905 (p. 45), and full particulars may be obtained on application to the Secretary, R.H.S., Vincent Square, Westminster, S.W., with whom also dates may be booked.

16. EXHIBITIONS, MEETINGS, AND LECTURES IN 1905.

A full programme for 1905 will be found on page 8 in the "Book of Arrangements" for 1905. It will be noticed that an Exhibition and Meeting is held in the Royal Horticultural Hall practically every fortnight throughout the year, and a short lecture on some interesting subject connected with horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, Westminster, S.W., a sufficient number (26) of halfpenny cards *ready addressed* to himself.

The following are the dates fixed for 1905–6 :—1905—January 3, 24 ; February 14 (Annual Meeting), 28 ; March 14, 28 ; 30, and 31 (Colonial Fruit and Vegetable Show) ; April 11, 25 (National Auricula and Primula Society's Show ; Daffodils) ; May 9, 23 (National Tulip Society's Show) ; May 30 and 31, June 1 (Temple Show) ; June 20 ; July 4 (National Sweet Pea Society's Show) ; July 11, 12, 13 (Summer Show in the grounds of Chelsea Hospital); July 18 (National Carnation and Picotee Society's Show); August 1, 15, 29; September 12; September 26, 27 (Autumn Rose Show); October 10, 11, and 12 (British Fruit Show); October 24 (Vegetable Show); November 7, 21; December 5, 19. 1906—January 9 and 23. Excepting the Temple Show and the Chelsea Hospital Show, all the above Shows will be held in the Royal Horticultural Hall, Vincent Square, Westminster.

17. THE TEMPLE SHOW.

The eighteenth great annual Flower Show in the Inner Temple Gardens, Thames Embankment, will be held, by the kind permission of the Treasurer and Benchers of the Inner Temple, on Tuesday, Wednesday, and Thursday, May 30 and 31, and June 1.

As on previous occasions, a large number of Silver Cups and Medals will be awarded according to merit. The VEITCHIAN CUP, value 55 guineas, will also be awarded on this occasion (see "Arrangements, 1905," p. 62).

Fellows of the Society are admitted free on showing their tickets. N.B.—Each Personal Pass is strictly non-transferable and will only admit the Fellow to whom it belongs, but no one else. Fellows' *Transferable Tickets* are available for themselves or a friend. The general public are admitted by purchased tickets:—On Tuesday, May 30, from 12.30 to 7 p.m., 7*s.* 6*d.* On Wednesday, from 9 a.m. to 7 p.m., 2*s.* 6*d.* On Thursday, from 9 a.m. to 6 p.m., 1*s.*

To avoid the inconvenience of crowding, tickets may be obtained beforehand at the Society's Offices, Vincent Square, Westminster, S.W. The Offices at Westminster will be closed on the days of the Show, and consequently no letters should be addressed there on the previous day.

On the days of the Show, tickets will only be on sale near the entrance to the Gardens (Thames Embankment Gate).

Members of Affiliated Societies, and *bona-fide* Gardeners, may obtain 2*s.* 6*d.* tickets for 1*s.*, which will admit them to the exhibition on Wednesday. Members of Affiliated Societies *must* apply *only through the Secretary of their own Society* if they wish to take advantage of this privilege. These tickets *can only be obtained* on or before May 27 *from the Society's Office,* Vincent Square, Westminster, S.W., and a large stamped and directed envelope must be sent with Postal Order in every case.

18. CHELSEA HOSPITAL SHOW.

As it was not possible to hold a Show this year at Holland House, the Council have arranged to hold a three days Summer Show in the grounds of Chelsea (Soldiers') Hospital, by the kind permission of the Lords Commissioners. This Show will be open to Fellows at 12.30, noon, on Tuesday, July 11, and the arrangements, with exception of dates, will be exactly similar to those about the Temple Show above mentioned. The Fellows' Tickets do not contain any reference to this Show, as at the time of printing them the matter was only in the first stage of negotiation. The Council congratulate the Fellows on having obtained permission to use this site, which is ample for all the Society's requirements, and is most centrally situated. Fellows are requested to make it widely known so that it may prove a success financially as it is certain to do horticulturally.

19. BRITISH FRUIT SHOW.

The Great Autumn Show of British-grown Hardy Fruits, which the Society has held for so many years past, has become as much a thing to be regularly looked for by fruit-growers as the Show at the Temple in May is looked for by growers of flowers.

The twelfth of these Shows will be held on October 10, 11, and 12, in the Society's Hall, and, being in the very heart of London, should prove very attractive to the public.

It is calculated that such a Show cannot be held under an expenditure of £350. If, therefore, the Show is to take place, it will be necessary for all who are interested (and who is not ?) in the encouragement of the growth of good fruits *within* the United Kingdom, instead of depending so much on external foreign supplies, to combine in raising a sum of at least half the amount of money required.

Cheques and Postal Orders should be made payable to the Secretary, and crossed "London & County Bank."

On Tuesday, October 10, there will be a Conference on the Importation of Foreign Fruit, and what should be the policy of English Fruit Growers regarding it, the subject being introduced by Mr. George Bunyard, V.M.H., and Mr. Joseph Cheal.

20. VEGETABLE SHOW.

On October 24 there will be a Vegetable Show, with a lecture on the Potato by Mr. Walter P. Wright, the Honorary Secretary of the Potato Society.

The Schedules for the Chelsea Show, for the Autumn Rose Show, and for the Fruit and Vegetable Shows will be issued at the beginning of April.

On Thursday and Friday, March 30 and 31, there will be a special Exhibition in the Hall of Colonial-grown Fruit and Vegetables, both fresh and preserved, especially of that grown in South Africa.

21. SHOWS IN CONJUNCTION WITH R.H.S. IN 1905.

The following Special Societies will hold their Annual Shows in connection with the Exhibitions of the Society on the dates mentioned:

April 25.—National Auricula and Primula Society.

May 23.—National Tulip Society (Southern Section).

July 4.—National Sweet Pea Society.

July 18.—National Carnation and Picotee Society.

Copies of the Schedules for these Shows may be obtained from the Honorary Secretary of each Society, or from the Offices of the R.H.S., Vincent Square, Westminster, S.W.

22. LECTURES.

The new Lecture Room is fitted with an electric lantern of the most modern construction; electric current, gas, and water are laid on, and every provision has been made for the due illustration and delivery of Lectures.

Any Fellows willing to Lecture, or to communicate Papers on interesting subjects, are requested to communicate with the Secretary.

23. EXAMINATIONS.

1. The Society's Annual Examination in the Principles and Practice of Horticulture will be held on Wednesday, April 12, 1905. Candidates should send in their names not later than March 1. Full particulars may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1904 (price 1*s.* 6*d.*, or 7*s.* 6*d.* a dozen) may also be obtained from the office. The Society is willing to hold an examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

2. The Society will also hold the second Examination in Cottage Gardening on Wednesday, April 5, 1905. This examination is intended for, and is confined to, Elementary and Technical School Teachers. It has been undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test whatever of such competence. The general conduct of this examination will be on similar lines to that of the more general examination.

24. INFORMATION.

Fellows may obtain information and advice free of charge from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid 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.

25. AFFILIATED SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of all local Horticultural, Floral, and Gardening Societies by a scheme of affiliation to the R.H.S. Since this was initiated, no less than 179 Societies have joined our ranks, and that number is steadily increasing.

Secretaries of Affiliated Societies can now obtain on application a specimen copy of a new Card which the Council have prepared for the use of Affiliated Societies wishing to have a Card for Certificates, Commendations, &c. It can be used for Fruit or Flowers or Vegetables, and is printed in two colours—art shades of deep blue and green. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

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, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case, complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the medal if ordered—price 6*d.* each.

26. 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. An Index to the Advertisements will be found on page 34.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

July 26, 1904.

Mr. J. Gurney Fowler in the Chair.

Fellows elected (115).—Mrs. J. T. Alderson, F. R. Allen, E. Amsden, Mrs. A. W. Anstruther, A. Ashworth, Rev. J. Mason Austen, Viscount Baring, P. Barnett, W. A. Bell, George Bentley, H. E. L. Bolton, Amar N. Bose (Bengal), R. Bowton, Mrs. Bucknill, Mrs. C. Bulkeley, P. F. Bunyard, Mrs. Burd, Miss Ada Burnand, Mrs. E. Chapman, Mrs. R. H. Cholmondeley, Lady Collins, Mrs. G. Cooper, Lady Corbet, A. W. Crichton, Laurence Currie, Miss E. Dalton, Mrs. E. Davies, Clement F. Davis, Mrs. V. De Michele, Miss Du Buisson, Lady Dunglas, Henry C. Durnford, The Hon. Mrs. Elliot, Mrs. W. Forbes, Sir William B. Forwood, Mrs. Goddard, Rev. J. M. Gordon, The Countess of Gosford, D. C. Haldeman, L. E. Halsey, William Hardy, Mrs. M. L. Hardy, T. J. Hare, Mrs. C. B. Harvey, Miss J. Haynes, Mrs. A. Hoare, J. Merrick Head, Mrs. Arthur Heath, Mrs. J. Hopkinson, The Lady Knightley of Fawsley, F. T. Langley, Col. The Hon. H. Legge, Joseph Leigh, Capt. E. Lewis, Isaac Lewis, Gerald W. E. Loder, E. G. B. Meade-Waldo, A. W. Molineux, Sir Samuel Montagu, Bart., Mrs. M. Mountain, H. W. Moy, Vice-Admiral Sir George S. Nares, George G. Neilson, Miss E. M. Nicholl, C. N. Nicholson, R. M. B. Otter-Barry, Mrs. Pakenham, Mrs G. Parkin, Mrs. G. S. Payne, Rev. Richard Perkes, His Grace the Duke of Portland, Her Grace the Duchess of Portland, Mrs. Preston, Francis Reckitt, Mrs. Richardson, Henry N. Ridley (Singapore), Countess Russell, F. R. Saunders, Mrs. Gwillum Scott, Sir Charles Seely, J. Shepherd, F. A. Sherras, Arthur Simonds, F. W. Slade, John E. Slade, B. H. Smith, W. Smith, Miss N. Spence, Harry Spreckley, F. B. Steel, Mrs. R. Steel, Sir Condie Stephen, K.C.V.O., Mrs. F. A. Stevens, Mrs. Stratton, Dowager Duchess of Sutherland, James A. Tawell, Miss Tennant, Miss B. Thomas, Mrs. G. W. Thompson, J. W. Toller, Mrs. H. R. Trafford, L. A. Trapman, Henry S. Trower, T. Trussler, Mrs. J. M. Tulloch, A. Turner, Mrs. G. G. Vertue, John F. Waby, F.L.S. (British Guiana), Miss G. E. Waller, R. Wallis, W. Wallis, Daniel Weelby, Mrs. Wilbraham, E. Wiseman, William Wright.

Associates (2).—G. N. Shull, Ph.D. (U.S.A.), H. White.

Society affiliated (1).—Woking Horticultural Society.

A lecture on "Orchid Varieties and Hybrids" (illustrated by lantern slides) was given by Mr. John Bidgood, B.Sc., F.L.S.

GENERAL MEETING.

August 9, 1904.

Mr. Harry J. Veitch, F.L.S., in the Chair.

Fellows elected (50).—E. Abbott, Rev. W. H. Arkwright, E. H. Battram, Miss A. Benecke, Mrs. Brooks, Mrs. Brooksbank, Rev. Arthur Carter, Richard Carter, Hon. Mrs. Evelyn Cecil, A. J. Clarkson, Mrs. Cook, Mrs. Croome, J. Cuming, Jun. (Australia), Mrs. de Chapeaurouge, Baron Donner (Germany), Mrs. W. W. Druce, Miss E. Du Bois, George Elliff, E. B. Faber, Mrs. Abdy Fellowes, Henry Field, G. Haslett, Arthur Hesketh, Miss E. H. Horsfall, Mrs. J. G. Johnson, E. W. King, Capt. R. A. F. Kingscote, C. C. Lacaita, E. O. Lambert, Hon. Mrs. H. Lawrence, Miss M. Levy, Miss H. E. Loyd, Mrs. McDonall, Lady Malcolm, J. G. Malcolm (Australia), Miss M. L. Mathieson, George Miller, Lord Oxmantown, Miss Partington, B. S. Faudel Phillips, Miss Rogers, Mrs. Sheldon, Miss K. B. Watson, Rev. A. B. Weymouth (Hawaiian Islands), V. S. Fellowes Wilson, R. H. Wilson, Miss M. Wilson, Mrs. Wordsworth, Mrs. Yates, Miss E. Young.

GENERAL MEETING.

August 23, 1904.

Mr. Alexander Dean, V.M.H., in the Chair.

Fellows elected (26).—A. H. Benson, Charles Blair, Mrs. Salvin Bowlby, C. C. Bowring, Mrs. Cardew, F. H. Cook, B. P. Ellis, R. E. Fisher, J. Franklin Adams, Mrs. A. Harvey, Miss Heberden, R. J. Lambert, Mrs. Lyle, Benjamin Lymer, Lady Mackenzie of Coul, Mrs. Mirrielees, Mrs. R. L. Newman, Miss Perkins, Francis Pritchett, Robert Roe, J. Steer, Hon. Mrs. Verner, John Wardman, C. A. White, John Wink, Hon. Mrs. Wynne.

Society affiliated (1).—The Public Library of South Australia.

A lecture on the "Preservation of our Wild Plants" was given by Prof. G. S. Boulger, F.L.S. (See p. 392.)

GENERAL MEETING.

September 6, 1904.

Mr. J. T. Bennett-Poë, V.M.H., in the Chair.

Fellows elected (17).—Charles E. Askew, Sir William H. Bennett, K.C.V.O., John Davies, Mrs. H. S. Draper, Herbert Fitch, Lady Dalton FitzGerald, Miss Annie Golightly, The Hon. Countess Granville, Francis V. Harward, J. Brereton Hooper, Samuel Jones, Mrs. Mackintosh of

Mackintosh, Percy Parker, G. Michael Ryan (India), G. H. Simpson-Hayward, H. Kemp-Welch, J. F. Williamson.

Associate (1).—William Mason.

A lecture on "Gourds" (illustrated by lantern slides) was given by Mr. J. W. Odell. (See p. 450.)

GENERAL MEETING.

SEPTEMBER 20, 1904.

Mr. EDWARD MAWLEY, V.M.H., in the Chair.

Fellows elected (7).—Mrs de Horne, Mrs. Edward Huth, James Hainsworth Ismay, Miss Georgiana F. Martin, Mrs. Carl Meyer, Mrs. Albert J. Palmer, The Hon. R. B. Campbell Scarlett.

A lecture on "Ways of Employing Roses in Garden Decoration" (illustrated by lantern slides) was given by Mr. George Gordon, V.M.H. (See p. 498.)

GENERAL MEETING.

OCTOBER 18, 1904.

Dr. MAXWELL T. MASTERS, F.R.S., in the Chair.

Fellows elected (70).—Mrs. Osborn Allen, F. P. Armstrong, Frank Bailey, G. D. Bailey, J. Spier Baker, H. Bates, The Hon. Mrs. Bathurst, Mrs. Braithwaite, W. P. Broadmead, J.P., The Hon. Mrs. Brodrick, W. Van O. Bruyn, John F. Bulbeck, Lady Burgoyne, A. H. Campbell, Mrs. C. Cave, Albert Chancellor, Mrs. Cole, Mrs. Collier, Mrs. G. Constable, H. G. Cook, J. Strode Coysh, C. A. Crafer, Justice Crowe, H. Daniel, W. G. Denecker (South Africa), F. K. Derbyshire, J. Hume Dodgson, Mrs. Dryhurst, Miss C. M. Faithfull, Mrs. Hamilton Fletcher, Mrs. Flett, Mrs. Gilchrist, Arthur Gill, M.R.C.V.S., Mrs. Graham, C. Greatheed, James Hall (South Africa), Edward Leonard, Mrs. Lowther, Mrs. Ian Malcolm, Miss Maunder, Sir Herbert Maxwell, Bart., Major A. B. Mayne, Otto Menzel (Pretoria), Mrs. Nash, Miss B. Nevill, William Neyns, W. Northover, E. Norwood, J. K. O'Donoghue, Mrs. Fox Pitt, Mrs. Powell, Miss M. W. Ranken, Mrs. J. P. Russell Rea, C. Richardson, Col. Henry D. Rooke, P. M. Ryves, T. P. Sainsbury, Prof. E. C. Stirling, F.R.S. (South Australia), Lord Ernest St. Maur, H. R. Schmettau, J. Smith, Mrs. T. S. Taylor, C. E. Thorn, B. R. Thornton, Onslow P. Traherne, J. L. Walker, Mrs. A. Webb, Mrs. W. Wetherhed, G. L. Wigg, Miss Worley.

Associates (5).—Miss M. Bologna, W. Hambleton, S. Jones, James Judd, F. W. Pearce.

Society affiliated (1).—Eltham and District Horticultural Mutual Improvement Association.

A lecture on "Geographical Botany, as the Result of Adaptation," was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (See p. 409.)

GENERAL MEETING.

November 1, 1904.

Mr. George Bunyard, V.M.H., in the Chair.

Fellows elected (33).—J. R. G. Adams (South Australia), J. Scobell Armstrong, Jun., Lord Balcarres, Walter Baxter, Mrs. Barnett, Dr. Robert Bell, Major-General Berkley, Mrs. J. Vaudrey Braddon, Mrs. E. Brook, Miss Kate Brown, Tom Brown, Sir Henry Burdett, K.C.B., Col. C. W. Carr-Calthrop, J. C. Daubuz, J.P., John T. Gow, Lady Harlech, Mrs. S. Fraser Harris, Lady Hillingdon, Charles Huke, Miss Nina Lankester, L. Coape Ludlow, Harold Moreland, Mrs. Charles Perkins, A. L. Pike, Miss G. S. Rice, H. Ripley, The Hon. Florence Hamilton Russell, Mrs. M. Thompson, Mrs. Verner, Col. Ralph Vivian, J. Graham Weall, T. L. Wood, Adolf Zimmern.

Societies affiliated (3).—Hutt Valley (New Zealand) Horticultural Society, SS. Philip and James and S. Margaret's Horticultural Society, Wylam and District Horticultural Mutual Improvement Society.

A lecture on "Planting Woods for Winter Effects" was given by the Hon. Vicary Gibbs.

GENERAL MEETING.

November 15, 1904.

Mr. Harry J. Veitch, F.L.S., in the Chair.

Fellows elected (24).—Lady Alexander, Lord Armstrong, Mrs. Clifford Beale, Alex. F. Caddy, Mrs. W. Carlisle, John S. Chisholme, A. S. N. Davis, William Danson, Mrs. Disraeli, William Duncan (South Africa), Col. Matthew Dixon, B. H. Emmerson, Mrs. L. F. Frampton, Mrs. Harford, James T. Helby, H. E. Houghton (Madras), J. Lea-Smith, G. J. Mackay (New Zealand), Miss Mackenzie, C. E. Noverre, William S. Page, Mrs. C. D. Radcliffe, James R. Richardson, Mrs. J. Wormald.

Society affiliated.—(1) Penshurst Gardening Association.

GENERAL MEETING.

November 29, 1904,

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. (President of the Society), in the Chair.

Fellows elected (31).—John S. Adamson, Mrs. H. Baird-Carter, John G. Bartel (New Zealand), Col. E. H. Berkeley, Miss Bischoff, Mrs. D. Chapman, C. H. Crawley, The Hon. Mrs. H. Darwin, Rev. the Hon. William C. Ellis, A. F. Evans, Harry E. Frisby, Mrs. H. Gladstone, The Rt. Hon. Herbert Gladstone, M.P., Thomas Hall, A. Hodgkinson, A. H. Horn, H. E. Houghton (Madras), Mrs. N. E. Humphreys, Mrs. Charles Lee, Mrs. McArthur, Dr. A. Marcus (Germany), Mrs.

E. S. Prince, H. Norman Savill, Mrs. A. Sebag-Montefiore, Mrs. Sparke, Mrs. L. C. Verry, G. Acheson Warre, Mrs. Venables Williams, Mrs. Wolley Dod, Mrs. M. Wyatt, Mrs. W. B. Yates.

GENERAL MEETING.

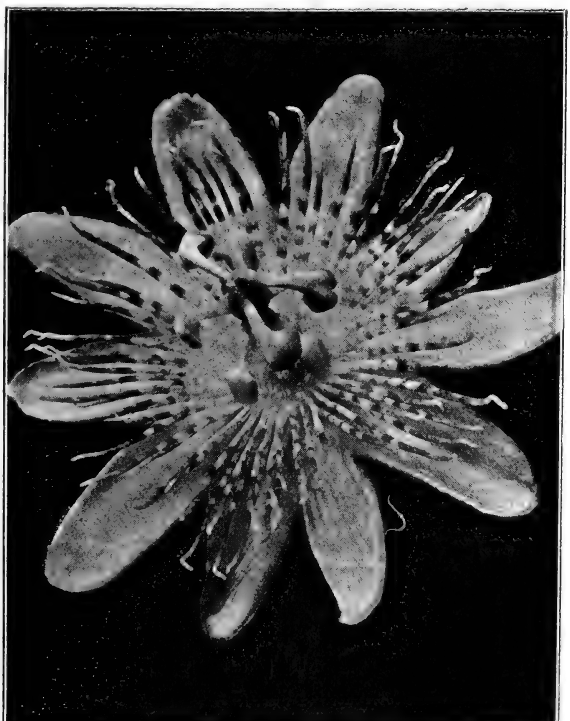
December 13, 1904.

Dr. Maxwell T. Masters, F.R.S., in the Chair.

Fellows elected (28).—Miss C. Aldersey, A. H. Anson, Ernest Baggallay, Michael Brett, Thomas Clarke, Mrs. Cooper, B. Egerton Davies, The Hon. Mary L. Hannen, Augustus Hartmann, The Rt. Hon. Lord Arthur Hill, Mrs. E. M. Hopkins, A. H. Joseph (South Africa), Miss K. Kinnear, Miss I. C. C. Maunsell, Miss Caroline Maunsell, W. J. Paley Marling, H. B. Pollard, Mrs. M. Rigby (Guernsey), R. Hirst Simpson, Mrs. L. B. Schlesinger, Francis L. Soper, F.L.S., Miss D. Sperling, Miss Stirling, Alex. H. Stirrat (South Africa), Mrs. Tarbolton, Mrs. F. Willis Taylor, Mrs. E. A. Thornely, A. E. L. Townsend.

Associate (1).—Miss M. H. Peers.

A lecture on "Fruits of the West Indies" was given by Mr. W. G. Freeman, B.Sc. (See p. 625.)



AUTUMN ROSE SHOW.

In Conjunction with the National Rose Society.

September 20, 1904.

NURSERYMEN.

General Section.

Class **1.**—36 blooms, distinct varieties.

First Prize, Silver-gilt Flora Medal; Second, Silver-gilt Banksian; Third, Silver Flora.

1. Messrs. Hugh Dickson, Belfast.
2. Messrs. J. Cocker, Aberdeen.
3. Messrs. J. Jefferies, Cirencester.

Tea and Noisette Section.

Class **2.**—18 blooms, distinct varieties.

First Prize, Silver-gilt Banksian Medal; Second, Silver Flora; Third, Silver Banksian.

1. Messrs. F. Cant, Colchester.
2. Mr. G. Prince, Longworth, Berks.
3. Messrs. J. Jefferies, Cirencester.

Exhibition Roses in Vases.

The vases used in this Section must rest on the staging itself, and not be raised above it; and the flowers must be equally distributed round each vase, and not be arranged to face only one way. In Class 3, vases of different sizes may be used. Only Roses mentioned in the N.R.S.'s Catalogue of Exhibition Roses are to be included. The quality of the blooms will be the first consideration with the Judges. In judging Class 3, each set of blooms will be counted as a unit, and not as seven separate blooms.

Class **3.**—12 distinct varieties, seven blooms of each (space occupied by exhibit not to exceed 6 feet by 3 feet). Exhibits to be staged in twelve vases.

First Prize, Silver-gilt Banksian Medal; Second, Silver Flora; Third, Silver Banksian.

1. Mr. G. Prince, Longworth, Berks.
2. Messrs. A. Dickson, Newtownards.
3. { Messrs. F. Cant, Colchester.
   Messrs. J. Jefferies, Cirencester. }

Class **4.** 12 blooms of any Rose, to be shown in a single vase.

First Prize, Silver Flora Medal; Second, Silver Banksian; Third, Bronze Flora.

1. Messrs. Hugh Dickson, Belfast.
2. Messrs. J. Cocker, Aberdeen.
3. Messrs. F. Cant, Colchester.

Section for Garden or Decorative Roses.

Class **5.**—36 distinct varieties, not less than three trusses of each (space occupied by exhibit not to exceed 8 feet by 5 feet).

N.B.—Exhibits in Class 5 should be arranged so as to show, as far as possible, the foliage and habit of growth of each variety, and may be staged in vases, boxes, or other receptacles. Each variety to be in a separate receptacle. All Hybrid Perpetuals, Hybrid Teas, and Teas and Noisettes mentioned in the N.R.S.'s Catalogue of Exhibition Roses are to be excluded. *All the stems must reach the water.*

First Prize, Silver-gilt Flora Medal; Second, Silver-gilt Banksian; Third, Silver Flora.

1. Messrs. F. Cant, Colchester.
2. Mr. J. Mattock, Oxford.
3. Messrs. C. Turner, Slough.

Group of Roses.

Class **6.**—A representative group of Roses placed on the floor (inverted pots, &c., may be used as usual for elevating separate plants) in a space not exceeding 50 square feet—in pots, or cut flowers in plain glasses, vases, or jars, and not in exhibition boxes. Ferns, palms, grasses, &c., in pots may be used as edging and background, and Rose foliage may be inserted with the cut blooms.

First Prize, Silver-gilt Flora Medal; Second, Silver-gilt Banksian; Third, Silver Flora.

1. Messrs. Paul, Cheshunt.
2. Messrs. C. Turner, Slough.
3. { Mr. G. Mount, Canterbury.
   Mr. G. Prince, Longworth. }

OPEN.

New Seedling Roses.

Class **7.***—Not less than 3 trusses of any new seedling Rose or distinct Sport (either not yet in commerce or not first distributed earlier than November 1903; a ground plant of the variety also must be shown). It must be stated by the exhibitor to what class he considers the Rose to belong, whether H.P., H.T., T., &c.

Gold Medal or Card of Commendation.

1. Gold Medal: Messrs. Hugh Dickson, Belfast.

Class **8.**†—A bowl of China Roses arranged with China Rose foliage only, but small buds may be left on the added foliage. The bowls, which

* No Rose which has won a National Rose Society's Gold Medal at any previous Exhibition may compete in Class 7. It is left to the discretion of the Judges to award more than one National Rose Society's Gold Medal or Commendation Card in this Class. The award of a Commendation Card at this Show will not disqualify any variety receiving it from competing for a Gold Medal at any subsequent Show of the National Rose Society, if not previously distributed.

† In Class 8, the First Prize will be a Piece of Plate, value three guineas, presented by E. T. Cook, Esq., Editor of "The Garden." The Second Prize of two guineas in this Class is presented by "A Well-wisher of the Society."

will be 9 inches high by 9 inches across the top (inside measurement), will be provided by the N.R.S. The bowls must rest on the staging itself, and not be raised above it.

NOTE.—In Class 8 the style and arrangement will be the first consideration with the Judges.

First Prize, Piece of Plate; Second, £2 2*s.*; Third, £1.

1. Mr. J. Mattock, Oxford.
2. Mrs. O. G. Orpen, Colchester.
3. Mr. G. Prince, Longworth.

AMATEURS.

GENERAL SECTION.

Class **9.**—18 blooms, distinct varieties (open to all amateurs irrespective of the number of plants they grow).

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. Rev. J. H. Pemberton, Havering-atte-Bower.
2. A. Tate, Esq., Leatherhead.
3. No award.

Class **10.**—12 blooms, distinct varieties (open only to growers of less than 2,000 plants, of varieties in the N.R.S.'s Catalogue of Exhibition Roses, including Teas and Noisettes).

First Prize, £1; Second, 15*s.*; Third, 7*s.*

1. E. Mawley, Esq., Berkhamsted.
2. E. M. Eversfield, Esq., Horsham.
3. J. B. Fortescue, Esq., Maidenhead.

Class **11.**—9 blooms, distinct varieties (open only to growers of less than 1,000 plants, of varieties in the N.R.S.'s Catalogue of Exhibition Roses, including Teas and Noisettes).

First Prize, £1; Second, 10*s.*; Third, 5*s.*

1. G. Moules, Esq., Hitchin.
2. A. Evans, Esq., Oxford.
3. L. E. Timis, Esq., Hitchin.

Class **12.**—6 blooms, distinct varieties (open only to growers of less than 500 plants, of varieties in the N.R.S.'s Catalogue of Exhibition Roses, including Teas and Noisettes).

First Prize, 10*s.*; Second, 7*s.*; Third, 5*s.*

1. Rev. J. B. Shackle, Maidenhead.
2. R. W. Bowyer, Esq., Hertford Heath.
2. C. C. Williamson, Esq., Canterbury.

TEA AND NOISETTE SECTION.

Class **13.**—12 blooms, distinct varieties (open to all amateurs irrespective of the number of plants they grow).

First Prize, £1; Second, 15*s.*; Third, 7*s.*

1. O. G. Orpen, Esq., Colchester.
2. Conway Jones, Esq., Hucclecote.
3. Rev. F. R. Burnside, Great Stambridge,

Class **14.**—9 blooms, distinct varieties (open only to growers of less than 500 plants of Teas and Noisettes in the N.R.S.'s Catalogue of Exhibition Roses).

First Prize, £1; Second, 10*s.*; Third, 5*s.*

1. A. Evans, Esq., Oxford.
2. }
3. } No award.

Class **15.**—6 blooms, distinct varieties (open only to growers of less than 200 plants of Teas and Noisettes in the N.R.S.'s Catalogue of Exhibition Roses).

First Prize, 10*s.*; Second, 7*s.*; Third, 5*s.*

1. R. W. Bowyer, Esq., Hertford Heath.
2. G. A. Hammond, Esq., Burgess Hill.
3. C. C. Williamson, Esq., Canterbury.

Exhibition Roses in Vases.

The vases used in this Section must rest on the staging itself and not be raised above it, and the flowers must be equally distributed round each vase, and not be arranged to face only one way. Vases of different sizes may be used. Only Roses mentioned in the N.R.S.'s Catalogue of Exhibition Roses are to be included. The quality of the blooms will be the first consideration with the Judges. In judging, each set of blooms will be counted as a unit, and not as five separate blooms.

Class **16.**—6 distinct varieties (to include not more than two varieties of Teas or Noisettes), five blooms of each (space occupied by exhibit not to exceed 4 feet by 3 feet). Exhibits to be staged in six vases.

First Prize, £1; Second, 15*s.*; Third, 7*s.*

1. Rev. J. H. Pemberton, Havering-atte-Bower.
2. O. G. Orpen, Esq., Colchester.
3. No award.

Class **17.**—4 distinct varieties of Teas and Noisettes, five blooms of each (space occupied by exhibit not to exceed 3 feet by 3 feet). Exhibits to be staged in four vases.

First Prize, £1; Second, 10*s.*; Third, 5*s.*

1. Rev. F. R. Burnside, Great Stambridge.
2. Conway Jones, Esq., Hucclecote.
3. O. G. Orpen, Esq., Colchester.

Decorative Section.

For Ladies only.

Open only to Lady Amateurs who are either Subscribers to the National Rose Society or to the Royal Horticultural Society, or are members of the family of an Amateur Subscriber.

Class **18.**—A bowl of cut Roses, lightly arranged with Rose foliage only, but small buds may be left on the added foliage. The bowls, which will be 8 inches high by 7 inches across the top (inside measurement), will be provided by the N.R.S. The bowls must rest on the staging itself, and not be raised above it.

First Prize, £1 ; Second, 10*s.* ; Third, 5*s.*

1. Miss J. Langton, Hendon.
2. Mrs. O. G. Orpen, Colchester.
3. Mrs. Mawley, Berkhamsted.

Class **19.**—A basket of cut Roses, lightly arranged with any cut foliage, ferns, or grasses. No ribbons must be used.

First Prize, £1 ; Second, 10*s.* ; Third, 5*s.*

1. Mrs. C. C. Williamson, Canterbury.
2. Mrs. O. G. Orpen Colchester.
3. Miss J. Langton, Hendon.

Note.—In Classes 18 and 19 the style and arrangement will be the first consideration with the Judges.

Section for "Garden" or Decorative Roses.

Exhibits in this Section should be arranged so as to show, as far as possible, the foliage and habit of growth of each variety, and *must be staged in vases.* Each variety to be in a separate vase. All Hybrid Perpetuals, Hybrid Teas, and Teas and Noisettes mentioned in the N.R.S.'s Catalogue of Exhibition Roses are to be excluded. *All the stems must reach the water.*

Class **20.**—12 distinct varieties, not less than three trusses of each (space occupied by exhibit not to exceed 6 feet by 3 feet).

First Prize, £1 ; Second, 15*s.* ; Third, 7*s.*

1. A. Tate, Esq., Leatherhead.
2. O. G. Orpen, Esq., Colchester.
3. No award.

Class **21.**—6 distinct varieties, not less than three trusses of each (space occupied by exhibit not to exceed 3 feet by 3 feet).

First Prize, £1 ; Second, 10*s.* ; Third, 5*s.*

1. Rev. J. H. Pemberton, Havering-atte-Bower.
2. C. J. Gordon Clark, Esq., Leatherhead.
3. No award.

ELEVENTH ANNUAL EXHIBITION OF BRITISH-GROWN FRUIT.

Held at the Society's Hall, Vincent Square, S.W., October 4, 5, and 6, 1904.

LIST OF SUBSCRIBERS TO THE PRIZE FUND OF 1904.

	£	s.	d.
Austin & Co., St. James's Works, Kingston-on-Thames	0	10	6
Basham, John, Bassaleg, Newport, Mon.	0	10	6
Bell, W. H., Seend, Melksham	1	1	0
Brown, J., Orford House Gardens, Market Rasen	0	5	0
Bunyard, G., & Co., Royal Nurseries, Maidstone	10	10	0
Bythway, Major, Warborough, Llanelly	1	1	0
Cannon, G., Cannon's Nursery, Ealing	1	1	0
Carlisle, A., Henlow Grange Gardens, Biggleswade	0	5	0
Challis, T., Wilton House Gardens, Salisbury	0	5	0
Cornford, J., Quex Park, Birchington	0	5	0
Davies, Mrs. C., Whitford, Upper Deal	0	10	6
Day, J., Galloway House Gardens, Garliestown	0	7	6
Dobbie & Co., Rothesay	5	0	0
Eddy, J. Ray, The Grange, Carleton, Skipton	1	0	0
Edwards, R., Beechy Lees Gardens, Sevenoaks	0	5	0
Heilbut, S., Holyport, nr. Maidenhead	1	1	0
Horne, W., & Sons, Cliffe, Rochester	10	0	0
Hutchesson, F., Queen's Road, Guernsey	0	5	0
Jefferies, W. J., & Son, Royal Nurseries, Cirencester	1	1	0
Kay, P. E., Claigmar, Church End, Finchley, N.	1	1	0
Lee, John, Higher Bebington	0	10	0
Lloyd, F. G. (the late)	3	3	0
McLachlan, R. (the late)	2	2	0
McLaren, Mrs. E., 56 Ashley Gardens, S.W.	1	1	0
Milner, R., Margam Gardens, Port Talbot	0	10	0
Munro, Miss, 27 Eaton Place, S.W.	0	2	6
Paulin, W. T., Broadfields, Winchmore Hill	2	2	0
Pearson, J. R., & Sons, Lowdham, Notts . . . . Prizes and	1	10	0
Perkins, T., & Sons, Northampton	2	2	0
Pyne, G., Topsham, Devon	5	0	0
Reid, J. W., St. Croix, Leamington Spa	0	5	0
Richards, A., 26 Duke's Avenue, Chiswick	0	10	6
Robb, Mrs., 46 Rutland Gate, S.W.	0	5	0
Rogers, Mrs.	1	0	0
Ross, Charles, Welford Park Gardens, Newbury	0	10	6
Savory, Rev. E., Binfield, Bracknell	0	10	0
Spooner, S., & Sons, Hounslow	1	1	0
Stone, R. E. T., 78, Woodstock Road, Oxford	2	2	0
Swanley Horticultural College	2	2	0
Sydenham, Robert, Tenby Street, Birmingham	1	1	0
Thorneycroft, Lady, Eyot Villa, Chiswick Mall	0	5	0
Turton, T., The Castle Gardens, Sherborne, Dorset	0	10	6
Veitch, J., & Son, Royal Exotic Nurseries, Chelsea	5	0	0
Walker, J., Ham Common, Surrey	1	1	0
Wallace, L. A., Sanderstead Court, Croydon	5	0	0

	£	s.	d.
Wethered, H. L., Canynge Road, Clifton	0	10	0
White, Mrs. T., Walton Hall, Kelso, N.B.	1	1	0
Whiting, R. M., Credenhill, Hereford	0	10	0
Wigan, A. L., Forest Park, Windsor	2	2	0
Willard, J., Holly Lodge Gardens, Highgate	0	10	6
Williams, H. H., Pencalenick, Truro	1	0	0
Woodward, G., Barham Court Gardens, Teston	0	10	6

THE JUDGES.

The following gentlemen kindly acted as Judges, and deserve the best thanks of the Society for their oftentimes very difficult work, viz.—

Allan, W., Gunton Park Gardens, Norwich.
Arnold, T., Cirencester Park Gardens, Gloucester.
Bacon, W. H., The Gardens, Mote Park, Maidstone.
Barnes, N. F., Eaton Gardens, Chester.
Basham, J., Bassaleg, Newport, Mon.
Bates, W., Cross Deep Gardens, Twickenham.
Beckett, E., Aldenham House Gardens, Elstree.
Bowerman, J., Hackwood Park Gardens, Basingstoke.
Challis, T., V.M.H., The Gardens, Wilton House, Salisbury.
Cheal, J., Crawley, Sussex.
Coomber, T., The Hendre Gardens, Monmouth.
Cornford, J., Quex Park Gardens, Birchington.
Crump, W., V.M.H., Madresfield Court Gardens, Malvern.
Dawes, J., Ledbury Park Gardens, Ledbury.
Dean, Alex., V.M.H., 62 Richmond Road, Kingston.
Divers, W. H., Belvoir Castle Gardens, Grantham.
Douglas, J., V.M.H., Great Bookham, Surrey.
Earp, W., The Gardens, Bayham Abbey, Lamberhurst.
Fielder, C. R., North Mymms Park Gardens, near Hatfield.
Hudson, J., V.M.H., Gunnersbury House Gardens, Acton, W.
Jaques, J., Pound Street, Wendover, Tring.
Kelf, G., South Villa Gardens, Regent's Park, N.W.
McIndoe, J., V.M.H., 8 Hythe Street, Dartford.
Markham, H., Wrotham Park Gardens, High Barnet.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishop's Waltham.
Mortimer, S., Rowledge, Farnham, Surrey.
Norman, G., V.M.H., Hatfield House Gardens, Hatfield.
Parker, R., 47 Clarence Road, Horsham
Paul, G., J.P., V.M.H., Cheshunt, Herts.
Pearson, A. H., The Hut, Lowdham, Nottingham.
Pearson, C. E., Chilwell Nurseries, Lowdham.
Poupart, W., Marsh Farm, Twickenham.
Reynolds, G., Gunnersbury Park Gardens, Acton, W.
Rivers, H. Somers, Sawbridgeworth.
Ross, C., Welford Park Gardens, Newbury.
Salter, C. J., Woodhatch Gardens, Reigate.
Spooner, S., The Nurseries, Hounslow.

Taylor, W., Tewkesbury Lodge Gardens, Forest Hill.
Veitch, P. C. M., J.P., New North Road, Exeter.
Ward, A., Godinton Gardens, Ashford, Kent.
Willard, Jesse, Holly Lodge Gardens, Highgate.
Woodward, G., Barham Court Gardens, Teston.

THE REFEREES.

The following gentlemen very kindly held themselves at the disposal of the Society to act in conjunction with any of the Judges as Referees if required, viz.—

Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Thomas, Owen, V.M.H., 25 Waldeck Road, West Ealing.
Wythes, G., V.M.H., Syon House Gardens, Brentford.

OFFICIAL PRIZE LIST.

(The address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.)

Division I.

Fruits grown under Glass or otherwise.

Open to Gardeners and Amateurs only.

Note.—Exhibitors can compete in one Class only of Classes 1, 2; and of Classes 3, 4.

Class **1.**—Collection of 9 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, Silver Cup and £5; Second, £5; Third, £3.

1. The Rt. Hon. Earl of Harrington, Derby (gr. J. H. Goodacre).
2. The Hon. Sir Charles Swinfen Eady, Weybridge (gr. J. Lock).
3. The Rt. Hon. Earl of Londesborough, Market Weighton (gr. J. C. McPherson).

Class **2.**—Collection of 6 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, Silver Cup and £3; Second, £3; Third, £2.

1. J. W. Fleming, Esq., Romsey (gr. W. Mitchell).
2. Lord Biddulph, Ledbury (gr. J. Dawes).
3. Sir Marcus Samuel, Maidstone (gr. W. H. Bacon).

Class **3.**—Grapes, 6 distinct varieties, 3 bunches of each; both Black and White must be represented.

First Prize, Silver Cup and £3; Second, £3.

No award.

Class **4.**—Grapes, 4 varieties, selected from the following: 'Madresfield Court,' 'Mrs. Pince,' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg,' 3 bunches of each.

First Prize, Silver Cup and £3; Second, £3; Third, £2.

No entry.

Class **5.**—Grapes, Black Hamburgh, 3 bunches.

First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. J. W. Fleming, Esq.
2. Col. G. B. Archer-Houblon, Bishop's Stortford (gr. W. Harrison).
3. The Earl of Harrington.

Class **6.**—Grapes, 'Mrs. Pince,' 3 bunches.

First Prize, £1. 10*s.*; Second, £1.

1. J. W. Fleming, Esq.
2. Major Hibbert, Rugby (gr. W. Camm).

Class **7.**—Grapes, Alicante, 3 bunches.

First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. G. C. Raphael, Esq., Englefield Green (gr. H. H. Brown).
2. Sir Marcus Samuel.
3. Lady Tate, Streatham (gr. W. Howe).

Class **8.**—Grapes, 'Madresfield Court,' 3 bunches.

First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. J. W. Fleming, Esq.
2. C. Bayer, Esq., Forest Hill (gr. W. Tayler).
3. The Earl of Harrington.

Class **9.**—Grapes, any other Black Grape, 3 bunches.

First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. J. W. Fleming, Esq.
2. G. C. Raphael, Esq.
3. H. P. Sturgis, Esq., Leatherhead (gr. W. Peters).

Class **10.**—Grapes, 'Muscat of Alexandria,' 3 bunches.

First Prize, £2. 10*s.*; Second, £1. 10*s.*; Third, £1.

1. C. Bayer, Esq. (Fig. 209.)
2. J. W. Fleming, Esq.
3. The Earl of Harrington.

Class **11.**—Grapes, any other White Grape, 3 bunches.

First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. C. Bayer, Esq.
2. J. Drakes, Esq., Market Rasen (gr. J. Brown).
3. J. Barker, Esq., Bishop's Stortford (gr. G. Beech).

Class **12.**—Grapes, 3 bunches of any Frontignan varieties.

First Prize, £1. 10*s.*; Second, £1.

No entry.

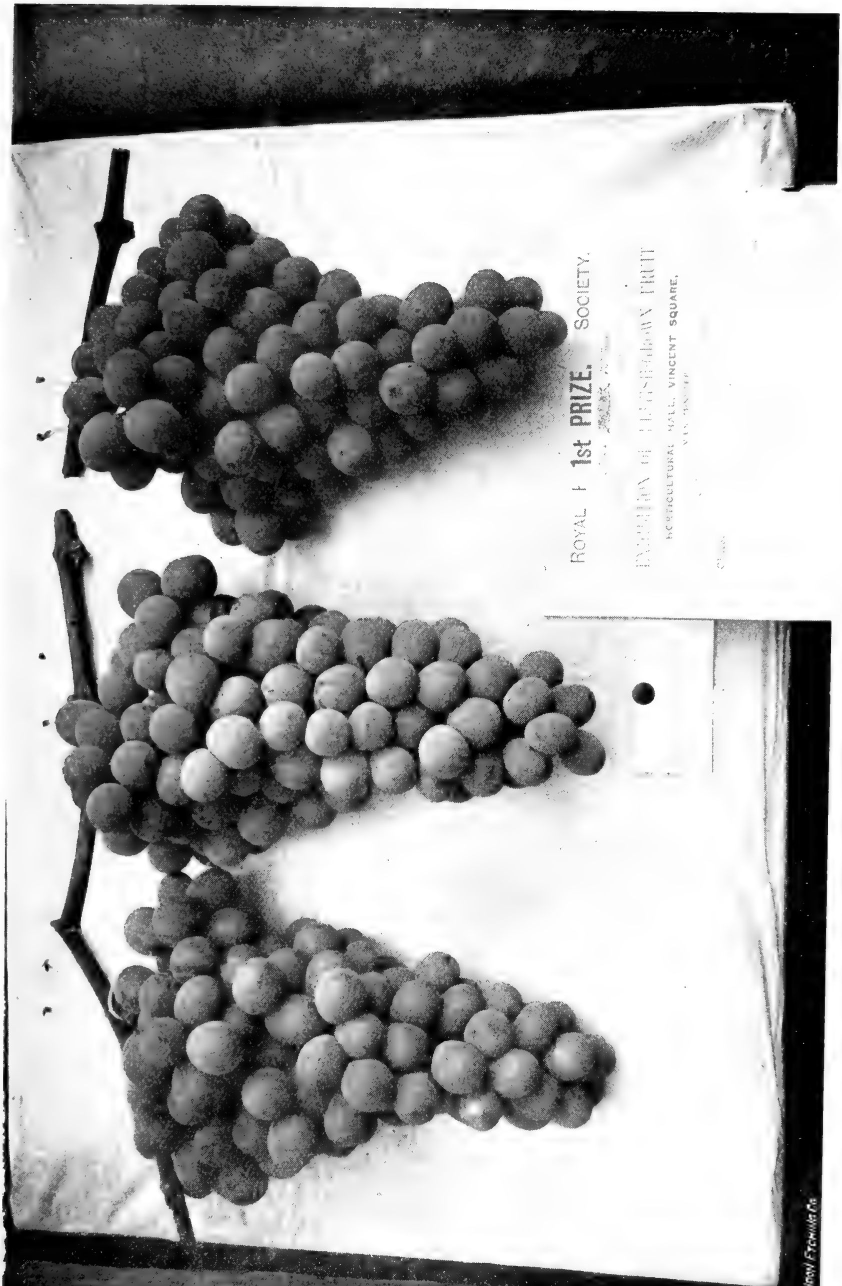


FIG. 209.—GRAPE 'MUSCAT OF ALEXANDRIA.'

Class **13.**—Collection of Hardy Fruit, 30 dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, The Hogg Medal and £3; Second, £2; Third, £1.

1. Sir Marcus Samuel.
2. T. L. Boyd, Esq., Tonbridge (gr. E. Coleman).
3. Major Powell Cotton, Birchington (gr. J. Cornford).

Division II.

Open to Nurserymen and Market Growers only.

Nurserymen and Market Growers must exhibit as individuals or as firms. They must have actually grown all they exhibit. Combinations of individuals or firms are not allowed, nor collections of produce from districts.

Nurserymen and Market Growers desiring to exhibit at this Show must make application for space as under Class 14, 15, or 16. No other spaces but the above can be allotted. Exhibitors can only enter in one of Classes 14 and 15.

Nurserymen and Market Growers may adopt any method of staging they desire, subject to the following reservations: (*a*) The number of fruits is not limited, but the baskets or dishes must not exceed 15 inches in diameter if circular, or 19 × 15 if rectangular, unless they be sieves or half-sieves; (*b*) Duplicate trees are permitted in Class 16, but not duplicate baskets or dishes of fruit; (*c*) No trees are admissible in Classes 14 and 15; (*d*) The fruit in exhibits under Classes 14 and 15 must in no case be raised higher than 18 inches from the table, but the use of foliage plants is allowed.

No awards of any sort will be made to Nurserymen and Market Growers who do not conform to the above regulations.

Important.—Nurserymen and Market Growers having entered and finding themselves unable to exhibit are *particularly* requested to give four days' notice to the Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

Allotment of table-space will be made on the following scales:—

For Fruit grown entirely out of doors.

Class **14.**—24 feet run of 6 feet tabling.

First Prize, Gold Medal; Second, Silver-gilt Hogg;
Third, Silver-gilt Knightian.

1. Messrs. G. Bunyard & Co., Maidstone.
2. Messrs. H. Cannell & Son, Swanley.
3. Messrs. W. Poupart & Sons, Twickenham.

Class **15.**—16 feet run of 6 feet tabling.

First Prize, Silver-gilt Hogg medal; Second, Silver Knightian,
Third, Silver Banksian.

1. Mr. John Basham, Newport, Mon.
2. Mr. G. Mount, Canterbury.
3. Messrs. Laxton Bros., Bedford.

For Orchard-house Fruit and Trees.

Class **16.**—24 feet run of 6 feet tabling.

First Prize, Gold Medal; Second, Silver-gilt Hogg.

1. Messrs. G. Bunyard & Co.
2. Messrs. Rivers & Son, Sawbridgeworth.

Division III.

Fruits grown entirely in the Open Air—Except Class 31.

Open to Gardeners and Amateurs only. Nurserymen and Market Growers excluded.

Exhibitors of Apples or Pears in Division III. are excluded from Division V.

Note.—Exhibitors can compete in one Class only of the Classes 17, 18, 19; of 22, 23, 24, 25; of 27, 28; of 29, 30.

Class **17.**—Apples, 24 dishes distinct, 16 Cooking, 8 Dessert. The latter to be placed in the front row.

First Prize, £4; Second, £3; Third, £2.

1. Mrs. Alexander, Maidstone (gr. C. Crane).
2. R. H. B. Marsham, Esq., Maidstone (gr. W. Lewis).
3. { Mrs. Haywood, Reigate (gr. C. J. Salter). / C. O. Walter, Esq., Wantage. } equal.

Class **18.**—Apples, 18 dishes distinct 12 Cooking, 6 Dessert. The latter to be placed in the front row.

First Prize, £3; Second, £2; Third, £1.

1. Lord Biddulph.
2. O. E. d'Avigdor Goldsmid, Tonbridge (gr. C. Earl).
3. The Rt. Hon. the Earl of Pembroke, Salisbury (gr. T. Challis).

Class **19.**—Apples, 12 dishes distinct, 8 Cooking, 4 Dessert. The latter to be placed in the front row.

First Prize, £2; Second, £1; Third, 15*s*.

1. H. C. Smith, Esq., Roehampton (gr. W. Wallace).
2. The Rt. Hon. Lord Howard de Walden, Saffron Walden (gr. J. Vert).
3. J. T. Charlesworth, Esq., Redhill (gr. T. W. Herbert).

Class **20.**—Cooking Apples, 6 dishes, distinct.

First Prize, £1; Second, 15*s*.

1. Mrs. Alexander.
2. The Rt. Hon. Earl De Grey, Kingston (gr. J. Smith).

Class **21.**—Dessert Apples, 6 dishes, distinct.

First Prize, £1; Second, 15*s*.

1. Mrs. Alexander.
2. Mrs. Burns, Hertford (gr. C. R. Fielder).

Class **22.**—Dessert Pears, 18 dishes, distinct.

First Prize, £3. 10*s*.; Second, £2; Third, £1.

1. Sir Marcus Samuel.
2. Major Powell Cotton.
3. No award.

Class **23.**—Dessert Pears, 12 dishes, distinct.

First Prize, £2; Second, £1; Third, 15*s*.

1. Rev. T. McMurdie, Weybridge (gr. A. Basile).
2. Mrs. Alexander.
3. The Rt. Hon. the Earl of Pembroke.

Class **24.**—Dessert Pears, 9 dishes, distinct.
First Prize, £1. 10*s.*; Second, 17*s.* 6*d.*
1. Lord Biddulph.
2. F. A. Bevan, Esq., New Barnet (gr. H. Parr).

Class **25.**—Dessert Pears, 6 dishes, distinct.
First Prize, £1; Second, 15*s.*
1. C. A. Morris-Field, Esq., Sevenoaks (gr. R. Edwards).
2. The Duke of Portland, Welbeck (gr. J. Roberts).

Class **26.**—Stewing Pears, 3 dishes, distinct.
First Prize, 15*s.*; Second, 10*s.*
1. Major Powell Cotton.
2. Max Michaelis, Esq., Tandridge Court (gr. J. D. Simmons).

Class **27.**—Peaches, grown entirely out of doors, 3 dishes, distinct.
First Prize, £1; Second, 15*s.*
1. The Earl of Harrington.
2. C. R. W. Adeane, Esq., Cambridge (gr. R. Alderman).

Class **28.**—Peaches, grown entirely out of doors, 1 dish of one variety.
First Prize, 10*s.*; Second, 7*s.*
1. Mrs. Alexander.
2. J. J. Morrish, Esq., Oxshott (gr. C. W. Mills).

Class **29.**—Nectarines, grown entirely out of doors, 3 dishes, distinct.
First Prize, £1; Second, 15*s.*
No award.

Class **30.**—Nectarines, grown entirely out of doors, 1 dish of one variety.
First Prize, 10*s.*; Second, 7*s.*
1. Lord Biddulph.
2. R. Bedingfeld, Esq., Roehampton (gr. J. Sparks).

Class **31.**—Plums, grown under Glass, 6 dishes, distinct.
First Prize, £1. 10*s.*; Second, 15*s.*
1. Lord Howard de Walden.
2. Martin R. Smith, Esq., Hayes (gr. C. Blick).

Class **32.**—Plums, 6 dishes, 2 Dessert and 4 Cooking, distinct.
First Prize, £1. 10*s.*; Second, 15*s.*
1. Lord Howard de Walden.
2. The Rt. Hon. the Earl of Stair, Dalkeith (gr. W. Smith).

Class **33.**—Plums, 3 dishes of Gages, distinct.
First Prize, 15*s.*; Second, 10*s.*
1. The Earl of Pembroke.
2. J. B. Fortescue, Esq., Maidenhead (gr. C. Page).

Class **34.**—Plums, 1 dish of Coe's Golden Drop.
First Prize, 7*s.*; Second, 5*s.*
1. The Marquis of Northampton, Northampton (gr. A. R. Searle).
2. Lord Howard de Walden.

Class **35.**—Plums, 1 dish of any other Dessert variety.

First Prize, 7*s.*; Second, 5*s.*

1. J. K. D. Wingfield-Digby, Esq., Sherborne (gr. T. Turton).
2. J. Liddell, Esq., Newbury (gr. R. Lye).

Class **36.**—Plums, 1 dish of Cooking of one variety.

First Prize, 7*s.*; Second, 5*s.*

1. F. W. Thomas, Esq., Polegate.
2. Lord Howard de Walden.

Class **37.**—Damsons, 3 dishes, distinct.

First Prize, 15*s.*; Second, 10*s.*

1. G. J. Gribble, Esq., Biggleswade (gr. A. Carlisle).
2. T. Clinch, Esq., Sittingbourne.

Class **38.**—Bullaces, 1 dish of one variety.

First Prize, 7*s.*; Second, 5*s.*

1. T. Clinch, Esq.
2. H. C. Smith, Esq.

Class **39.**—Morello Cherries, 50 fruits.

First Prize, 7*s.*; Second, 5*s.*

1. H. F. Walker, Esq., Balcombe (gr. J. Coles).
2. J. B. Fortescue, Esq.

Class **40.** Grapes grown out of doors, Basket of about 6 lb. weight.

First Prize, 15*s.*; Second, 7*s.* 6*d.*

1. No award.
2. H. C. Smith, Esq.

Division IV.

Special District County Prizes.

Open to Gardeners and Amateurs only.

(In this Division all fruit must have been grown in the open.)

N.B.—Exhibitors in Division IV. must not compete in Division II., or in Classes 1, 2, 3, 4, 17, 18, 19, 22, 23, 24.

Class **AA.**—Apples, 6 dishes, distinct, 4 Cooking, 2 Dessert.

1st Prize, £1 and 3rd class Single Fare from Exhibitor's nearest railway station to London *; 2nd Prize, 15*s.* and Railway Fare as above.*

Class **BB.**—Dessert Pears, 6 dishes, distinct.

1st Prize, £1. 10s. and Railway Fare as above *; 2nd Prize, £1 and Railway Fare as above.*

The two above classes, AA and BB, are repeated eleven times as follows, and Exhibitors must enter for them thus: "Class AA 41" or "BB 42," and so on, to make it quite clear whether they mean Apples or Pears.

Class **41.**—Open only to Kent Growers.

AA. { 1. W. Stowers, Esq., Sittingbourne.
2. T. L. Boyd, Esq.

BB. { 1. W. Stowers, Esq.
2. T. L. Boyd, Esq.

* In the event of the same Exhibitor being successful in both classes AA and BB only one Railway Fare will be paid.

Class **42.**—Open only to Growers in Surrey, Sussex, Hants, Dorset. Somerset, Devon, and Cornwall.

AA. { 1. B. H. Hill, Esq., Crediton (gr. G. Lock).
2. J. K. D. Wingfield-Digby, Esq.

BB. { 1. F. W. Thomas, Esq.
2. J. K. D. Wingfield-Digby, Esq.

Class **43.**—Open only to Growers in Wilts, Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA. { 1. A. W. G. Wright, Esq., Newent (gr. W. H. Davies).
2. G. J. Gribble, Esq.

BB. { 1. Mrs. St. Vincent Ames, Westbury-on-Trym (gr. W. Bannister).
2. G. J. Gribble, Esq.

Class **44.**—Open only to Growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA. { 1. K. M. Courtauld, Esq., Colne Engaine (gr. C. Taylor).
2. Col. G. B. Archer-Houblon (gr. W. Harrison).

BB. { 1. Col. The Hon. C. Harbord, Norwich (gr. W. Allan).
2. Col. G. B. Archer-Houblon (gr. W. Harrison).

Class **45.**—Open only to Growers in Lincoln, Northampton, Warwick Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA. { 1. John Lee, Esq., Higher Bebington.
2. The Duke of Rutland, Grantham (gr. W. H. Divers).

BB. { 1. The Duke of Portland.
2. Major Hibbert.

Class **46.**—Open only to Growers in Worcester, Hereford, Monmouth, Glamorgan, Carmarthen, and Pembroke.

AA. { 1. H. C. Moffatt, Esq., Ross (gr. T. Spencer).
2. R. M. Whiting, Esq., Credenhill.

BB. { 1. H. C. Moffatt, Esq.
2. Dow. Lady Hindlip, Droitwich (gr. C. Crooks).

Class **47.**—Open only to Growers in the other Counties of Wales.

AA. { 1. Col. Cornwallis West, Ruthin (gr. H. Forder).
2. Mr. R. A. Horspool, Ruabon.

BB. { 1. Col. Cornwallis West.
2. Mr. R. A. Horspool.

Class **48.**—Open only to Growers in the Six Northern Counties of England, and in the Isle of Man.

AA. { 1. The Earl of Lathom, Ormskirk (gr. B. Ashton).
2. H. Thellusson, Esq., Doncaster (gr. W. Chuck).

BB. { 1. The Earl of Lathom.
2. H. Thellusson, Esq.

Class **49.**—Open only to Growers in Scotland.

AA. { 1. The Duke of Richmond and Gordon, Fochabers (gr. C. Webster).
2. The Earl of Galloway, Garliestown (gr. J. Day).

BB. { 1. The Earl of Galloway.
2. The Duke of Richmond and Gordon.

Class **50.**—Open only to Growers in Ireland.

AA. { 1. Viscount Duncannon, Piltown (gr. J. G. Weston).
2. No award.

BB.—No entry.

Class **51.**—Open only to Growers in the Channel Islands.

AA.—No entry.

BB.—No entry.

Division V.

Single Dishes of Fruit grown in the Open Air.

Open to Gardeners and Amateurs only. Nurserymen and Market Growers excluded.

Prizes in each Class (except 55, 67, 75, and 76). 1st Prize, 7*s.*; 2nd Prize, 5*s.*

Choice Dessert Apples.

Class **52.**—Allington Pippin.
1. W. Stowers, Esq.
2. F. W. Thomas, Esq.

Class **53.**—American Mother.
1. H. C. Moffatt, Esq.
2. N. R. Page, Esq., Clacton-on-Sea.

Class **54.**—Blenheim Orange. (See Class 66.)
Small highly coloured fruits which will pass through a 3-inch ring.
1. R. J. Lambert, Esq. (gr. G. D. Reid).
2. Jeremiah Colman, Esq., Gatton Park (gr. W. Bound).

Class **55.**—Charles Ross.

First Prize, £5; Second, £3; Third, £2.

Presented by Messrs. Horne, of Cliffe, Rochester.

1. Mr. G. Pyne, Topsham.
2. W. Stowers, Esq.
3. Mrs. Alexander.

Class **56.**—Cox's Orange Pippin.
1. Lord Poltimore, Exeter (gr. T. H. Slade).
2. Felix B. Parfitt, Caversham.

Class **57.**—Egremont Russet.
1. Walpole Greenwell, Esq., Marden Park (gr. W. Lintott).
2. T. L. Boyd, Esq.

Class **58.**—James Grieve.
1. Col. G. B. Archer-Houblon (gr. W. Harrison).
2. R. M. Whiting, Esq.

Class **59.**—King of the Pippins.
1. W. Stowers, Esq.
2. J. L. Newland, Esq., Byfleet (gr. H. James).

Class **60.**—Lady Sudeley.
1. J. K. D. Wingfield-Digby, Esq.
2. G. J. Gribble, Esq.

Class **61.**—Margil.
1. A. W. G. Wright, Esq.
2. G. J. Gribble, Esq.

Class **62.**—Ribston Pippin.
1. Sir Oswald Mosley, Bart., Burton-on-Trent (gr. G. Woodgate).
2. Walpole Greenwell, Esq.

Class **63.**—Worcester Pearmain.
1. J. B. Fortescue, Esq.
2. G. J. Gribble, Esq.

Class **64.**—Any other variety not named above.
Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

An Exhibitor may only enter one variety in Class 64, in which Class 8 Fruits must be shown to a dish for the Judges to be able to taste two of them.

1. Hon. Sir Charles Swinfen Eady.
2. W. Stowers, Esq.
3. Col. Archer-Houblon, Newbury (gr. C. Ross).
4. Lord Poltimore.

Choice Cooking Apples.

Class **65.**—Bismarck.
1. J. K. D. Wingfield-Digby, Esq.
2. E. W. Caddick, Esq., Ross (gr. M. Roe).

Class **66.**—Blenheim Orange. Large fruits. (See Class 54.)
1. Hon. Sir Charles Swinfen Eady.
2. H. C. Smith, Esq.

Class **67.**—Bramley's Seedling. 1st Prize, 20*s*.; 2nd, 10*s*.; 3rd, 5*s*.
Prizes given by Messrs. H. Merryweather, The Nurseries, Southwell.
1. Col. Archer-Houblon (gr. C. Ross).
2. E. W. Caddick, Esq.
3. No award.

Class **68.**—Ecklinville.
1. R. M. Whiting, Esq.
2. Jeremiah Colman, Esq.

Class **69.**—Gascoyne's Scarlet.
1. F. W. Thomas, Esq.
2. W. Stowers, Esq.

Class **70.**—Golden Noble.
1. A. W. G. Wright, Esq.
2. Max Michaelis, Esq.

Class **71.**—Grenadier.
1. J. B. Fortescue, Esq.
2. C. P. Wykeham Martin, Maidstone (gr. D. McAinsh).

Class **72.**—Lane's Prince Albert.
1. Col. Archer-Houblon (gr. C. Ross).
2. W. Stowers, Esq.

Class **73.**—Lord Derby.
1. W. Stowers, Esq.
2. Col. Archer-Houblon (gr. W. Harrison).

Class **74.**—Mère de Ménage.
1. W. Stowers, Esq.
2. John Lee, Esq.

Class **75.**—Newton Wonder.

First Prize, 20*s.*; Second, 10*s.*; Third, 5*s.*

Prizes presented by Messrs. J. R. Pearson & Sons, Lowdham, Notts.

Open only to Exhibitors living in Cardigan, Radnor, Shropshire, Stafford, Warwick, Northampton, Bedford, Cambridge, Essex, or counties further north.
1. The Earl of Londesborough.
2. The Duke of Rutland.
3. Col. the Hon. C. Harbord.

Class **76.**—Newton Wonder.

First Prize, 20*s.*; Second, 10*s.*; Third, 5*s.*

Prizes presented by Messrs. J. R. Pearson & Sons, Lowdham, Notts.

Open only to Exhibitors living south of the before-named counties.
1. W. Stowers, Esq.
2. The Earl of Pembroke.
3. F. W. Thomas, Esq.

Class **77.**—Peasgood's Nonesuch.
1. The Hon. W. Lowther.
2. E. S. Hanbury, Esq., Ware (gr. F. W. Church).

Class **78.** Pott's Seedling.
1. J. K. D. Wingfield-Digby, Esq.
2. Sir Oswald Mosley, Bart.

Class **79.**—Stirling Castle.
1. Col. Archer-Houblon (gr. C. Ross).
2. R. M. Whiting, Esq.

Class **80.**—Waltham Abbey Seedling.
1. E. W. Caddick, Esq.
2. Col. Archer-Houblon (gr. C. Ross)

Class **81.**—Warner's King.
1. Nicholas R. Page, Esq.
2. J. Drakes, Esq.

Class **82.**—Any other variety not named above.

Four Prizes, 7*s.*, 6*s.*, 5*s.*, 4*s.*

An Exhibitor may only enter one variety in Class 82, in which Class 8 Fruits must be shown to a dish for the Judges to be able to taste two of them.

1. Col. Warde, M.P., Maidstone.
2. C. A. Morris-Field, Esq., Tunbridge Wells (gr. J. R. Allen).
3. B. H. Hill, Esq.
4. Col. Archer-Houblon (gr. C. Ross).

Choice Dessert Pears.

Class **83.**—Beurré Dumont.

1. No award.
2. T. L. Boyd, Esq.

Class **84.**—Beurré Hardy.

1. Mrs. H. St. Vincent Ames.
2. Col. Archer-Houblon (gr. W. Harrison).

Class **85.**—Beurré Superfin.

1. J. K. D. Wingfield-Digby, Esq.
2. W. Stowers, Esq.

Class **86.**—Comte de Lamy.

1. Col. the Hon. C. Harbord.
2. J. T. Charlesworth, Esq.

Class **87.**—Doyenné du Comice.

1. Col. the Hon. C. Harbord.
2. J. K. D. Wingfield-Digby, Esq.

Class **88.**—Durondeau.

1. Col. Warde, M.P.
2. J. K. D. Wingfield-Digby, Esq.

Class **89.**—Emile d'Heyst.

1. J. K. D. Wingfield-Digby, Esq.
2. Col. the Hon. C. Harbord.

Class **90.**—Fondante d'Automne.

1. H. C. Moffatt, Esq.
2. T. L. Boyd, Esq.

Class **91.**—Louise Bonne of Jersey.

1. E. A. Lee, Esq., Liphook (gr. J. Sherlock).
2. G. J. Gribble, Esq.

Class **92.**—Marguerite Marillat.

1. W. Stowers, Esq.
2. Mrs. Haywood.

Class **93.**—Marie Louise.

1. Col. the Hon. C. Harbord.
2. J. K. D. Wingfield-Digby, Esq.

Class **94.**—Pitmaston Duchess.
1. J. B. Fortescue, Esq.
2. B. H. Hill, Esq., J.P.

Class **95.**—Souvenir du Congrès.
1. Rev. T. McMurdie.
2. The Marquis of Northampton.

Class **96.**—Thompson's.
1. J. K. D. Wingfield-Digby, Esq.
2. Col. the Hon. C. Harbord.

Class **97.**—Triomphe de Vienne.
1. H. C. Moffatt, Esq.
2. T. L. Boyd, Esq.

Class **98.**—Williams' Bon Chrétien.
1. Col. G. B. Archer-Houblon (gr. W. Harrison).
2. Lord Belper, Derby (gr. W. H. Cooke).

Class **99.**—Any other variety not named above.
Four Prizes: *7s.*, *6s.*, *5s.*, *4s.*

An Exhibitor may only enter one variety in Class 99, in which Class 8 Fruits must be shown to a dish for the Judges to be able to taste two of them.

1. W. Stowers, Esq.
2. J. K. D. Wingfield-Digby, Esq.
3. Lord Howard de Walden.
4. Col. G. B. Archer-Houblon (gr. C. Ross).

SHOW OF COLONIAL-GROWN FRUIT AND OF PRESERVED AND BOTTLED FRUIT.

Held at the Society's Hall, Vincent Square, S.W., December 12 and 13, 1904.

The twenty-fifth and last show held by the Society in the year 1904 will ever be remembered as the first show of Colonial-grown fruit. Its occurrence in the year (1) of the Society's Centenary, (2) of the jubilee of the Colonial Office, and (3) of the granting of a charter to the West India Committee by His Majesty the King, was most opportune. A great deal more attention has of late years been directed to our Colonies and their possibilities, but considerable ignorance still exists as to their horticultural products. Although the idea of the Old Home Society holding exhibitions of Colonial produce has only been rendered possible for the first time this year, by the completion of the Society's New Centennial Hall in Vincent Square, Westminster, yet as far back as 1886 the Council urged (without effect) the Commissioners of the Indian and Colonial Exhibition to hold such a show in that year. It is, moreover, gratifying to think that much of the beautiful fruit shown in December 1904 was doubtless descended from the cuttings and grafts sent out three-quarters of a century ago by the Society from Chiswick to the then infant but now well-developed Colonies.

The date of this year's show was fixed principally for the advantage of the Canadian and West Indian exhibitors, but the Council decided to hold a second show of Colonial-grown fruits on Thursday and Friday, March 30 and 31, 1905, with a view to exhibiting such fruits as could not be looked for in perfection on December 13 and 14, 1904. This will be of especial service to South African growers, and the dates fixed for 1906 are March 22, 23, June 6, 7, December 4, 5, so as to suit all Colonies.

As might have been expected for a first experiment, the exhibits were not very numerous, but the result more than justified the experiment, and those who visited the exhibition saw perhaps for the first time in perfection such fruits as the Mangosteen, the Papaw, and the Mammee Apple.*

The show was open for a private view on the evening of Monday, December 12, when the guests invited included many well-known horticulturists, prominent Colonials now in England, the high officials of the Colonial, Indian, and Crown Agents' Offices, the Agents-General of the Colonies, the principal representatives of the West India Committee, the directors of the Steam Ship Companies, the Prime Minister, the Rt. Hon. Joseph Chamberlain, M.P., the Lord Mayor of London, the Mayor of Westminster, and other prominent citizens.

Sir Trevor Lawrence, President of the Royal Horticultural Society, addressed a few informal words of welcome to the Colonial exhibitors,

* For a description of the Fruits of the West Indies see pp. 625–643.

and commented upon the great development which had taken place in the supplies of fruit to this country from the Colonies. He spoke of the

Fig. 210.

immense advantages which would result from an increased importation of fruits and vegetables from our Colonies, and pointed to the display as furnishing a convincing proof of the adaptability of all the various fruits and vegetables to the British taste. Sir Daniel Morris, the Imperial Commissioner of Agriculture for the West Indies, had assured him that the Banana trade would one day attain immense proportions. He (Sir Trevor) said that if the Colonial producer would remember the importance of packing his goods in an alluring form the demand would increase still more. Sir Alfred Jones, Chairman of the Liverpool Chamber of Commerce, had been largely instrumental in developing the output of Bananas from the Canary Islands, and on the same lines much might be done by others. He was assured that the Yam, if treated as an ordinary Potato, would be considered a very excellent dish. Nothing could beat the Nova Scotian and British Columbian Apples for their looks. He hoped that in future shows of a similar character they would be able to command a much larger number of exhibits.

Several English exhibitors most opportunely sent exhibits of tropical fruits grown at home, and the Fellows of the Society and the visitors thus had an opportunity of comparing, perhaps for the first time, both home and colonial grown Pineapples, Bananas, Apples, and Oranges side by side.

LIST OF JUDGES.

The following gentlemen very kindly acted as Judges, and deserve the best thanks of the Society.

Class **1.**—Collection of Colonial Fruits.

A. M. Walker.
George Monro, V.M.H.

Classes **2–4.**—Apples and Pears.

George Bunyard, V.M.H.
A. H. Pearson.

Classes **5–10.**—Other Colonial-grown Fruits.

Algernon E. Aspinall.
George F. Butt.
Michael Garcia.

Classes **11–13.**—Bottled Fruits, &c. (Open Classes).

James Hudson, V.M.H.
William Marshall.
R. Hedger Wallace.

Classes **14** and **15.**—Bottled Fruits (Amateurs).

Miss Bradley.
Miss Mary Crooke.
Rev. W. Wilks.

Division I.

Colonial-grown Fruit.

Class **1.**– Collection of Colonial-grown Fruit.

Such things as Yams and Sweet Potatos may be include

Gold Medal.

The West India Committee (Algernon E. Aspinall, Secretary). Fig. 210.

Royal Mail Steam Packet Co. See fig. 211.

James Philip & Co. Fig. 210.

Fig. 211.

{ Class **2.**—Collection of Colonial-grown Apples (dessert).
{ Class **3.**—Collection of Colonial-grown Apples (cooking).

Gold Medal.

Government of British Columbia (Hon. J. H. Turner, Agent-General). See fig. 212.

Silver-gilt Knightian Medal.

Government of Nova Scotia (Major Howard, Agent-General).

Dominion of Canada (A. McNeill, Chief of the Fruit Division, Dept. of Agr., Ottawa).

Class **4.**—Collection of Colonial-grown Pears.

Class **8.**—Colonial-grown Grapes.
No entry.

The exhibits in Classes **5, 6, 7, 9,** and **10** for Pineapples, Bananas, Mangos, and other fruits, and for tubers, were shown in the general collections in Class **1**, and were consequently not judged separately; but the fruits shown proved clearly that the Colonies can more than hold their own against foreigners in our home markets.

Division II.

Preserved Fruits, Jams, &c.

Dried or preserved Fruits of any kind might be shown, subject to the condition of their being tested by the Judges, and provided that in Classes 11, 14, and 15 they have been grown in the British Islands, in Class 12 in a British Colony, and in Class 13 in a Foreign country.

Class **11.**—Home Preserved or Home Bottled British-grown Fruits. *Open.* This exhibit must not occupy a space greater than 8 feet by 6 feet, and must not be built up more than 2 feet high in the centre. Jams in clear glass jars or bottles; bottled fruits in clear glass bottles; small quantities of Fruits, preserved, dried, or evaporated in any other way, may be included, but all alike must be British grown and British prepared.

Silver-gilt Knightian Medal.

Miss Crooke, Lady Warwick College, Studley Castle, Warwickshire.

Sir Walter Gilbey, Bart., Elsenham Hall, Essex (gr. Wm. Pleston).

Silver-gilt Banksian Medal.

Fowler, Lee & Co., 78, Bank Street, Maidstone.

Yeatman & Co., Ltd., Denmark Street, E.

Silver Knightian Medal.

E. & T. Pink, for T. Haswell, Staple Street, S.E.

Class **12.**—Colonial-grown and Preserved or Bottled Fruits. *Open.* This exhibit must not occupy a space greater than 8 feet by 6 feet, and must not be built up more than 2 feet high in the centre. Jams in clear

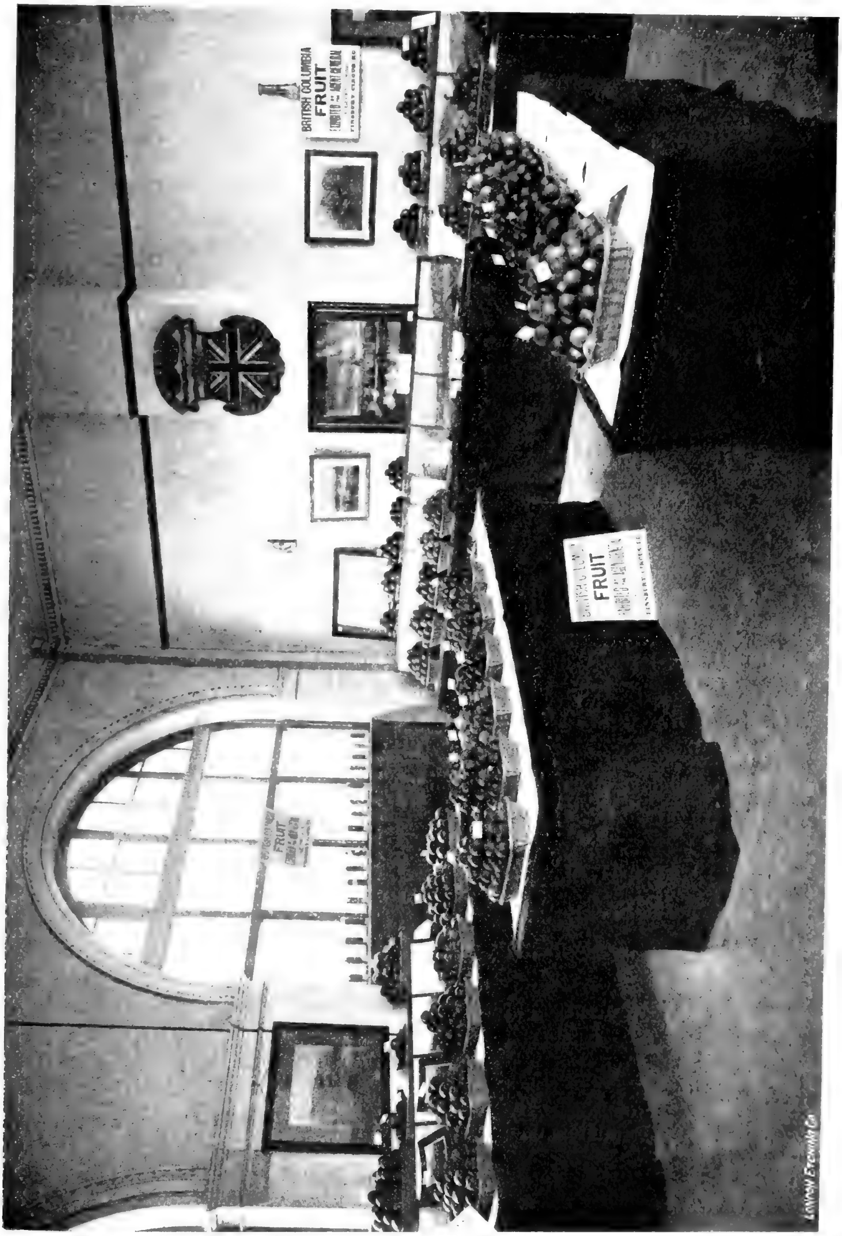


FIG. 212.—FRUITS FROM BRITISH COLUMBIA.

glass jars or bottles ; bottled fruits in clear glass bottles ; small quantities of Fruits, preserved, dried, or evaporated in any other way, may be included, but all alike must be Colonial grown and Colonial prepared.

Silver Banksian Medal.

The Superintendent of Forests and Gardens, Penang, S.S.

Other Exhibits and Awards included under Class 1.

Class **13.**—Foreign-grown and Preserved or Bottled Fruits. *Open.* This exhibit must not occupy a space greater than 8 feet by 6 feet, and must not be built up more than 2 feet high in the centre. Jams in clear glass jars or bottles ; bottled fruits in clear glass bottles ; small quantities of Fruits, preserved, dried, or evaporated in any other way, may be included, but all alike must be Foreign grown and Foreign prepared.

Bronze Banksian Medal.

Miss C. E. Martin (per Mrs. Miller), New York, U.S.A.

Class **14*.**—Exhibits of 18 bottles of Bottled British-grown Fruits (including six different kinds at least), bottled and shown by exhibitors who do not sell their produce or in any way work for the trade (wholesale or retail), but only and entirely for their own household consumption.

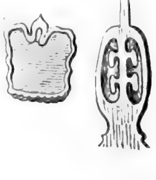
1. (£3.) Mrs. Banks, c/o C. P. Markham, Hasland Hall, Chesterfield.
2. (£2.) Mrs. E. Beckett, Aldenham Park, Elstree, Herts.
3. (£1.) Chas. O. Walker, Ickleton House, Wantage, Berks.

Class **15*.**—Exhibits of a dozen bottles of Bottled British-grown Fruits (including four different kinds at least), bottled and shown by exhibitors who do not sell their produce or in any way work for the trade (wholesale or retail), but only and entirely for their own household consumption).

1. (£2.) Mrs. W. H Plowman, Heath Cottage, Beddington Corner, Mitcham.
2. (£1.) Mrs. H. Yates Thompson, 19, Portman Square, W.
3. (10*s.*) Henry Bates, Salisbury Villa, Robertsbridge.

It is worthy of remark in passing that the first prize exhibit in this class was won by a cottager, who, although she used only an ordinary saucepan instead of any patent steriliser, was successful with an exhibit of Blackberries, Gooseberries, Pears, Plums, Raspberries, and Tomatos, five of the twelve bottles of which exhibit had been preserved over two years.

* Exhibitors might not enter in both Classes 14 and 15.



SCIENTIFIC COMMITTEE.

JULY 26, 1904.

Dr. M. T. MASTERS, F.R.S., in the Chair, and ten members present.

Aspen Poplar with galls.—Mr. Odell showed branches on which the globular galls of *Eriophyes pustulatum* were remarkably abundant.

Solanum muricatum (*S. guatemalense* hort.)—Mr. A. W. Sutton, V.M.H., exhibited fruiting plants of this species. The egg-shaped fruit is known as the "Melon-Pear." They are remarkably juicy and cool, with a distinct flavour, suggesting the name.

Heath malformed.—Mr. Kitson, of Newton Abbot, sent flowers of the common Heath, with the petals free, and only four stamens opposite the sepals, which were subpetaloid.

Carnation sport.—Mr. Roberts, of Croxley Green, Herts, sent a stem bearing two flowers, one a self, rose-coloured flower, and the other an ordinary bloom of 'Lottie Collins,' from a plant layered last year from the latter. The sport may possibly be a reversion to the rose-coloured flowers of the wild *Dianthus Caryophyllus.*

Peach Mildew.—Mrs. Chambers, of Hatfield Court, sent Peach leaves and fruits covered with mildew. Dr. Cooke reported as follows :

"This mildew is not common on Peach, but not uncommon on Plum. In this white mildewy stage it is an *Oidium* similar to that of the Grape, but in its mature condition would probably be *Podosphæra tridactyla*, JOURN. R.H.S. xxviii. p. 19, pl. xi. fig. 16. The remedy should be the same as recommended for Grape mildew—dusting with powdered sulphur, or with the addition of a little lime. It will not injure the fruit. Use sulphur at once, but I fear it is too late for this season. Burn all possible of the mildewy leaves, to prevent the spores spreading, as they are here by thousands."

SCIENTIFIC COMMITTEE, AUGUST 9, 1904.

Dr. M. T. MASTERS, F.R.S., in the Chair, and seven members present.

Datisca cannabina, Parthenogenesis in.—Mr. Odell showed female flowering branches with swelling ovaries; but as the pistil is protogynous, and the only male plant grew at a distance of a hundred yards, the fruit was apparently forming without fertilisation.

Proliferous Clover.—Mr. Odell also showed specimens of this not uncommon monstrosity, in which the carpels are virescent, the carpellary leaves being both simple and trifoliolate.

Cucumber-formed Melon.—Mr. Odell also exhibited a variety of Melon with the form of a large Cucumber. The form comes true by self-pollination.

Watsonia with aërial corms.—Mr. Chittenden showed stems bearing axillary corms similar to the bulbils normally occurring on bulbiferous Lilies.

Bamboo flowering.—Mr. Bowles showed a flowering spray of *Phyllostachys Boryana* of a remarkably elegant character, being superior in this respect to many of the other Bamboos.

Plantains with foliaceous bracts.—Mr. Bowles also showed specimens of *Plantago major* and *P. media* in this not rare condition. They come true from seed. He also brought leaves of a flowering spike of *P. maxima* from Greece.

Apples Falling.—Mr. Dunlop, of Loughgall, writes as follows:—"With regard to the great dropping of Apples, some varieties were very heavily 'set,' but very few remain, especially 'Royal Jubilee,' which hitherto has always set well. Other varieties have fallen elsewhere, *e.g.* 'Lord Derby,' but it is good here. The 'Queen' has also gone terribly, but that is its habit. It was noticed that bees were very scarce on the brightest days; would that have anything to do with the Apples falling off? Is there any list known of self-fertile Apples in this country? Is it true that some varieties self-fertile in one season may yet be sterile in another?" In reply to these questions Mr. Chittenden observed that, from his experiments with both Apples and Pears, as a general rule they require to be fertilised by insects; but 'Stirling Castle,' though usually self-fertile, was not so this year. With regard to Pears it was the same, but 'Conference' and 'Durondeau' are both self-fertile." As the Apples referred to as dropping appeared to have been regularly formed, it was thought that the great heat, acting upon heavy crops in an immature state, was the probable cause. It was not stated whether seeds were forming in the Apples or not.

White Melilot and Foxglove, produce of.—Prof. Henslow mentioned an instance of a seedling plant of Melilot which accidentally appeared in his garden. It grew to a height of 5 feet, and bore some 300 racemes of various lengths. These were arranged in seven groups according to length, and the average number of the one-seeded pods in each group was ascertained by counting them on some half-dozen or more racemes taken at random. The total number of seeds was thus found to be about 15,660. Each plant required an area of 3 square feet, as the longest branches spread over a circle with a diameter of 2 feet; so that this one plant would have supplied enough seed for 1 acre and 380 square yards. In the case of a gigantic plant of a Foxglove, the number of seeds was approximately a million and a half.

Sooty Fungus on Plum (Fumago vagans).—Mr. H. Cunynghame, C.B., sent leaves of Plum covered with blackish mildew. Dr. Cooke reported as follows:—"This black mould is very common on many trees, especially on the Lime, more rarely on orchard trees. Nearly always it thrives on the honeydew, secreted by the aphides which generally swarm on the leaves, before the appearance of the sooty mould. Generally it covers the whole tree, so that it is impossible to pick off all the diseased leaves. If taken early and the swarm of aphis destroyed there will be no honeydew, and consequently no sooty mould. It is scarcely possible to clean the tree when so badly affected as the leaves sent. It is too late for syringing now to do any good, but it should certainly be tried early another year, when the leaves are young, and watch should be kept for 'green fly' in April and May."

SCIENTIFIC COMMITTEE, AUGUST 23, 1904.

Dr. M. C. COOKE in the Chair, with nine members present, and Professor Liberty H. Bailey, of Cornell University, and Professor L. J. Jones, of Vermont University, Burlington, U.S.A., attended as visitors.

Diseased Potentillas.—Mr. Saunders, F.L.S., reported as follows on some specimens submitted to him :—" The diseased blossoms of a *Potentilla,* exhibited by Mr. Bowles, are attacked by eelworms, and probably by the species which is the cause of the ' Cauliflower disease ' in the cultivated Strawberry (*Aphelenchus fragariæ*), a disease which has been known to ruin nearly half the crop by rendering the flowers abortive. I am afraid that there is no real cure for this infestation, and that the best thing to do is to burn the affected plants and the soil round their roots. If the plant be a valuable one, it might be of use to cut away all the parts which show any sign of being infested, and to remove as much as possible of the soil round the roots. The following dressings have been found very useful in the case of Clover which was attacked by the ' stem eelworm ' (*Tylenchus devastatrix*) : three parts of sulphate of potash, and one of sulphate of ammonia or sulphate of iron."

Leaf-miner in Lilacs &c.—Mr. Saunders also reported that the leaves of the common Lilac, exhibited by Mr. Holmes, F.L.S., were attacked by the caterpillars of the "Lilac-moth" (*Gracillaria syringella*). The caterpillars had, however, all left the leaves to pupate. The Willow leaves also shown by him were attacked by a small beetle, *Phratora vitellinæ* ; and some other Willow leaves by the grubs of one of the saw-flies belonging to the genus *Nematus.* The leaves of the shoots of Black Currant, also submitted to Mr. Saunders, were covered with small transparent blister-like pustules, the cause of which he could not determine. On examining them under a microscope he could find no trace of insects, mites, or fungi in them. There were a few acari and thrips on the leaves, but they were not the authors of the pustules, nor of the injury to the leaves. Mr. Saunders suggested that the pustules may be of bacterial origin. Cut off and burn all the shoots bearing leaves which are affected.

Fungus on Charred Gorse.—Some specimens of fungi observed on Gorse after being burnt were submitted to Dr. Cooke.

Fungus on Cypripedium Leaf.—A leaf attacked by a fungus was submitted by Mr. Douglas, V.M.H., and referred to Dr. Cooke for examination.

Variegation in Ferns.—Mr. C. T. Druery, V.M.H., sent a unique and interesting example of symmetrical variegation in a British Fern in the form of a frond of *Polystichum angulare* var. *pulcherrima* Moly. found many years ago in Dorsetshire. The plant is perfectly constant, and, curiously enough, perfects its fronds as purely green ones, the variegation appearing subsequently as they ripen. The Fern is furthermore interesting as being the only known example of a constant aposporous form of *P. angulare,* the sickle-shaped, inferior pinnules developing prothalli from their tips when layered. The resulting sexual plants, however, are irregular and depauperate, with extremely rare exceptions. Mr. Druery was indebted for this plant to Dr. Stansfield, of Reading.

Rare Plants from Herr Henkel, of Darmstadt.—Dr. Masters, F.R.S., exhibited fruiting specimens of *Ribes pinctorum*, a native of New Mexico, bearing globular, purplish-brown berries thickly studded with long, stiff, bristly hairs. Also flowers of *Scutellaria baicalensis* with large bluish flowers like those of our 'Skull-cap,' but larger. It is described as a fine hardy herbaceous plant, flowering continuously in summer and autumn, and suitable for a warm and sunny place on the rockery or front row of the herbaceous border. With these came a plant of *Cyperus fertilis*, said to be a native of tropical Africa, with long green stems bearing close spikes of whitish bracts and flowers. It thrives in a partially shaded, moist situation, in a warm temperature. It makes a good plant for hanging baskets. The specimens were forwarded, at Herr Henkel's request, to the gardens of the Society at Wisley.

Pitcher-like Leaf of Pelargonium.—Mr. Malcolm Ball sent a leaf with a funnel-like outgrowth, such as is not uncommon in Cabbages &c.

Syncarpy in Apples.—Mr. Hugh Aldersey sent specimens of two Apples partially fused together at their base.

Variegated Maple.—Mr. F. Lloyd sent specimens of crippled foliage of *Acer Negundo variegatum* which had suffered some check to growth, and was attacked by aphides and other pests.

Fungus on Grass.—Rev. W. Wilks showed specimens affected with rust, *Uredo rubigo vera*.

Diseased Oats.—Mr. Hooper showed specimens of Oats apparently attacked with eelworm. The specimens were referred to Mr. Saunders for examination and report.

Castanopsis chrysophylla.—Dr. Masters showed fruiting specimens of this handsome Californian Chestnut. It has the lower surface of the leaves of a golden-yellow colour, and the bristles of the husk are of a rich purplish-brown. The specimen was received from Mr. Lindsay, of Edinburgh.

Twofold Nepenthes.—Dr. Masters, F.R.S., exhibited from Messrs. Jas. Veitch a specimen in which two leaves were joined at the base, so that the specimen had the appearance of a single leaf branched below the middle and each branch bearing a pitcher.

Currant Anthracnose.—Mr. Blair, of Blair, sent what proved to be a bad case of Currant anthracnose, *Glœosporium ribis* (see JOURN. R.H.S. 1903, xxviii. p. 35, pl. xii. fig. 32). Dr. Cooke advised: "When the fruit, if any, has been gathered, sprinkle the bushes with dilute Bordeaux mixture and gather up and burn all fallen leaves. Continue this weekly on all the bushes as long as there are any leaves. In the spring commence spraying again, as soon as the leaves expand, and repeat once a week until the berries are formed. It is only by persistent spraying that the disease will be prevented extending to all the bushes. It is a most difficult disease to combat when it establishes itself. Courage and perseverance can alone cope with it."

Scientific Committee, September 6, 1904.

Dr. M. C. Cooke, V.M.H., in the Chair, and five members present.

Pink Mould on Charred Wood.—Dr. Cooke, V.M.H., reported that the pink mould on burnt wood, sent by Mr. Saunders, was common on all kinds of vegetable matter, dead or decaying, and had recently been claimed as a parasite on Apples (Journ. R.H.S. xxviii. p. 233). The conidia are profuse, colourless, elliptical, and uniseptate when mature. It is called *Cephalothecium roseum.*

Orchid Leaves.—Dr. Cooke reported that the light-coloured spots on a Cypripedium-leaf forwarded by Mr. Douglas were deficient in chorophyll and semi-translucent, but contained no trace of fungi. The dark-coloured spots appeared to be scars from wounds, but contained no trace of fungi.

Supposed Damage from Foxglove.—Lady Roscoe inquired whether some deleterious substance did not come from Foxgloves which harmed other plants. She was also suspicious of *Nicotiana affinis* having the same effect, as plants near either seemed to languish. It was considered that any harm could only be done by the shade of the large leaves, or by the roots devouring all the food in the soil.

Diseased Oak.—Lady Mary Herbert sent specimens of disease in roots of Oak. The specimens plainly showed the marks of injury, and the disease had evidently been caused by water entering through the injured parts and causing ordinary decay.

Chermes laricis.—Lady Herbert also sent specimens of Larch attacked by this pest, now only too common. Nothing could be done, except to use one of the soft-soap and paraffin sprays.

Soil.—Mr. Dean, Wainsford, sent specimens of soil which it was proposed to use for Peach trees. It showed brown, thread-like marks following the decay of some previously existing roots. It was considered unsuitable for the purpose, as likely to engender fungus.

Nut-mite.—Adolph Reikmann, Esq., Mottingham, complained that having been compelled to destroy his Black Currants on account of the bud-mite, the insect (or one very like it) seemed now to be attacking his Filberts.

Checked Fungus Pests.—Dr. Cooke, V.M.H., read the following communication to the Committee:—

"A correspondent forwarded me recently the leaves from Apple trees of one special variety, which were plentifully marked with the orbicular spots which are characteristic of the Apple-leaf spot, *Septoria pyricola,* but which bore no perithecia, and consequently no fruit. Hence it is scarcely possible to be certain that the spots were caused by the *Septoria,* the identity of which depends upon the sporules, but any practical mycologist would have no hesitation in referring them to *Septoria pyricola.* With the leaves came the information that some trees were completely defoliated, and others partly so, besides which it was intimated that all the trees had been plentifully sprayed with ammoniated copper carbonate, and it was asked what further could be done.

"My inference from this communication, although only a hypothesis, is what I desire to lay before the Committee. If the spots are those caused by the *Septoria* in question, then the check to the development of the fungus, and the absence of fruit, must be due to some efficient cause, which cause I attribute to syringing with the fungicide. This being the case, although it did not prevent the spots or the defoliation, would necessarily stop the dissemination of the fungus, because of the absence of sporules to perform this act. I conclude, therefore, that if all the fallen leaves are collected and burnt, and the trees given the opportunity to recover themselves in the spring of next year (and as soon as the leaves begin to unfold themselves they should be treated again once a week with a diluted solution of ammoniated copper carbonate), it is highly probable that they will entirely cast off the disease and recover.

"From another source I received Cucumber leaves, spotted with the large pallid blotches so familiar of late on leaves of Melons and Cucumbers, as caused by the black mould *Cercospora melonis*. In this case also no hyphæ or conidia were formed; therefore it is not possible to be quite certain that the spots were caused by the *Cercospora*; but there is every reasonable ground to suppose that such was the case, and that from some cause the development of the mould was checked, and the production of fruit prevented. The correspondent in this case claims to have furnished the cause of the check to the development of the mould, by the use of potash in the soil, the details of which are not in my possession. It seems to me that the career of the *Cercospora* in this instance was suddenly and efficiently checked, and the cause assigned is a feasible one, which should be well followed up and tested, and then made known as widely as possible.

"These may appear to be trivial matters to urge upon the Committee; but I think in both cases, if proved to be true, the results will be the saving of thousands of pounds, as well as deliverance from a great source of anxiety to cultivators."

Scientific Committee, September 20, 1904.

Dr. M. C. Cooke, V.M.H., in the Chair, and eight members present.

Apple and Pear Blossom, Pollination of.—In reply to Mr. Dunlop's inquiry as to the advice that "no one variety of Apple should be largely planted by itself," Mr. Worsley observed that such dessert Pears as 'Marie Louise' require special conditions of temperature, about 70° F. in a dry place, for effective pollination. But it is not often that such perfect conditions obtain when the trees are in blossom, so that Pears of that variety are often regarded as "bad setters." It has been found that all choicer varieties do very much better when intermingled with commoner ones.

Oats Malformed.—Mr. Saunders, F.L.S., reported as follows upon some stunted Oats which were shown by Mr. C. H. Hooper on August 23:—"They were attacked by the stem-eelworm (*Tylenchus devastatrix*), causing them to become 'Tulip-rooted' or 'segged.' The best method of exterminating this pest is to burn all the stubble-roots &c. of the crop, and then to plough the land deeply (16 or 18 inches), so as to bury the eelworms so deeply that they cannot reach the surface again. As this pest is also the cause of the disease in Clover known as 'Clover sickness,' this crop should never immediately follow an infested crop of Oats. This pest is easily carried from one field to another by the soil attached to various implements, horses' feet, and the boots of labourers. The following dressings have been found of use in assisting an infested crop to 'grow away' from the pest, though I doubt if they have had much effect on the eelworms :—Sulphate of potash 1 cwt. per acre, 3 cwt. of sulphate of potash and 1 cwt. of sulphate of ammonia, or two parts of sulphate of potash and three parts of sulphate of ammonia, or sulphate of iron 3 cwt. per acre."

Grapes attacked by Insects.—The following is Mr. Saunders' report on samples sent from Blackheath :—"I have no doubt but that the insects attacking the Grapes are the caterpillars of *Batodes* (*Tortrix*) *angustiorana*; but the *Tortrix* caterpillars are so much alike, and the moths were in such bad condition, that I cannot speak positively. As to destroying the caterpillars, it seems almost impossible to suggest any means which would not spoil the Grapes, as any insecticide would impart a flavour to the fruit. Syringing with cold water might do some good, but it would have to be used with considerable force. I have not been able to find out where the chrysalides are formed. If in the ground, removing, say, 2 in. of the surface soil would be effectual; if they are formed on the stems or shoots of the Vines, then the latter should be carefully dressed. This would kill the chrysalides, which will be found in a silken web or cocoon. The walls and woodwork should also be well washed, so as to kill any which may be formed on them."

Iris and Fungi.—In reply to an inquirer as to the cure of the common Iris fungi, the Rev. W. Wilks gave his experience of dusting the plants with kainit once a fortnight or once in three weeks during autumn and spring. By this means he perfectly cured many badly diseased plants.

Peach Rot.—Dr. Cooke, V.M.H., reported as follows upon fruits received from Leeds :—"Undoubtedly the Peaches are suffering from a bad attack of *Glœosporium fructigenum*, which also attacks Apples, Grapes, Figs, and other fruits. It is dangerous, as it may soon extend to other trees, and is very difficult to exterminate, as it is deep-seated. Let all fruits be gathered and destroyed as soon as diseased spots appear. The only remedy we know is spraying with a solution of half-an-ounce of sulphate of potassium to one gallon of water. Application to be made at intervals of ten days."

Apple Canker.—Dr. Cooke exhibited branches of Apple suffering from canker. Surrounding the cankerous spots were tufts of slightly pinkish mould, which had been identified as the conidia of *Nectria ditissima*. Other and older cankers on thicker limbs showed no trace of either the conidia or the perfect *Nectria*, and would otherwise have been difficult to trace to their true cause, especially now that it is believed the *Glœosporium* also produces canker on Apple branches. With this evidence it would be tolerably clear that all the cankers on this tree were due to the *Fusarium*, which forms the initial stage or conidial form of the *Nectria*.

Lychnis with Grubs.—Mr. Saunders reported as follows upon specimens sent by Mr. Holmes :—"I should say that the small yellow grubs in the seed vessels of *Lychnis diurna* are those of a small two-winged fly, probably belonging to the family *Cecidomyidæ*. It is very difficult to name these little dipterous grubs unless you can rear the flies."

Scientific Committee, October 18, 1904.

Dr. M. T. Masters, F.R.S., in the Chair, and ten members present.

Bulbophyllum Weddelii.—Mr. Odell showed a spray of this Orchid, remarkable for the oscillating character of the labellum.

Dahlia virescent.—Mr. Saunders, F.L.S., showed some malformed flowers from a cottage garden, upon which Dr. Masters will report.

Echium, Dye from.—Dr. Plowright sent specimens and the following communication: "For some years past I have been endeavouriug to obtain specimens of *Lithospermum arvense*, in order to test its colouring properties; but I have neither been able myself to meet with specimens, nor have I been able to obtain any from my friends. At the suggestion of Mr. E. M. Holmes, I examined the roots of *Cynoglossum officinale* and *Echium vulgare*. In the first named I failed to detect any colour; but in the last named certain specimens contain alkannin in appreciable quantities. As is well known, *Echium vulgare* favours sandy [or limestone] soils, and it is often a brilliant ornament to our sandy lanes and barren places on heaths &c. At times it strays into cultivated light land. I have examined specimens from five localities near King's Lynn, in three of which the *Echium* roots were devoid of red colour, excepting, perhaps, the barest trace. In the other two the colour was developed in more or less extended patches on the main and secondary roots. The age of the plant does not seem to have much effect upon its production; but, if anything, it is more abundant in the biennial plant. The two localities which produced it in greatest quantity had this in common. They were both almost pure sand, but received the washings from the main road made of imported granite. In fields, whether manured or not, and in ordinary sandy habitats, the roots were devoid of colour. So were specimens growing on roadsides where any flint was employed as road metal. The probable explanation is that the disintegration of the granite yields an appreciable amount of potash. The alkannin is confined to the cortex. It is deposited in the cell-walls in a more or less patchy manner. By treatment with caustic potash the red cells are changed to bright blue. The coloured parts of the roots were treated with spirit of wine and oil of turpentine, both of which dissolved out the alkannin. Fragments of root were treated with white wax, with white hard paraffin, and with lard, to all of which the red colour was yielded. A disc covered with the alkannæ of commerce is also sent. My friend, Rev. H. E. Bishop, of Middleton Vicarage, near King's Lynn, has been successful in growing the true *Anchusa* (*Alkanna*) *tinctoria* in his rockwork garden. He has kindly supplied a specimen, from the root of which the accompanying specimen of lard was coloured pink, as well as a disc of white wax. The living plant and its flower were also sent. The red colour of the root is very marked. It contains much larger quantities of the colouring matter, of course, than does the *Echium*."

Corticium Chrysanthemi, n. sp.—Dr. Plowright also sent the following description of a new fungus, upon which Dr. Cooke will also report: "Effused, incrusting indeterminate, milk-white, with a filamentous substratum; spores oval, with a large nucleus, 5 to 8 by 3 to 5 μ. Parasitic on bases of the stems and roots of the cultivated Chrysanthemum, in gardens, King's Lynn. This species, which I have known for many years, is the common cause of death in old Chrysanthemum plants. It is closely allied to *Corticium sambuci*, but differs in its habit in being confined to the ground-line and just below, of its host. It extends both upwards and downwards for an inch or two, and mats together the affected stems and surrounding earth. It eventually causes the death of the plant it attacks."

Fruit-fly Parasite, Discovery of.—Mr. A. Sanderson, Chislehurst, sent an interesting account of Mr. G. Cowpere's discovery in Brazil of the parasite of the fruit-fly, well known as a devastator of orchards in South Africa, Jamaica, Bermudas, Italy, Spain, and Southern France, as well as Malta. After two years' travel and of search with no success, he finally discovered it in São Paulo, and succeeded in conveying it alive, by rendering it torpid by the refrigerator, to Australia. A difficulty arose in the seasons of Brazil and Australia not coinciding, so that Mr. Cowpere is feeding them artificially till the fruit season comes round. He found several other parasites, as of the black scale, which has revolutionised the treatment of the pest in California, where its success has convinced even the most sceptical. Mr. Cowpere secured a second parasite of the black scale in Brazil. He discovered also the codlin-moth parasite in Europe.

Plant Bug.—Mr. Saunders, F.L.S., reports as follows upon specimens sent by Miss Cope:—"The insect attacking the plants is one of the plant bugs (*Lygus pabulinus*), a common insect on various plants. The members of the bug family, unlike many other insects, when they emerge from the egg very much resemble their parents in general appearance, though of course they are much smaller; and this similarity increases as the insect grows, so that it is never in a dormant state, as other insects are when they become chrysalides. This is one reason why these insects are difficult to destroy. Many, however, might be killed by shaking the plants they are infesting over freshly tarred or painted boards or sheets of card or metal. Others might be destroyed by spraying the plants thoroughly with a solution of paraffin emulsion, or some other insecticide containing soft-soap. In the case of a plant growing against a wall it might be possible to so fasten up a tarpaulin or some thick canvas that the plant might be fumigated. I cannot suggest any other methods of destroying these insects."

Trichosanthes, Tendrils of.—Mr. Odell showed specimens of *T. Anguina* and *T. cucumerina*, the tendrils of which (resembling those of the Bryony) had adhered by adhesive pads to a flat wall in a similar way to Virginia Creeper. The usual method of climbing is to twist round some slender support.

Nerine sarniensis from Japan.—Mr. Worsley drew attention to the fact that he had received bulbs with other plants, presumably from Japan, and that both Kæmpfer and Thunberg in 1795 recorded it as a native ("Botanical Magazine," t. 294). It is said to be common in Nagasaki, and the question arose whether it had not reached Japan from the Cape, or whether those early botanists had confounded it with *Lycoris*.

Herbertia pulchella, Bulbs.—Mr. Worsley also showed specimens of bulbs of this plant with long brown scales, within which the bulb had grown downwards some inch or two, but without the aid of contractile roots.

Woods, Photos of.—Dr. Russell showed several remarkable photographs of sections of woods, taken by the action of the wood itself on a photograph plate in the dark. The spring (active) and the autumn wood (inactive) appeared as black and white concentric circles. The action is due to the presence of resinous matter, which gives rise to peroxide of hydrogen. In the autumn woods resin is present but cannot escape. It is remarkable that in the Larch, Cedar, and Deodar, the action of the spring and autumn layers is reversed (see "Proceedings of the Royal Society," vol. lxxiv.).

Laburnum Moth.—Mr. F. Townsend, F.L.S., sent specimens of small caterpillars caught descending by a silken filament from Laburnum trees in his garden at Honington Hall. Mr. Saunders reported as follows:—"The leaves of the Laburnum are attacked by the caterpillars of the 'Laburnum Moth' (*Cemiostoma laburnella*), one of the *Tineina*. The moths are most charming little insects, measuring rather more than a quarter of an inch across the wings when expanded. Their bodies are pearly grey, with a white spot on either side of each segment. The wings are silvery-white, with long fringes; the upper pair have yellow bands and a darker spot near their tips. There are two broods of this insect in the course of the season. The moths appear in May or June; they may be shaken out of the trees into a butterfly-net. The leaves which are infested should be gathered and burnt if possible. It is very essential to destroy the first brood so as to prevent the trees being attacked by the second. The chrysalides are formed either in the ground or on grass or other plants growing beneath the trees. The caterpillars all seem to come to maturity at the same time, for I have on more than one occasion seen them hanging in the air by hundreds. When this is the case they may easily be caught on newly painted or tarred boards, or by the aid of a birch broom."

Scientific Committee, November 1, 1904.

Dr. M. T. Masters, F.R.S., in the Chair, and nine members present.

Nerine, Hybrids.—Mr. Worsley brought interesting specimens of hybrid varieties raised by himself.

Hippeastrum, Hybrid.—Mr. Worsley also showed the result of a cross between *H. aulicum* ♀ and *H. equestre* ♂. It was strictly intermediate. Also a hybrid between *H. aulicum* ♀ and *H. vittatum* ♂.

Pears, crossed and self-fertilised.—Mr. Chittenden showed drawings illustrating the results on 'Durondeau.' The Pears had nearly the same mean size, with the exception that the width across the upper part was on the average of $2\frac{1}{3}$ inches in the self-pollinated and $2\frac{5}{8}$ inches in that of the crossed. With regard to the optimum temperature required for the fertilisation of Pears, Mr. Worsley observed that 70° was necessary for 'Marie Louise.' Mr. Walker remarked that it was useless to attempt to grow 'Marie Louise' on the Welsh coast. Mr. Bunyard said that 'Gloria Mundi' was a bad self-fertiliser, but was very good with other pollen. The fruit usually bore furrows: these disappeared from the fruit if the flower had been crossed. With regard to the 'Beauty of Kent,' it bore well on chalk, according to Mr. Chittenden. Other varieties were alluded to, from which it would seem that the nature of the soil and climate, as well as pollination, were matters for consideration.

Gazania, foliaceous.—Mr. Hooper showed an inflorescence in which the bracts of the involucre had become long and leaf-like, while the florets of the head were abortive.

Twin Maize Seedlings.—Mr. Chittenden showed two seedlings arising from a single grain. On examination they proved to be from two embryos standing on opposite sides of the grain, with a single mass of endosperm between them.

Black Apple Rot.—Dr. Cooke, V.M.H., reported on this disease as follows:—"The Black Apple submitted to the Committee was stated to be one of several found amongst stored Apples. The whole fruit was pitchy-black in colour, and the rind became rather tough and leathery, but there was no external sign of wound or cicatrice. Cut in section the core in the centre was hollow, and full of a loose white mycelium. The substance of the Apple was uniformly brown and rotten. In the centre, and around the hollow core, were a number of irregular shaped sclerotiform bodies, from the size of a hempseed to a diameter of half an inch, but too soft and immature to hope for any success in their culture. Perhaps in a more advanced state of decay the sclerotia may be found to have hardened, and become more promising for culture. Throughout the brown rotting pulp rather thick threads of mycelium were scattered. It seems scarcely possible to arrive at any conclusion about this disease from the preliminary investigation. It would appear to have connection with fungi of a certainty, but whether the cause of the rotting or discoloration, or whether merely a saprophyte following decay, has yet to be determined. The white flocculent mycelium and the sclerotiform bodies remind one of the sclerotium disease of Potato haulms and other herbaceous stems. The remains are under bell-glasses for observation of any development of *Botrytis*. We know of no disease of the kind already recorded.

"Massee has suggested that it is probably a condition of the 'brown rot' which is attributed to *Monilia fructigena*, and I am quite disposed to accept his suggestion, which the presence of sclerotia seems to strengthen, since sclerotia, producing a form of *Peziza* as its ultimate development, have been detected in the centre of fruits attacked by the *Monilia*."

Presumed Corticium on Chrysanthemum.—Dr. Cooke also reported on this disease:—"The specimens submitted must be supposed to be typical of what has been described as *Corticium chrysanthemi* (Plow.).

"Examination of these specimens fails to show any hymenium, or basidia, or any evidence of their belonging to the Basidiomycetes. There is certainly a white floccose incrustation, not distinctly different from the same kind of thing which is found on the exterior of old Potato haulms, Tomato stems, Cucumber stems, and even old Chrysanthemum stems, and is a prelude to the sclerotia which have been found afterwards in the centre of such stems, giving rise to that form of *Peziza* which has been called *Sclerotinia sclerotiorum* (Mass.).

"Moreover, the evidence is not forthcoming that this white flocculent matter occurs upon the stems of Chrysanthemum during active life, and that it is a true parasite, and not a saprophyte. No suggestion has been made of any attempt to inoculate healthy plants with this assumed parasite. We have failed to discover that the fungus mycelium belongs to the Basidiomycetes, and hence that it is either *Corticium* or *Hypoclinus*. We find also that it is equally consistent and probable that the fungoid growth belongs to the preliminary condition of the sclerotium disease of Potato haulms and other similar plants, and that, with a known disease sufficient to account for the appearances, it is at least unwise to assign another problematical cause."

Scientific Committee, November 15, 1904.

Dr. Masters, F.R.S., in the Chair, with ten members present, and Mr. Webb, visitor.

Prof. Henslow.—On the motion of Dr. Masters, it was resolved that "This Committee, on hearing of the resignation of its Secretary, the Rev. Prof. Henslow, V.M.H., desires to place on record its sense of gratitude for the unvarying courtesy and marked ability he has shown in the disinterested discharge of his duties during a period of a quarter of a century. The Committee trusts that, although the Professor is compelled by circumstances to retire from the regular duties of his office, it may still be able to profit by his experience and to welcome him occasionally at its meetings." The resolution was carried by acclamation, all the members up-standing.

Mignonette attacked by Eelworms.—Mr. Saunders, F.L.S., reported on plants sent from Hillingdon:—"The plants were badly attacked. The best thing to do is to burn all infected plants, and the soil they are growing in. Every care should be taken that none of the soil should get mixed with soil that is not infected, either on the potting-bench or elsewhere; and the pots in which the plants were growing should be baked or thoroughly boiled before being used again."

Palm-scale.—Mr. Saunders reported upon Palm-leaves attacked by scale: "The specimens sent are the scale insects, *Aspidiotus hederæ*, a very common insect on various plants in stoves and greenhouses. The best means of destroying them is to wash them off with a sponge and soft-soap and water, or a solution of paraffin emulsion. A detailed description is given in *Newstead's Coccidæ*. The eggs of these insects are laid beneath the scale of the female, and when the young are hatched they spread themselves over the plants until they find a suitable position; they then thrust their proboscis into the leaf and remain in that place for the rest of their lives."

Roots attacked by various pests.—With reference to some Daisies, Mr. Saunders observed that "it is a good way to destroy various pests which are attacking the roots of a plant, when you lift it, to thoroughly drench the soil with boiling water. This destroys any of the pests which may be left in the ground. The soil from the roots of the lifted plant should be removed as far as possible before it be replanted, and the roots washed."

Puccinia gentianæ (Strauss).—The three following communications were received from Dr. Plowright:—"On *Gentiana Amarella* on the Chalk Downs near Salisbury (Mr. E. J. Tatum, September 19, 1904). This *Puccinia* has not, I believe, been previously recorded as the host-plant in England. It grew far away from cultivation, and can hardly have been introduced, as the specimens found some years ago in Kew Gardens probably were. The *Puccinia* was found in the following month (October 1904) on the same host-plant, about seventeen miles distant from the first locality."

Rhizoctonia violacea (Tul.).—"This disease is not at all a common one in this part of East Anglia, according to my experience. This year, however, it has attacked certain crops of Carrots. The specimen sent shows how the violet mycelium has eaten into the middle of the Carrot. It has also attacked the apex and completely arrested the development of the root. The specimen came from Terrington St. Clement, near King's Lynn."

Ustilago hypodytes (Schlecht.).—"The specimen sent was found by Mr. E. J. Tatum, near Salisbury, in June last. The host is *Bromus erectus*—a plant on which the fungus is rare in England. It is, of course, extremely improbable that the various forms on *Triticum repens*, *Elymus arenarius*, and *Bromus erectus* are identical."

Lucombe Oak.—Mr. Elwes, V.M.H., exhibited acorns and cups from a tree, the latter being like those of *Quercus Cerris*, this and the Cork Oak having been the parents of this hybrid. It was seldom that the acorns were not attacked by grubs. The numerous specimens of the Lucombe Oak in existence are grafted plants.

SCIENTIFIC COMMITTEE, NOVEMBER 29, 1904.

Dr. MASTERS, F.R.S., in the Chair, and nine members present.

Galls on Nepeta Glechoma.—Mr. Saunders, F.L.S., reported on these, brought by the Rev. W. Wilks, as follows:—"The galls are by no means uncommon on this plant. They are formed by the grub of one of the Hymenopterous gall-flies belonging to the family *Cynipidæ* (*Diastrophus glechomæ*). The insect is now in the imago state, apparently quite ready to leave the gall in the spring."

Mignonette diseased.—Mr. Saunders reported as follows upon plants sent to the last meeting from Bexley Heath:—"The Mignonette is rather a puzzle. The plants resemble in every particular, both externally and internally, those I examined from another source, which were reported on at the meeting on the 15th inst., but the latter were badly attacked by eelworms. Just at the point where the root ends and the stem begins there was a hollow space, and the cells round it were broken up: in this space, and among the cells, were, in both the plants that I examined, a number of eelworms. I have since examined nearly, if not quite, a dozen of the plants from Bexley Heath, and in most of them there were the hollow space and the broken-up cells, but not a single eelworm could I find, which surprised me very much. These creatures pass part of their existence in the soil, and it is just possible that they may have left the plants for that purpose. The roots were much curled and twisted about. I could not find any sign of insects or fungi." With regard to eelworms in the soil, Mr. Douglas observed that they were killed if the fresh loam was stacked with London dung while the latter fermented (four loads of loam to one of dung). Mr. Odell stated that eelworms were often found in the dung of animals fed on clover-hay, proving a source of infection.

Fasciated Gourd.—Mr. Odell showed a remarkable Gourd, which had the stem closely joined to the fruit-wall along one side. A tendril was growing from the stem about the middle of its junction to the fruit. All the fruits produced on the plant while it was young were similar to this, but those produced later were normal.

Carpentaria, Diseased Leaves of.—Dr. Cooke gave the following report:—"The leaves of *Carpentaria* are badly affected with leaf-spot of a very common kind, produced by a fungus of the genus *Phyllosticta*, although the species is not very decided. In such cases it is advisable to collect and burn all the diseased leaves possible, and not to allow them to remain on the ground, as they are liable to develop a higher form of fructification in the winter, and produce *sporidia* in the spring, which will attack the young and healthy leaves. Spraying with Bordeaux mixture in spring at intervals of a fortnight may prevent the spread of the disease."

Apple Scab &c.—A letter was handed in by Mr. C. H. Hooper, in which attention was drawn to the prevalence of Apple scab this season, and of moulds on Apples in the fruit store. His correspondent said:—"I think I shall master it by burning a piece of sulphur the size of a pea on a piece of live coal twice a week. But I have little doubt formalin (40 per cent.) is the proper remedy to prevent the growth of fungi in a fruit store. . . . One cannot be too careful about the kind and condition of wood used for shelf-fixing (slate shelves are in use). Many sorts of fungi start from wood." Several members mentioned the great abundance of "scab" this season.

Flora of the Belgian Sand Dunes.—Dr. Masters showed a number of photographs illustrating the physical features and flora of the dunes of the Belgian coast, the Botanic Garden at Coxyde among the dunes, and the method of retaining the sand by the growth of Poplars and other means.

Scientific Committee, December 13, 1904.

Dr. Masters, F.R.S., in the Chair, with nine members present, and Messrs. W. G. Freeman, Watson, and Hillier, visitors.

Eelworms in Mignonette.—Mr. Saunders further reported on these:—"1. The worms, after making their way into the plant, feed on the contents of the cells. In the two plants from Hillingdon, both, just at the point where the root ends and the stem begins, were hollow, and the cells round this space were much broken up with a number of eelworms working among them. 2. The presence of eelworms in soil cannot be ascertained except by careful examination under a microscope; a very tedious operation; the worms are so small that they are not visible under even a strong lens."

Fungus on Plum Stump.—Mr. Hooper showed specimens of *Xylaria hypoxylon* from the stump of a Plum tree.

Weed on Lawn.—Specimens of the troublesome lawn weed *Prunella vulgaris* were received. It was recommended to manure the lawn with sulphate of ammonia and other nitrogenous manure to promote the growth of the grass.

Plants from Rhodesia.—Specimens of *Afzelia quanzensis* and an Orchid, *Ansellia africana*, were sent from Rhodesia for naming.

Oranges attacked by Scale.—Fruits and leaves of Orange badly attacked by the scale insect, *Aspidiotus aurantii*, were received from the British Vice-Consul at Seville.

Fruit of Jasminum officinale.—Ripe fruits of this plant, which rarely fruits in England, where shown by Mr. Chittenden. The fruits were found at Chelmsford on a plant raised from seed ripened at Plymouth.

West Indian Fruits.—A number of fruits cultivated in the West Indies were shown and commented upon by Mr. Freeman, including the Papaw (from which papain is obtained), the Bread-nut, Pater-nut, Sapodilla, and *Citrus Medica.*

Canarina campanulata.—Mr. Moore sent specimens of this plant, a native of the Canaries, in flower, from Glasnevin.

FRUIT AND VEGETABLE COMMITTEE.

JULY 26, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Hogg Memorial Medal.

To Messrs. Veitch, Chelsea, for a magnificent collection of Gooseberries.

FIG. 213.—RASPBERRY 'PENWILL'S CHAMPION.' (*Journal of Horticulture.*)

Silver Knightian Medal.

To the Marquis of Salisbury, Hatfield (gr. Mr. Norman, V.M.H.), for Figs and Peaches.

To H. L. Bischoffsheim, Esq., Warren House, Stanmore (gr. Mr. Ellis), for Pineapples.

Other Exhibits.

Lord Belper, Kingston Hall, Derby (gr. Mr. Cooke), sent Cucumber 'Progress.'

Mr. Penwill, Totnes, staged Raspberry 'Penwill's Champion.' (Fig. 213.)

Messrs. Spooner, Hounslow, brought Apples.

Mr. Yates, Sutton, Hounslow, sent Pea 'Purple Pod.'

Capt. Holford, C.I.E., C.V.O., Westonbirt (gr. Mr. Chapman), staged Melons.

Mr. Deal, Kelvedon, sent Peas.

Messrs. Sutton, Reading, staged *Solanum muricatum* syn. *S. guatemalense,* known in the Canary Islands as the 'Melon-Pear,' and in America as the 'Pepino.' The fruits are the size and shape of a hen's egg, pale yellow in colour, slightly tinged with purple streaks, very fleshy and juicy. As the fruits contain no seed, the plant must be propagated by cuttings. It is of bushy habit and very ornamental when in fruit, and succeeds well in a cool greenhouse.

Mr. Will Tayler, Hampton, brought Peach 'Libra.'

Mr. Parr, Trent Park, Barnet, staged Melons 'Trent Park.'

Rt. Hon. Joseph Chamberlain, M.P., Highbury (gr. Mr. Deacon), sent Melon 'High Scarlet,' not quite ripe.

Messrs. Rivers, Sawbridgeworth, brought Peach 'Duke of York.'

Messrs. Lack, Wellingborough, sent Gooseberries and Red Currants.

Mr. Morris, Bowden Hill, Chippenham, staged Melon 'Bowden Favourite.'

Fruit and Vegetable Committee, August 9, 1904.

Mr. A. H. Pearson, in the Chair, and thirteen members present.

Awards Recommended :—

Silver Knightian Medal.

To the University College, Reading (gr. Mr. Foster), for a collection of fruit and vegetables.

Silver Banksian Medal.

To Miss Adamson, Regent's Park (gr. Mr. Kelf), for a collection of Plums.

Other Exhibits.

W. Roupell, Esq., Streatham, sent Apples 'Mr. Gladstone.'

Mr. Crampton, Sissinghurst, brought Potato 'Southern Star.'

J. Hodges, Esq., Queen's Wood Avenue, Highgate (gr. Mr. Pelley), staged Grapes.

Mr. Gregory, Royston, sent a Melon.

Sir A. K. Osborn, Bart., Chicksands Priory, Shefford (gr. Mr. Ellett), staged Apple 'Mr. Gladstone.'

Mr. Penwill, Totnes, brought Raspberry 'Penwill's Champion.'

F. A. Bevan, Esq., Trent Park, Barnet, sent Melons and Tomatos.

Col. Simpson, Shirley Park, Croydon (gr. Mr. Cook), sent Peaches and Tomatos.

Messrs. Rivers, Sawbridgeworth, staged Peaches and Plums.

Four Oaks Sundries Co., Sutton Coldfield, sent the Four Oaks Syringe.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 23, 1904.

Mr. CHEAL in the Chair, and nine members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Bunyard, Maidstone, for a collection of Apples.
To Messrs. Cannell, Swanley, for a collection of fruit.

Silver Banksian Medal.

To Messrs. Spooner, Hounslow, for a collection of Apples and Pears.

Cultural Commendation.

To Mr. Crook, Forde Abbey, Chard, for 'Moorpark' Apricots.
To W. Roupell, Esq., Streatham, for 'Lady Sudeley' Apples.

Other Exhibits.

Sir Pryse Pryse, Bart., Gogerddan, Cardiganshire (gr. Mr. Winstanley), sent Melon 'The Baronet,' which the Committee wished to see again, considering it a very promising variety.

Mr. Penwill, Totnes, sent Raspberry 'Penwill's Champion.'

Mr. Oldham, Easingwold, sent Tomato 'Ashby Favourite.'

Mr. Deal, Kelvedon, staged Potato 'Excelsior,' and Runner Bean Brooklands Scarlet.'

Mr. Kent, Norbury Park, Dorking, brought Melons 'Kent's A1' and 'Norbury Hero'; the latter the Committee asked to see again.

Col. Davis-Evans, Highmead, Llanybyther (gr. Mr. Fox), sent Melon 'Glanusk Favourite,' not quite ripe.

Mr. Colwill, Sidmouth, sent Raspberry 'Colwill's Red Diamond,' a very fine variety, which the Committee asked to see again.

Col. Simpson, Shirley House, Croydon (gr. Mr. Cook), staged Tomato 'Shirley Favourite,' Peaches, and Grapes.

Messrs. Bunyard, Maidstone, brought Apple 'Bielo Borodawka,' an improved 'Duchess of Oldenburg,' of great cropping quality.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 6, 1904.

Mr. A. H. PEARSON in the Chair, and fourteen members present, including Mr. Gilbert, the German Emperor's gardener at Potsdam.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. W. Paul, Waltham Cross, for fruit trees in pots.

Silver Knightian Medal.

To Mrs. Brightwen, The Grove, Stanmore (gr. Mr. Odell), for Gourds and Cucurbits.

Silver Banksian Medal.

To G. Ferguson, Esq., Weybridge (gr. Mr. Smith), for Gourds.

Fig. 214.—Raspberry 'Colwill's Red Diamond.' (*The Garden.*)

(*To face page* clxxix.)

Bronze Knightian Medal.

To Capt. A. E. Speer, Esher (gr. Mr. Perry), for Gourds.

Award of Merit.

To Raspberry 'Red Diamond' (votes, unanimous), from Mr. Colwill, Sidmouth. Fruit very large and conical, dark red in colour, and pleasantly acid in flavour. Fruiting branches were shown bearing immense crops. (Fig. 214.)

Cultural Commendation.

To W. Roupell, Esq., Streatham, for 'Bietigheimer Red' Apples.

To Mr. Lye, Sydmonton Court, Newbury, for very fine 'Sydmonton Exhibition' Runner Beans.

Other Exhibits.

Mr. Kent, Norbury Park, Dorking, sent Melon 'Norbury Hero.'

Earl of Carnarvon, Highclere Castle (gr. Mr. Pope), staged a small collection of Apples.

Mr. Aldridge, Teddington, brought a seedling White Grape.

H. J. Veitch, Esq., East Burnham Park, sent a collection of Gourds.

Mr. Osman, Sutton, staged a collection of Gourds.

Mr. Gilbert, Drachenberg, Potsdam, brought Grape 'Drachenberger Seedling,' which the Committee decided was very similar to 'General de la Marmora.' A vine was promised for trial in the Society's Gardens.

Mr. Otteway, Swanley, sent Apple 'Otteway's Pippin.'

Mr. Seward, Hanwell, brought Tomato 'Hanwell Victory,' very similar to 'Frogmore Selected.'

Messrs. J. Veitch, Chelsea, staged Tomato 'Gilbert's Seedling.'

Col. Archer-Houblon, Welford Park (gr. Mr. Ross), sent Apples and Plums.

Mr. Penwill, Totnes, sent Raspberries.

Mr. Anker, Kensington, brought a new fruit picker.

G. Ferguson, Esq., sent Vegetable Marrow 'Bon Goût.'

Swanley College, Swanley, staged Gourds.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 20, 1904.

Mr. BUNYARD, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Gold Medal.

To Lord Aldenham, Elstree, Herts (gr. Mr. Beckett), for a wonderful collection of vegetables.

Silver Knightian Medal.

To Messrs. J. Veitch, Chelsea, for pot vines.

To Messrs. Peed, Streatham, for 100 dishes of fruit.

Silver Banksian Medal.

To the Duke of Rutland, Belvoir Castle (gr. Mr. Divers), for a collection of Plums.

Bronze Banksian Medal.

To Messrs. Harrison, Leicester, for a collection of Tomatos.

Award of Merit.

To Apple 'Rev. W. Wilks' (votes, unanimous), from Messrs. J. Veitch, Chelsea. Fruit very large, of fine form, creamy-yellow in colour, and sparsely covered with minute brown and scarlet dots, eye closed with long segments, set in a moderately deep basin slightly furrowed; stalk one inch long, thick, and deeply inserted in a wide, deep cavity, lined with russet. Flesh white, juicy, and pleasantly flavoured, and should prove an

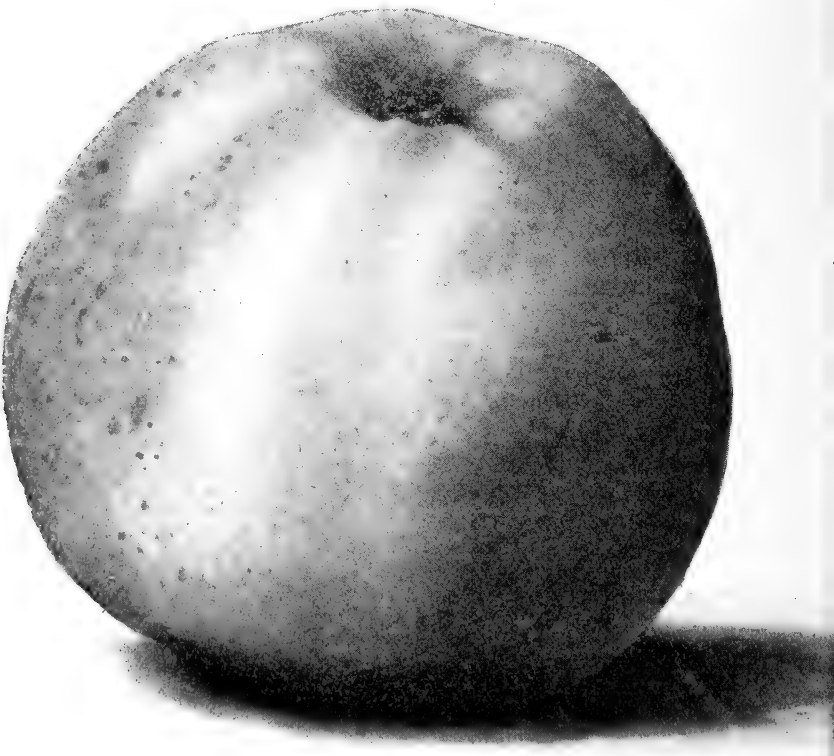


FIG. 215.—APPLE 'REV. W. WILKS.' (*The Garden.*)

excellent cooking Apple. The tree was said to be a vigorous grower and free bearer. Raised from 'Peasgood Nonsuch' × 'Ribston Pippin.' (Fig. 215.)

To Crab 'Veitch's Scarlet' (votes, 9 for, 1 against), from Messrs. J. Veitch. Raised from Crab 'Red Siberian' × Apple 'King of the Pippins.' A very handsome brilliant red fruit of a roundish-oval shape, and borne in large clusters. The flavour was very acid, and it may, therefore, be useful for cooking, but its chief value will be for ornament.

To Crab 'Frettingham's Victoria' (votes, 9 for), from Mr. Frettingham, Notts. Fruit a flat round, of a bright red colour and very ornamental. The tree is stated to bear profusely as a standard or bush.

To Strawberry 'Eythorpe Perpetual' (votes, 15 for), from Miss Alice de Rothschild, Eythorpe, Aylesbury (gr. Mr. Gibbs). This variety was said to be raised from 'St. Antoine de Padoue' crossed with another variety. The fruit is bluntly round, scarlet, with prominent yellow seeds, flesh pink, and of excellent flavour, and greatly superior to the ordinary autumn fruiting Strawberries.

Cultural Commendation.

To Mr. Blick, gr. to Martin R. Smith, Esq., for very fine 'El Dorado' Potatos.

To Mr. Beckett, gr. to Lord Aldenham, Elstree, for excellent 'Aldenham Pink Perfection' Celery.

Other Exhibits.

Messrs. J. Veitch sent a collection of outdoor Tomatos.

Col. Davies-Evans, Highmead, Llanybyther, sent Melon 'Glanusk Favourite' over ripe.

Miss Hitchcock, Chelmsford, sent a seedling Apple.

E. Hartridge, Esq., Stanmore, brought several bunches of Grapes.

Lady Frederick Fitz-Roy, Balcombe, sent a very old Peach 'Blood Red,' which has a purplish-black skin, with flesh of a deep mulberry colour, but of somewhat inferior flavour.

Mr. Cummins, Welton, Lincoln, staged Tomatos.

Mr. Colwill, Sidmouth, sent Raspberry 'Red Diamond.'

Mr. Aldridge, Teddington, sent a seedling Grape synonymous with 'Foster's Seedling.'

Messrs. Barr, Covent Garden, brought a collection of Brassicas.

Mr. Stiling, Livermere Park, Bury St. Edmunds, sent 'Barrington' Peaches, under the name of 'St. Edmunds.'

Mr. Bull, Bernards, Cottenham, brought Apple 'Sir W. Harcourt.'

Fruit and Vegetable Committee, October 4, 1904.

Mr. Bunyard, V.M.H., in the Chair, and thirty-one members present.

Awards Recommended:—

Award of Merit.

To Apple 'King's Acre Bountiful' (votes, 11 for, 3 against), from King's Acre Nursery Co., Hereford. Fruit large roundish conical, skin pale yellow, slightly flushed on the sunny side, stalk one inch long, inserted in a moderate russety cavity, eye partly closed in a shallow basin, flesh brisk, and should cook well. Season, September and October. Parentage not known.

To Apple 'Werder's Golden Reinette' (votes, 19 for, 5 against), from Messrs. J. Veitch, Chelsea. A dessert variety of handsome appearance and suitable size, somewhat like a flat 'King of the Pippins,' but of a more golden colour. Flesh crisp, juicy, and good flavour. Season October.

To Apple 'Hector MacDonald' (votes, 20 for), from Mr. Ross, gr. to Col. Archer Houblon, Welford Park, Newbury. Fruit very large and of handsome shape, intermediate between 'Peasgood Nonsuch' and 'Lane's Prince Albert'; flesh firm and very brisk in flavour. It should prove an excellent mid-winter variety.

To Pear 'S. T. Wright' (votes, unanimous), from Messrs. J. Veitch, Chelsea. Raised from 'Beurré Bachelier' × 'Williams' Bon Chrétien.' Fruit of medium size, tapering gradually to the stalk, which is one inch

FIG. 216.—PEAR 'S. T. WRIGHT.' (*The Garden.*)

long, and not inserted in a cavity; eye small and open; skin yellow, thickly coated with russet, flesh melting, and of delicious flavour. Season Michaelmas. (Fig. 216.)

Cultural Commendation.

To Mr. Roberts, Ye Cottage, Watford, for very fine fruiting branches of Apple 'Emperor Alexander.'

To Mr. Harris, gr. to A. Sutton, Esq., V.M.H., Bucklebury Place, Berks, for exceptionally fine 'St. Joseph' Strawberries.

To A. B. H. Goldschmidt, Esq., Cavenham Park, Suffolk, for excellent 'St. Joseph' Strawberries.

Other Exhibits.

Sir A. H. Dunbar, Bart., Duffus House, Elgin, sent three varieties of Scotch Apples.

J. B. Fortescue, Esq., Dropmore, Maidenhead, sent Pear 'King Edward.'

Mr. Gribble, Wynyard Park, Stockton-on-Tees, staged Grape 'Wynyard Hanipool' very similar to a poorly coloured 'Madresfield Court.'

Mr. Martin, Fentiman Road, Clapham, brought Grapes grown in a cool house.

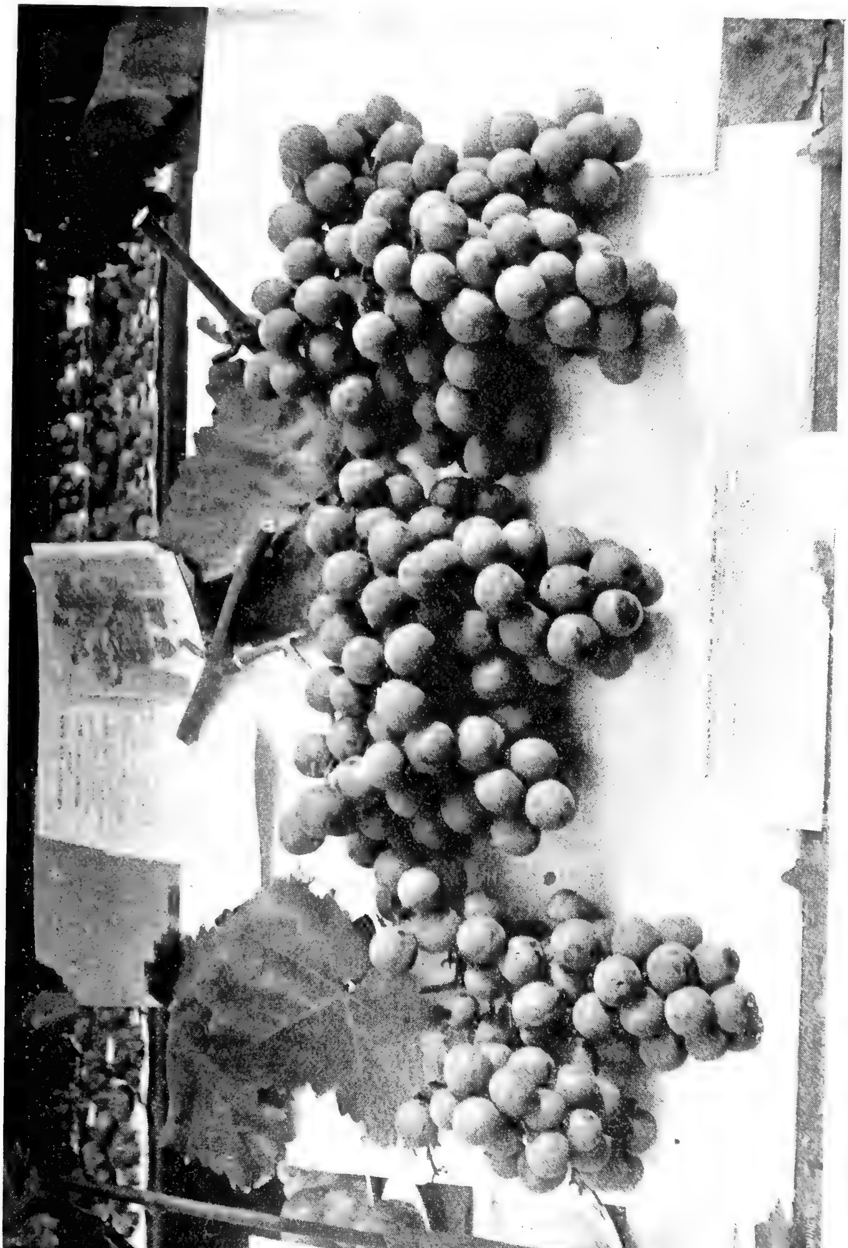


Fig. 217.—Grape 'Melton Constable.'

Mr. Williams, Whitbourne Hall, Worcester, sent Apple 'Ideal,' which the Committee asked to see again.

Mr. Prowse, Wroughton, Wilts, brought Apple 'Prowse's Seedling.'

Mr. Raschen, Sidcup, staged several varieties of Apples.

Mr. Ambrose, Cheshunt, staged Grape 'Melton Constable.' (Fig. 217.)

Mr. Sturges, Givons, Leatherhead, sent several varieties of American Grapes.

Messrs. Bath, Wisbech, sent Apple 'Green Harvey,' which the Committee asked to see again.

Messrs. Davies, Yeovil, staged Apple 'Autumn Pearmain.'

E. W. Caddick, Esq., Ross, sent Apple 'Caradoc Scarlet.'

Fruit and Vegetable Committee, October 18, 1904.

Mr. Bunyard, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended:—

Gold Medal.

To the Agent-General for British Columbia, for a superb collection of Apples, Pears, and Plums.

Silver-gilt Hogg Medal.

To Roger Leigh, Esq., Barham Court, Maidstone (gr. Mr. Woodward), for a collection of fruit.

Silver-gilt Knightian Medal.

To J. A. Nix, Esq., Tilgate, Crawley (gr. Mr. Neal), for a collection of fruit.

To University College, Reading, for a collection of fruit and vegetables.

To Messrs. Baker, Wolverhampton, for a collection of Potatos.

Silver Knightian Medal.

To Lady Tate, Streatham (gr. Mr. Howe), for Grapes.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for vegetables.

To Mr. Williamson, Mallow, Cork, for a collection of Potatos.

First-class Certificate.

To 'Langley' Bullace (votes, unanimous), from Messrs. J. Veitch, Chelsea. This excellent Bullace received an Award of Merit, November, 4, 1904, and by reason of its great cropping qualities, size, and general excellence it now received the higher award.

Cultural Commendation.

To Mr. McDonald, Cornilla Lacey, Dorking, for very large fruits of Pear 'Pitmaston Duchess.'

To the Agent-General for British Columbia, for immense highly coloured fruits of Apple 'Wolfe River.'

Other Exhibits.

The Rev. C. C. Ellison, Bracebridge, Lincoln, sent Apple 'Ellison's Orange Pippin.' A very promising variety indeed, raised from 'Cox's

Orange Pippin' × 'Calville Blanche.' It is very like a Cox both in appearance and flavour, but it is said to be far less tender, both in the blossom and as regards canker.

Mr. Coleman, North Frith, Tonbridge, sent Apples 'Coleman's Crimson' and 'Autumn Beauty.'

Mr. Morrow, Leominster, staged Apples 'Saxby Pippin' and 'Robert Morrow Market Apple,' the latter a very handsome fruit but of poor quality.

F. Boyes, Esq., Beverley, sent a seedling Apple raised from 'Cox's Pomona,' and somewhat resembling the parent.

Mr. Berwick, Sidmouth, sent Apple 'Autumn Pearmain,' sometimes known as 'Alexander Russet,' a very old and very good West of England variety.

Messrs. Brown, Peterborough, staged Apples 'Carlton Seedling' and 'Triumph' which the Committee desired to see in comparison with 'Baron Wolseley.'

Messrs. J. Veitch, Chelsea, brought Apple 'H. Ballantine' raised from 'Peasgood Nonsuch' × 'St. Edmunds Pippin,' a promising-looking variety.

Messrs. Cannell staged Apple 'Beauty.'

Mr. Winnard, gr. to the Hon. F. G. Wynn, Glynllivon Park, Carnarvon, sent Melon 'Glyn Royal,' of very pleasant flavour for so late in the season.

Mr. Wythes, V.M.H., gr. to the Duke of Northumberland, Syon House, sent a seedling Melon raised from 'Hero of Lockinge' × 'Syon House.'

Fruit and Vegetable Committee, November 1, 1904.

Mr. Bunyard, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—

Hogg Medal.

To Mr. Ross, gr. to Col. Archer-Houblon, Welford Park, Newbury, for eighteen varieties of Apples of his own raising. It is probable that this exhibit was unique in the history of gardening; at all events it was sufficiently remarkable for a man to be able to show eighteen good varieties all raised by himself. (Figs. 218 and 219.)

Silver Banksian Medal.

To Mr. King, Biddenham, Bedford, for a collection of Apples.

Cultural Commendation.

To Canon Ellacombe, Bitton Vicarage, Bristol, for very fine fruits of *Diospyros Kaki*, the Persimmon.

Other Exhibits.

Mr. Vokes, Kingsworthy, Winchester, sent seedling Apples.

Mr. Smith, Shotesham Park, Norwich, sent Apple 'Leslie Smith.'

Mr. Faulkner, Inkpen, Hungerford, sent Nuts.
Mr. Strugnell, Rood Ashton, staged Apple 'Rambour Franc.'
Mr. Lane, Kynaston, Ross, sent several unnamed seedling Apples.

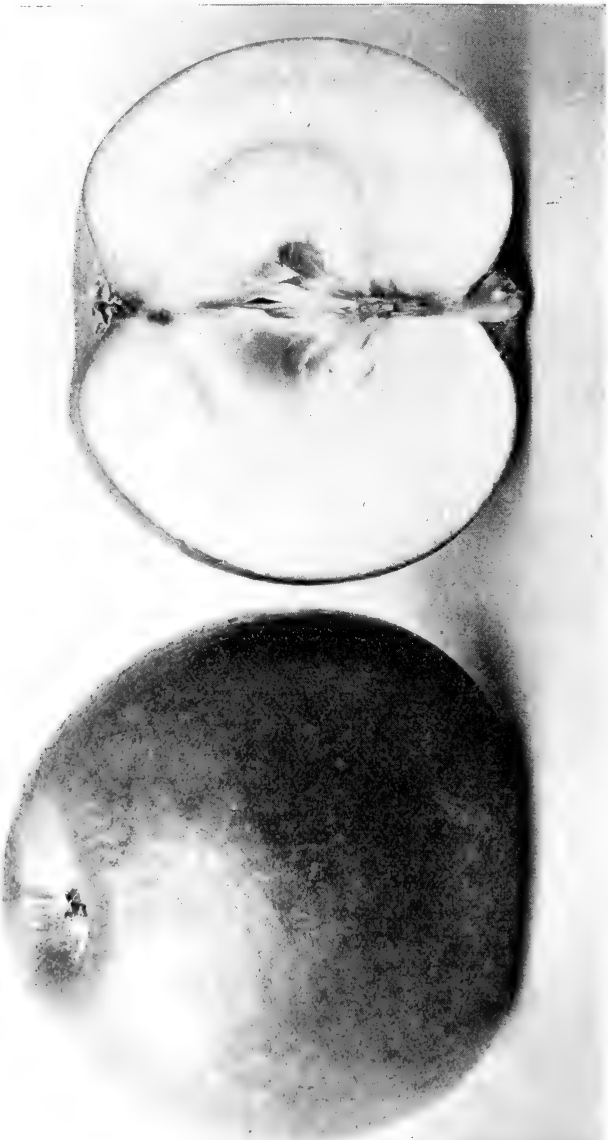


Fig. 218.— pple 'Charles Ross.' (*The Garden.*)

Mr. King, East Hernden, sent Potatos and Apples.
Messrs. Brown, Peterborough, staged Apple 'Triumph.'
Messrs. J. Veitch, Chelsea, brought Apple 'H. Ballantine.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMEBR 15, 1904.

Mr. CHEAL in the Chair, and sixteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To the Duke of Westminster, Eaton Hall, Chester (gr. Mr. Barnes), for a collection of fruit.

FIG. 219.—APPLE 'RIVAL.' (*The Garden.*)

Silver Banksian Medal.

To E. S. Godsell, Esq., Camscross House, Stroud, for a collection of Grapes.

To Messrs. Wallace, Dunstable, for Apples.

Other Exhibits.

Messrs. Green, Wisbech, staged Potatos.

Mrs. Carr, Dunstable, sent a seedling Apple.

Mr. Clayton, Grimston Park, Tadcaster, sent Walcheren Broccoli.

Mr. Hammond, Pilgrims Hatch, Brentwood, staged Apple 'Invery Pippin,' evidently a seedling from 'Blenheim Orange.'

Messrs. Ambrose, Cheshunt, brought Grape 'Melton Constable,' which the Committee desired planted in the Society's Gardens.

J. T. Bennett-Poë, Esq., Holmwood, Cheshunt (gr. Mr. Downes), staged large bunches of 'Mrs. Pince' Grapes.

Messrs. J. Veitch, Chelsea, sent Apple 'Marquis of Lansdowne,' raised from 'Bismark' × 'Cornish Gilliflower.' The fruit was past its best.

Messrs. Sutton, Reading, staged 'Christmas Rhubarb,' grown in the open air without protection.

Mr. Woodward, Barham Court, Maidstone, brought large fruits of Pear 'Charles Ernest.'

Mr. Crook, Forde Abbey, Chard, sent Apples.

Mr. Beck, Cooksbridge, staged Apples.

Fruit and Vegetable Committee, November 29, 1904.

Mr. A. H. Pearson in the Chair, and twelve members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Sir Chas. Russell, Bart., Swallowfield Park, Reading (gr. Mr. Cole), for a collection of fruit.

To the Earl of Carnarvon, Highclere Castle, Newbury (gr. Mr. Pope), for a collection of Onions.

Silver Banksian Medal.

To Mrs. Noble, Henley-on-Thames (gr. Mr. Powell), for retarded Potatos. These were grown from retarded tubers of Potatos, which were placed in a Cucumber frame on October 17, and just covered with soil; no haulm was made, but a quantity of small tubers were formed, which were of excellent quality when cooked. 'Windsor Castle' was said to be one of the best and most prolific varieties for this purpose, and 'Up-to-Date' one of the worst. See p. 481.

To Messrs. Brown, Peterborough, for Apples and Pears.

Other Exhibits.

The Earl of Stradbroke, Henham Hall, Norfolk (gr. Mr. Simpson) sent Apple 'Fenn's Seedling.' A promising variety of large size, which the Committee desired to see again.

Messrs. Laxton, Bedford, staged Apple 'Bedford Scarlet.'

Messrs. Ambrose, Cheshunt, brought Grapes.

Mr. F. G. Brewer, Brentwood, sent Potato 'Eblingford's Seedling,' which the Committee wished tried at Wisley.

Mr. Newbery, Exeter, sent Apple 'Newbury's Pippin.'

Mr. Keane, Wicklow, staged Apple 'Keane's Seedling.'

W. Roupell, Esq., Streatham, staged Apple 'Chelmsford Wonder.'

Mr. Branton, Hedon, sent a seedling Apple.

Fruit and Vegetable Committee, December 13, 1904.

Mr. Bunyard, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Cannell, Swanley, for a collection of Apples wonderfully coloured.

Silver-gilt Knightian Medal.

To Lord Llangattock, The Hendre, Monmouth (gr. Mr. Coomber), for Pineapples.

Silver Knightian Medal.

To Sir W. Pearson, Bart., Paddockhurst, Worth (gr. Mr. Wadds), for Musas and Oranges in tubs and pots.

To Messrs. Cheal, Crawley, for a collection of Apples.

Silver Banksian Medal.

To R. M. Holland, Esq., Overbury Court, Tewkesbury, for a collection of dried fruit.

Award of Merit.

To Potato 'Peckover' (votes, 11 for, 4 against), from Mr. Boyce, Welney, Wisbech.

To Potato 'Queen Alexandra' (votes, unanimous), from Mr. Coleman, Culverden Down, Tunbridge Wells. Both these varieties had been tried at Wisley (see page 219).

Cultural Commendation.

To Mr. Hudson, V.M.H., gr. to Leopold de Rothschild, Esq., Gunnersbury House, for Bitter Oranges.

To Hon. A. H. T. de Montmorency, The Grange, Carrickmines, Dublin, for new Potatos—'Sir John Llewelyn'—grown from tubers exhibited at the Temple Show in May last.

Other Exhibits.

Col. Archer-Houblon, Welford Park, Newbury (gr. Mr. Ross), sent Pears 'R. D. Blackmore' and 'General Wauchope.'

Messrs. Ambrose, Cheshunt, sent Grapes.

Col. Brymer, M.P., Ilsington House, Dorchester (gr. Mr. Powell), sent an unnamed Pear, which the Committee asked to see again with further particulars, and under a name.

Mr. M.'F Sinclair, Union Street, Aberdeen, staged Potato 'Earl Marischal,' which the Committee requested should be sent for trial to the Society's Gardens.

Mr. Raschen, Sidcup, brought two varieties of Apples.

Mr. Cowles, Ipswich, sent Apple 'Sir Walter Blackett's Favourite.'

R. B. L. Monk, Esq., Fulshaw Hall, Wilmslow (gr. Mr. Traill), sent Apple 'Royal Seedling.'

FLORAL COMMITTEE.

July 26, 1904.

Mr. Marshall in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Gladioli.

To L. Currie, Esq., Minley Manor, Farnborough, for Water-lilies.

To P. Waterer, Esq., Fawkham, for Phlox.

To the Marquis of Salisbury, Hatfield (gr. Mr. Norman), for Carnations.

Silver-gilt Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for Carnations and Fuchsias.

To Mr. Prichard, Christchurch, for hardy plants.

Silver Flora Medal.

To Messrs. Jones, Shrewsbury, for Carnations and Sweet Peas.

To Messrs. Ware, Feltham, for Carnations.

To Messrs. Hill, Edmonton, for Ferns.

To Messrs. Dobbie, Mark's Tey, for Violas and Pansies.

To Messrs. Webb & Brand, Saffron Walden, for Hollyhocks.

To Mr. Dutton, Bexley Heath, for Carnations.

Silver Banksian Medal.

To Mr. May, Edmonton, for miscellaneous plants.

To Messrs. Cutbush, Highgate, for Carnations.

To Messrs. Cuthbert, Southgate, for Lilies.

Bronze Flora Medal.

To Mr. Perry, Winchmore Hill, for hardy plants.

To Mr. Russell, Richmond, for stove plants.

Award of Merit.

To Carnation 'Daffodil' (votes, unanimous), from Mr. Douglas, V.M.H., Great Bookham. A very pretty pale yellow flower, of good form and substance, and with no sign of a split calyx, but nearly scentless.

To Carnation 'The Old Guard' (votes, unanimous), from Mr. Douglas. A large flower of a pleasing shade of crimson, but nearly scentless.

To Gladiolus 'Leader' (votes, 15 for), from Messrs. Kelway, Langport. The spike and flowers are large and of canary-yellow colour.

To Gladiolus 'Aphrodite' (votes, 10 for, 5 against), from Messrs. Kelway. A strikingly bold, pure white variety.

To *Gentiana dahurica* (votes, 9 for), from Messrs. Cutbush, Highgate. A dwarf prostrate variety with growths about 10 inches long, and leaves about $1\frac{1}{2}$ inch long and $\frac{1}{2}$ inch wide. The flowers have a white tube, with deep blue segments. It should prove an acquisition for the Alpine garden.

Other Exhibits.

Messrs. Laing, Forest Hill, sent Begonias.

Mr. Boyes, Leicester, staged Carnations.

Messrs. Wallace, Colchester, brought herbaceous plants.

Messrs. Bull, Chelsea, staged stove plants.

Messrs. Peed, Streatham, sent Carnations.

Messrs. Phillips & Taylor, Bracknell, brought Carnations.

Messrs. Hobbies, Dereham, staged Roses &c.

Messrs. Low, Enfield, sent Carnations.

Mr. Upton, Guildford, sent hardy flowers.

Messrs. Gibson, Leeming, brought hardy flowers.

Messrs. Carter, High Holborn, staged Petunias.

Messrs. Cheal, Crawley, sent hardy flowers and ornamental foliage.

Messrs. Bath, Wisbech, brought Carnations.

C. B. Gabriel, Esq., Horsell, Woking, sent Begonias.

Mr. Hedges, Catford, sent *Tillandsia angustifolia.*

Mr. Eschweiler, Oudenbosch, Holland, sent *Diervilla hortensis nivea variegata.*

Messrs. Stokes, Trowbridge, sent Campanulas.

Mrs. Harcourt Rose, Newick, staged Carnations.

The Earl of Harrington, Elvaston Castle, Derby (gr. Mr. Goodacre), sent Carnations.

Mrs. Bulteel, Sefton Park, Slough, sent Carnations.

Mr. John Scott, Brooklyn, N.Y., sent *Nephrolepis exaltata Scottii.*

Floral Committee, August 9, 1904.

Mr. May in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. Dobbie, Rothesay, for Sweet Peas.

To Mr. Mortimer, Farnham, for Dahlias.

Silver Banksian Medal.

To Messrs. Bull, Chelsea, for Tree Ferns.

To Messrs. Hill, Edmonton, for *Brainea insignis.*

To Mr. May, Edmonton, for flowering plants.

To Messrs. Jas. Veitch, Chelsea, for Begonias and Annuals.

To Lord Aldenham, Elstree (gr. Mr. Beckett), for *Streptocarpus* and Pentstemons.

To Messrs. Cuthbert, Southgate, for Lilies and Phloxes.

Award of Merit.

To *Campanula hybrida* 'Isabel' (votes, 14 for), from Mr. Prichard, Christchurch. A dwarf spreading plant with flower stems about six inches high, with broad, flattish, dark blue flowers more than two inches across, and very floriferous. A very handsome rock plant.

To Dahlia 'Radium' (votes, 11 for, 2 against), from Messrs. Stredwick, St. Leonards-on-Sea. A cactus variety with large flowers of excellent form, of a pleasing shade of orange suffused with fawn, and a yellow centre.

To Begonia 'Washington' (votes, 10 for), from Messrs. J. Veitch, Chelsea. A remarkably dwarf tuberous variety, with sturdy habit and medium-sized foliage, above which was a mass of brilliant scarlet double flowers. If this variety proves good for bedding it will be a great acquisition.

To Gladiolus 'Miss Zena Dare' (votes, unanimous), from Messrs. Kelway, Langport. A lovely variety with creamy-white flowers shading to lemon, and bright red veins in the lower petals.

To Gladiolus 'Valdora' (votes, 15 for), from Messrs. Kelway. A bold striking variety of the largest type. The segments are white, with the lip a pale yellow, which is lined and spotted with purple.

Other Exhibits.

Messrs. Cutbush, Highgate, staged herbaceous plants.

Mr. Perry, Winchmore Hill, brought herbaceous plants.

Messrs. Barr, Covent Garden, sent Cannas and Gladioli.

Mr. Prichard, Christchurch, staged hardy plants.

Messrs. Gunn, Birmingham, sent Phloxes.

Messrs. Cheal, Crawley, brought herbaceous plants.

Mr. Douglas, V.M.H., Great Bookham, sent Carnations.

Mr. Blyth, Castle Douglas, N.B., sent seedling *Anthemis*.

H. W. G. Morris, Esq., Chipping Norton, staged Carnations.

Mr. Ross, Alexandria, N.B., sent Chrysanthemums.

Mr. Robson, Altrincham, brought Bouvardias.

Mr. Shoesmith, Woking, staged Dahlias.

R. Brocklebank, Esq., Haughton Hall, Cheshire, sent *Ribes sanguineum aureum*.

Mr. Marc, Champreys, Tring, sent *Acalypha musaica Cowburnii*.

Martin R. Smith, Esq., Hayes (gr. Mr. Blick), brought Carnations.

Messrs. Rockford, Broxbourne, staged *Adiantum Harrisonii*.

Floral Committee, August 23, 1904.

Mr. Marshall in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. Gwillim, New Eltham, for Begonias.

Silver Flora Medal.

To Mr. Prichard, Christchurch, for herbaceous plants.

To Messrs. Laing, Forest Hill, for Begonias.

Silver Banksian Medal.

To Mr. May, Edmonton, for miscellaneous plants.

To Messrs. Ware, Feltham, for Dahlias.

To Messrs. Peed, West Norwood, for Gloxinias.

To Mr. Perry, Winchmore Hill, for herbaceous plants.

To Messrs. Barr, Covent Garden, for herbaceous plants.

Award of Merit.

To Dahlia 'Blush Queen' (votes, unanimous), from Mr. Mortimer, Farnham. A lovely flower of moderate size and fine form; the colour is a beautiful rosy-peach, merging to a delicate creamy-white at the centre.

To *Tamarix hispida æstivalis* (votes, 13 for), from Messrs. Turner, Slough. This is one of the most charming varieties of *Tamarix* we have seen. The elegant branching spike is covered with pretty rosy flowers, shown to advantage against the dark glaucous foliage.

Botanical Certificate.

To *Gladiolus primulinus* 'Maid of the Mist' (votes, unanimous), from F. Fox, Esq., Alyn Bank, Wimbledon. Mr. Fox stated that this plant grows in the "Rain Forest" immediately in front of the Victoria Falls of the river Zambesi, exposed to perpetual spray. The foliage is about 3 feet long, narrow, with a distinct vein running down the centre all the length. The peduncle is 3 feet long, with six or seven lovely pale yellow flowers. (Fig. 220.)

Other Exhibits.

Messrs. Jas. Veitch, Chelsea, sent miscellaneous plants.

Miss Easterbrook, Fawkham, Kent, brought a delightful basket of wild flowers.

Messrs. Turner, Slough, staged a collection of *Hibiscus*.

Mr. Kent, Norbury Park, Dorking, sent *Lobelia oculata*.

Mr. Bull, Rathlin, Ramsgate, sent Gladiolus.

Messrs. Proctor, Chesterfield, staged Carnations and Picotees.

Mr. Shoesmith, Woking, brought Dahlias.

Messrs. Felton, Hanover Square, staged Chrysanthemums.

Mr. Watts, Bronwylfa, St. Asaph, sent Carnations.

Mr. Hamlin, Gordon Road, Worthing, brought Lobelias.

Floral Committee, September 6, 1904.

Mr. Marshall in the Chair, and twenty-five members present.

Awards Recommended:—

Silver-gilt Flora Medal.

Messrs. Cannell, Swanley, for Cannas.

Silver-gilt Banksian Medal.

To Mr. Prince, Longworth, for Roses.

Silver Flora Medal.

To Messrs. Blackmore & Langdon, Bath, for Begonias.

To Messrs. Gunn, Birmingham, for Phloxes.

FIG. 220 —GLADIOLUS PRIMULINUS 'MAID OF THE MIST.'
(*Journal of Horticulture.*)

Silver Banksian Medal.

To Messrs. Hill, Edmonton, for Ferns.
To Mr. Perry, Winchmore Hill, for hardy plants.
To Messrs. Wallace, Colchester, for hardy plants.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias.

Award of Merit.

To Begonia 'Argus' (votes, unanimous), from Messrs. Blackmore & Langdon. A tuberous variety with medium-sized brilliant scarlet flowers, which are freely produced on stout stalks. It was tried in the Society's Gardens and proved an excellent bedding variety.

To *Campanula Fergusoni* (votes, unanimous), from G. Ferguson, Esq., Weybridge. This variety was raised from *C. pyramidalis* × *C. carpatica*, and is intermediate in habit and also in the flowers. The growth is sturdy and about 18 inches high, bearing large quantities of bright pale blue flowers. It should be a very useful plant both for pots and open border.

To Dahlia 'Fairy' (votes, 14 for, 2 against), from Messrs. Stredwick, St. Leonards. A cactus variety with small white flowers, with a tinge of green in the centre of each.

To Dahlia 'J. B. Riding' (votes, unanimous), from Messrs. Stredwick. A cactus variety of unique colour, being a deep orange suffused with salmon, shading to a pale yellow centre. The flower is of good size and of true cactus form.

To Dahlia 'Wm. Hopkins' (votes, 12 for, 3 against), from Mr. Shoesmith, Woking. A very handsome cactus variety, with dark crimson flowers shading into the centre; all the petals are beautifully quilted.

To Dahlia 'Edina' (votes, unanimous), from Messrs. Turner, Slough. A rather small Pompon variety, of perfect form and of a rich yellow colour.

To Pink 'Florence' (votes, 10 for, 5 against), from Messrs. Ladhams, Southampton. Flowers pure white at the margins, with a very dark crimson-maroon centre. It is said to bloom continuously for months.

Cultural Commendation.

To Mr. Holloway, gr. to G. H. Baxter, Esq., Hutton Park, Brentwood, for a magnificent plant of *Davallia figiensis*.

To Mr. Bain, gr. to Sir Trevor Lawrence, Bart., Burford, Dorking, for immense flowers of *Ixora Duffii* and *I. macrothyrsa*.

Other Exhibits.

Messrs. Peed, Streatham, staged alpines.
Mr. D. Russell, Brentwood, sent hardy Ericas.
Messrs. Bull, Chelsea, sent stove plants.
Mr. Ladhams, Southampton, brought hardy flowers.
Messrs. Carter, High Holborn, sent Petunias.
Messrs. Cuthbert, Southgate, staged Lilies.
Messrs. Wells, Redhill, sent Chrysanthemums.
Messrs. Barr, Covent Garden, brought hardy flowers.

Fig. 221.—Clematis 'Grata.' (*Journal of Horticulture.*)

(*To face page* cxcvii.)

Mr. May, Edmonton, staged Bouvardias.
Messrs. R. Veitch, Exeter, sent Cassias and Hypericums.
Mr. Brown, Four Oaks, sent Carnation 'Marjorie.'
The Hon. Walter Rothschild, M.P., sent a few choice Nymphæas.

Floral Committee, September 20, 1904.

Mr. Marshall in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.
Messrs. Cheal, Crawley, for Dahlias.

Silver-gilt Banksian Medal.

To Messrs. Cannell, Swanley, for Dahlias.

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Dahlias.
To Mr. West, Brentwood, for Dahlias.
To Messrs. Dobbie, Rothesay, for Dahlias.
To Messrs. Hobbies, Dereham, for Dahlias.

Silver Banksian Medal.

To Mr. Jones, Lewisham, for Asters.
To Messrs. Barr, Covent Garden, for herbaceous plants.
To Mr. Prichard, Christchurch, for herbaceous plants.
To Messrs. Wallace, Colchester, for herbaceous plants.

Bronze Flora Medal

To Messrs. Blackmore & Langdon, Bath, for Begonias.
To Messrs. Ware, Feltham, for Dahlias.

Bronze Banksian Medal.

To Messrs. Harkness, Hitchin, for Gladiolus.

Award of Merit.

To Aster 'Perry's Favourite' (votes, 13 for, 5 against), from Mr. Perry, Winchmore Hill. Flowers an inch across, of a deep rosy-lilac colour, produced in great profusion.

To Clematis 'Grata' (votes, unanimous), from Messrs. Brown, Peterborough. A hard-wooded variety, with masses of small pale lavender flowers, shading to nearly white, borne in abundance on long axillary racemes. The exhibitor said that it flowered equally freely on plants that had been cut back, and on those unpruned. (Fig. 221.)

To *Colletia spinosa* (votes, unanimous), from Lord Aldenham, Elstree (gr. Mr. Beckett). This plant was introduced from Chili and Peru nearly a century ago, and as the specimen exhibited had been grown in a cool and exposed position out of doors, it proves that it is much hardier than is usually believed. The small white flowers are freely produced in scattered fascicles, and are most deliciously scented. The leaves are entire, elliptic, with very strong awl-shaped spines.

To *Hypericum patulum* var. *Henryi* (votes, unanimous), from Messrs. R. Veitch, Exeter. A very fine variety, and an improvement on *H. patulum*; the flowers are over three inches across, and of bright yellow colour. The plant grows about two feet high, and is quite hardy.

To *Hydrangea Hortensia nivalis* (votes, 15 for), from Messrs. Bull, Chelsea. A remarkably fine foliage plant. Not only is the foliage heavily marked with white, but the stems are also white.

To Dahlia (Cactus) 'Alexandra' (votes, unanimous), from Mr. Mortimer, Farnham. Flowers large, of excellent form; deep crimson, shaded with maroon.

To Dahlia (Cactus) 'Lord of the Manor' (votes, unanimous), from Mr. Seale, Sevenoaks. Very large, of fine form, and of a brilliantly dazzling red colour.

To Dahlia (Cactus) 'Ella Kræmar' (votes, unanimous), from Messrs. Stredwick, Hastings. This is a lovely rosy-pink variety, of medium size and perfect form.

To Dahlia (Cactus) 'Cockatoo' (votes, unanimous), from Messrs. Keynes, Williams, Salisbury. Flowers of a soft yellow, brightest in the centre, and shading to almost a rose colour at the points of the florets.

To Dahlia (Cactus) 'Helen Stephens' (votes, unanimous), from Messrs. Hobbies, Dereham. A very pretty pale yellow variety of excellent shape.

To Dahlias (Cactus) 'Harbour Lights' (votes, unanimous), from Messrs. Hobbies. A striking showy variety, with yellow flowers suffused and tipped with bright crimson.

To Dahlia (Pompon) 'Little Mary' (votes, unanimous), from Mr. Searle. Flowers of beautiful shape, medium size, and a rich deep crimson colour.

To Dahlia (Pompon) 'Neatness' (votes, unanimous), from Mr. West, Brentwood. Flowers a salmon-yellow, slightly suffused with rose. Medium size, and good form.

To Dahlia (Single) 'Dorothy' (votes, unanimous), from Messrs. Cheal, Crawley. The flowers have a white centre, with a margin of deep rosy-purple, making a pretty variety.

To Dahlia (Single) 'Miss Bastone' (votes, unanimous). A very pretty flower having a white centre, shading to canary-yellow at the margin.

To Dahlia (Single) 'The Mikado' (votes, unanimous). A bold handsome variety, with a centre zone of red, and a margin of bright yellow.

To Dahlia (Single) 'Unique' (votes, unanimous). This flower has a reddish central zone, with a buff margin, making it a most attractive variety.

The three last named were sent by Mr. Seale.

Other Exhibits.

Messrs. Turner, Slough, staged Roses and Dahlias.

Messrs. Brown, Peterborough, brought Roses and Clematis.

Messrs. Jackman, Woking, sent Roses.

Mr. Perry, Winchmore Hill, staged hardy plants.

Messrs. B. R. Cant, Colchester, sent Roses.
Mr. May, Edmonton, staged Roses.
Mr. J. Russell, Brentwood, brought hardy shrubs.
Mr. Tayler, Hampton, sent Roses.
Messrs. Wells, Redhill, brought Chrysanthemums.
Messrs. Jas. Veitch, Chelsea, staged *Streptocarpus.*
Lord Rothschild, Tring Park, sent *Saintpaulia ionantha.*
The Royal Botanic Gardens, Glasnevin, Dublin, sent *Eucryphia cordifolia.*
Messrs. Pollard, Lee, sent Pelargoniums.
Messrs. Copijn, Groenekan, Utrecht, brought Dahlias.
Mr. H. Mathias, Thames Ditton, staged Carnations.

Floral Committee, October 18, 1904.

Mr. Marshall in the Chair, and twenty-six members present.

Awards Recommended :—

Gold Medal.

To Messrs. Jas. Veitch, Chelsea, for Nepenthes and greenhouse plants.
To Messrs. Wells, Redhill, for Chrysanthemums.

Silver-gilt Flora Medal.

To Mr. Norman Davis, Framfield, for Chrysanthemums.
To Mr. H. B. May, Edmonton, for Crotons.
To Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. J. Hudson, V.M.H.), for Chrysanthemums.

Silver-gilt Banksian Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Frank Cant, Colchester, for Roses.
To Messrs. Prince, Longworth, for Roses.
To Messrs. Cutbush, Highgate, for Carnations.
To Capt. Holford, C.I.E., Westonbirt, Tetbury (gr. Mr. Chapman), for autumn foliage.

Silver Banksian Medal.

To Lady Tate, Park Hill, Streatham (gr. Mr. Howe), for foliage plants.
To Mr. Godfrey, Exmouth, for Chrysanthemums.
To Messrs. Jeffries, Cirencester, for *Coniferæ* and shrubs.
To H. J. Elwes, Esq., Colesborne, for Nerines.
To Messrs. Paul, Cheshunt, for Roses.
To Messrs. Cannell, Swanley, for Chrysanthemums and Pelargoniums

Bronze Flora Medal.

To Messrs. Waterer, Bagshot, for shrubs and *Coniferæ.*

First-class Certificate.

To *Nepenthes* 'F. W. Moore' (votes, 13 for), from Messrs. Jas. Veitch, Chelsea. Raised from *N. mixta* × *N. Dicksoniana.* Pitchers of medium size, roundish, green, and the rim of the pitchers is a pretty rosy-crimson. A distinct and showy variety. (Fig. 222.)

Award of Merit.

To '*Aconitum Wilsoni*' (votes, 17 for, 1 against), from Messrs. J. Veitch. This plant was introduced from China by Messrs. J. Veitch,

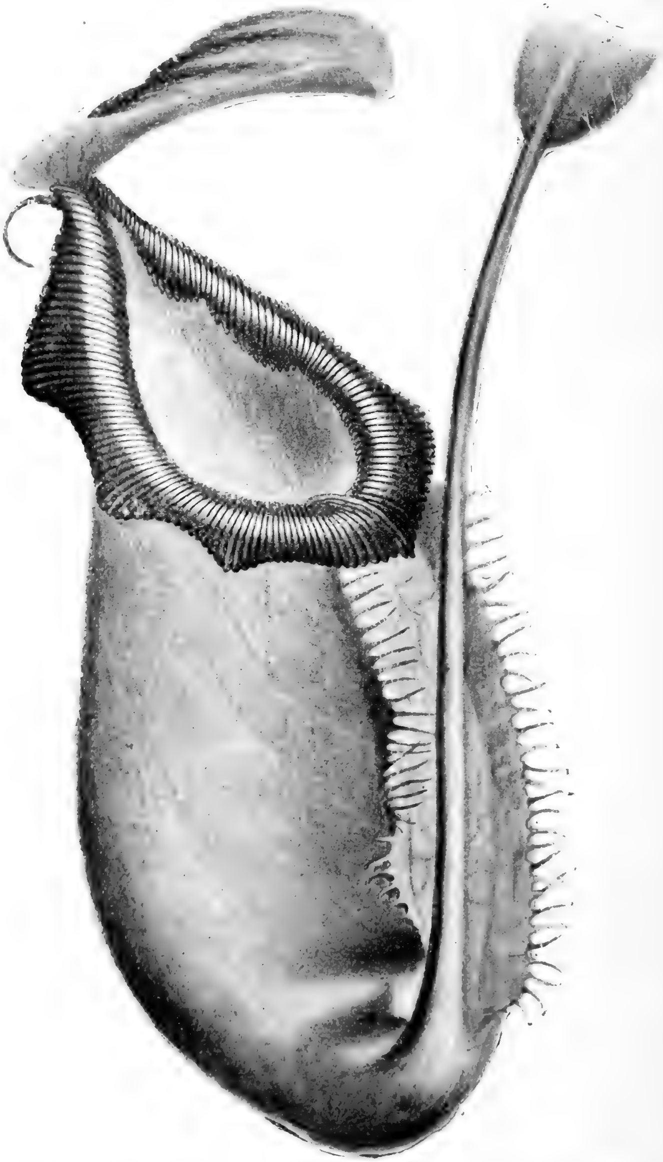


Fig. 222.—Nepenthes × 'F. W. Moore.' (*Journal of Horticulture.*)

and should prove a valuable perennial for the open border. The plant is about 6 feet high, and produces a quantity of secondary spikes of blossom on the main stem, of a purplish-blue colour.

To Begonia 'Fearnley Sanders' (votes, unanimous), from Messrs. Sander, St. Albans. Raised from *B. Bowringiana* × *B. Rex*. Foliage large, hairy, shining brown, with a green margin, the margin being thickly covered with white and red spots; a lovely variety.

To Begonia 'Mrs. H. G. Moon' (votes, unanimous), from Messrs. Sander. This was raised from *B. Rex* × *B. Bowringiana* and, like, the last named, the foliage is large, shining brown, with a beautiful margin of red and white charmingly blended.

To *Helianthus sparsifolius* (votes, 14 for, 1 against), from Messrs. Cannell, Swanley. The shape and colour of the flower are very similar to *H.* 'Miss Mellish,' but larger; the plant is said to be of American origin, and to have been raised from *H. multiflorus* × *H. californicus.*

To *Nerine Bowdeni* (votes, unanimous), from Messrs. R. Veitch, Exeter. Flowers very large, $3\frac{1}{2}$ inches across, bright pink, and borne on stems about 2 feet high. (Fig. 223.)

To Nerine 'Lady Ffolkes' (votes, 18 for), from H. J. Elwes, Esq. Plant dwarf, with flowers carmine, having a white centre; a very pretty variety.

To Nerine 'Miss Shelley' (votes, unanimous), from H. J. Elwes, Esq. A handsome variety with pale pink flowers, in size and shape like those of *N. Fothergilli.*

To *Sternbergia lutea major* (votes, unanimous), from Messrs. Barr, Covent Garden. A glorified form of the well-known *S. lutea.*

To *Rhus cotinoides* (votes, 12 for, 6 against), from Messrs. R. Veitch. Foliage ovate, and of a brilliant red colour; a valuable shrub for autumn effects.

To *Coriaria terminalis* (votes, unanimous), from Messrs. R. Veitch. A herbaceous plant growing about $2\frac{1}{2}$ feet high, with ovate leaves and yellow flowers, and fruits, which are the size of a Black Currant, in bunches 4 to 5 inches long; a strikingly beautiful hardy plant.

To Chrysanthemum 'Mrs. D. W. James' (votes, unanimous), from Messrs. Wells, Redhill. A Japanese variety with incurved flowers of large size and good shape; the petals are a chestnut-brown with a gold reverse.

To Chrysanthemum 'E. J. Brooks' (votes, unanimous), from Messrs. Wells. An enormous flower, of a deep plum colour, with white reverse; incurved Japanese.

To Chrysanthemum 'Mrs. W. Know' (votes, unanimous), from Messrs. Wells. A large reflexed Japanese flower; full and of good shape, and a soft pleasing shade of yellow.

To Chrysanthemum 'Goacher's Pink' (votes, unanimous), from Messrs. Wells. A very fine decorative early-flowering variety, evidently very floriferous; of a lovely shade of pink.

To Chrysanthemum 'Jenny' (votes, unanimous), from Messrs. Wells. An early-flowering Pompon of deep yellow colour, the flowers most abundantly produced.

To Chrysanthemum 'Mrs. Chas. Beckett' (votes, unanimous), from Mr. N. Davis, Framfield. A reflexed Japanese variety of the finest size and form; the colour is pure white, with a touch of pale yellow in the centre.

To Chrysanthemum 'Perle Rose' (votes, unanimous), from Messrs. Cannell, Swanley. An early-flowering decorative variety, of a rosy-mauve colour, and free-blooming habit.

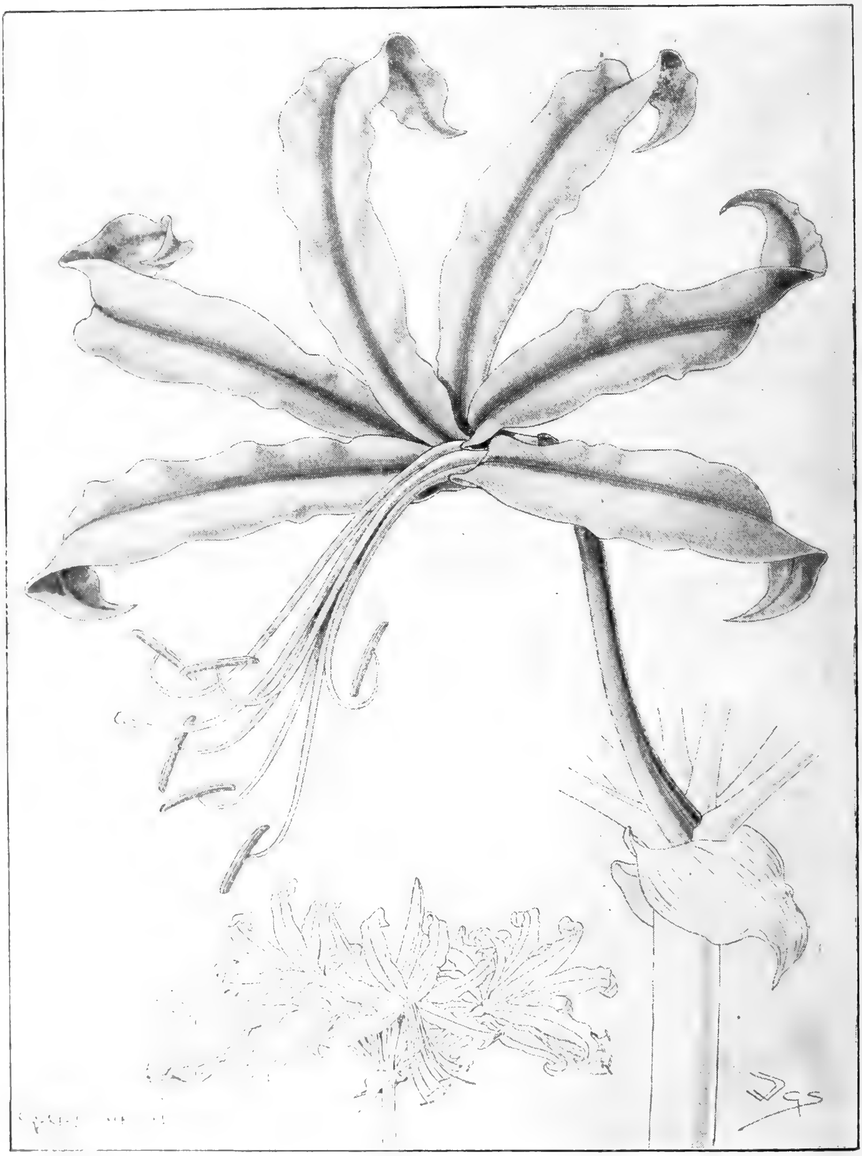


FIG. 223.—NERINE BOWDENI. (*Gardeners' Chronicle.*)

To Chrysanthemum 'Miss Dorothy Oliver' (votes, unanimous), from Mr. G. Mileham, Emlyn House, Leatherhead. This is a very large Japanese variety, of good shape, with broad petals of a beautiful blush colour.

To Chrysanthemum 'Edith Smith' (votes, unanimous), from Mr. H. J. Jones, Lewisham. A reflexed Japanese flower of the largest size, with long drooping petals of pure white; a very fine variety.

Cultural Commendation.

To Messrs. Jas. Veitch, Chelsea, for *Leonotis Leonurus* (Lion's Tail).

Other Exhibits.

Messrs. Dobbie, Mark's Tey, sent Chrysanthemums.
Messrs. Peed, W. Norwood, brought Chrysanthemums.
Mr. A. Perry, Winchmore Hill, staged hardy plants.
Messrs. Ware, Feltham, sent Asters.
Messrs. Bull, Chelsea, brought foliage plants.
Mr. L. R. Russell, Richmond, staged berried shrubs.
Messrs. Low, Bush Hill Park, sent Carnations.
Messrs. Cheal, Crawley, brought autumn foliage.
Messrs. Gunn, Birmingham, staged hardy flowers.
Leopold de Rothschild, Esq., Gunnersbury Park (gr. Mr. Reynolds), sent *Amasonia punicea*.
Messrs. Barr, Covent Garden, brought Asters.
Mr. Seward, Hanwell, sent Chrysanthemums.
Mrs. J. Rolls-Hoare, West Grinstead Park, Horsham (gr. Mr. R. V. Smith), sent Carnations.
A. Du Cros, Esq., Canons Park, Edgware (gr. Mr. Baltimore), staged Chrysanthemums.
Messrs. Adams, Tunbridge Wells, brought Chrysanthemums.
Messrs. Brown, Peterborough, sent Carnations and Solanums.
Mr. Wallace, Dunstable, sent Chrysanthemums.
Mr. Tyler, Carrickmines, Dublin, sent Carnations.
Mr. Kromer, Bandon Hill, Croydon, staged Gesneras.
Mr. Ladhams, Southampton, sent Lobelias and Polygonums.
Mrs. Blow, Petworth, sent Chrysanthemums.
The Hon. Walter Rothschild, M.P., Tring Park (gr. Mr. Dye), sent *Gloriosa Rothschildiana*.

FLORAL COMMITTEE, NOVEMBER 1, 1904.

Mr. W. MARSHALL in the Chair, and twenty-three members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Lord Aldenham, Elstree (gr. Mr. Beckett), for autumn foliage.
To Messrs. Cutbush, Highgate, for retarded plants.
To Messrs. Hill, Edmonton, for Ferns.

Silver-gilt Banksian Medal.

To Messrs. Wells, Earlswood, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations.
To Mr. Prince, Longworth, for Roses.

Silver Banksian Medal.

To Hon. W. F. D. Smith, M.P., Greenlands, Henley-on-Thames, for Hippeastrums.

To Mr. Potten, Cranbrook, for Chrysanthemums.

To Mr. H. B. May, Edmonton, for Dracænas.

To Messrs. Ware, Feltham, for herbaceous flowers.

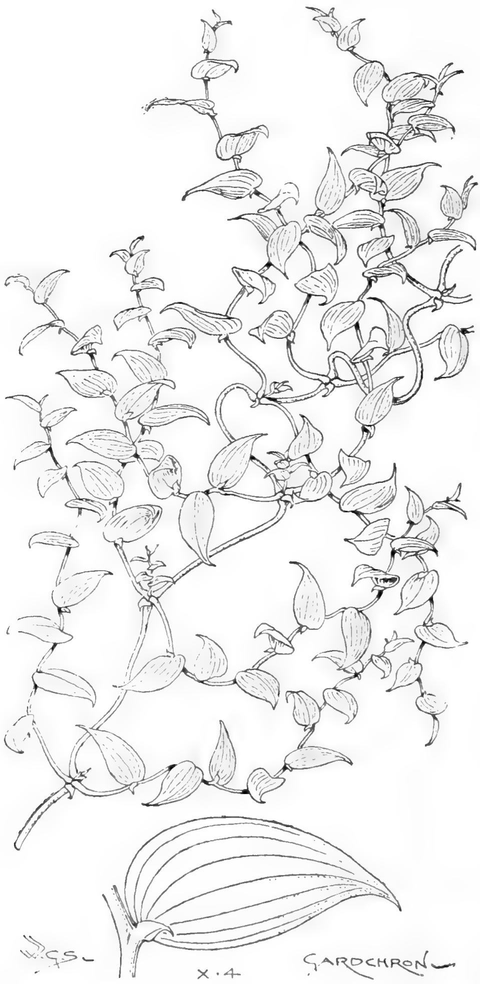


FIG. 224.—ASPARAGUS MEDEOLOIDES MYRTIFOLIUS. (*Gardeners' Chronicle.*)

Bronze Banksian Medal.

To J. A. Young, Esq., Stone House, Putney (gr. Mr. Street), for Begonias.

Award of Merit.

To Chrysanthemum 'Kathleen Thompson' (votes, unanimous), from Mr. Lilley, St. Peter's, Guernsey, and Mr. Thompson, Enfield Highway.

A sport from 'Caprice du Printemps,' and in form exactly like its parent, but the colour is a very rich bronzy-red.

To *Asparagus medeoloides myrtifolius* (votes, 14 for, 5 against), from Messrs. Low, Bush Hill Park, Enfield. This is the most elegant form we have seen, and the long slender growths, with their small foliage, should make this plant very popular for table decorations. (Fig. 224.)

Other Exhibits.

Mr. Reuthe, Keston, brought Nerines.

Messrs. Low, Bush Hill Park, sent Carnations and *Smilax.*

Mr. Russell, Richmond, staged hardy berried plants.

Messrs. Jas. Veitch, Chelsea, sent winter-flowering Begonias.

Messrs. Barr, Covent Garden, brought Nerines.

Mr. Baldock, Swanley, staged Chrysanthemums.

Messrs. Brown, Peterborough, sent cut flowers.

Mr. F. Penn, Canterbury, brought Chrysanthemums.

Leopold de Rothschild, Esq., Gunnersbury House (gr. Mr. J. Hudson V.M.H.), sent winter-flowering Begonias.

Mr. Seward, Hanwell, brought Chrysanthemums.

Miss Beckford, Ham Common, sent a seedling *Coleus.*

A. H. Lee, Esq., Rookesbury Park, Wickham (gr. Mr. N. Molyneux), brought Chrysanthemums.

Mrs. Rose Haig, Warmwell, Dorchester, staged a green-flowered *Hippeastrum.*

Mr. W. Broughton, Maidenhead, sent Chrysanthemums.

Mr. W. Jinks, Staines, brought Chrysanthemums.

FLORAL COMMITTEE, NOVEMBER 15, 1904.

Mr. MARSHALL in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations and Alpine plants.

To Mr. H. B. May, Edmonton, for Begonias and Poinsettias.

To Messrs. Jas. Veitch, Chelsea, for Begonias.

To Messrs. Wells, Redhill, for Chrysanthemums.

To Messrs. Cannell, Swanley, for Zonal Pelargoniums.

Silver Banksian Medal.

To Messrs. Felton, Hanover Square, for retarded plants.

To Messrs. Ambrose, Cheshunt, for Carnations and Roses.

Award of Merit.

To Carnation 'Lord Charles Beresford' (votes, 10 for), from Messrs. Cutbush. A winter-flowering variety of moderate size, and excellent form. The ground colour is white, heavily streaked with scarlet, and a perfect calyx. A very pretty and sweet-scented flower.

To *Capsicum annuum* var. *conoides* (votes, 13 for), from J. Gurney Fowler, Esq., Glebelands, S. Woodford. A very handsome decorative plant covered with bright scarlet pods about an inch long. Large plants, 2 feet high and as much through, were exhibited growing in pots $4\frac{1}{2}$ inches across.

To Chrysanthemum 'Dora Stevens' (votes, unanimous), from Messrs. Wells. A large Japanese variety with florets of a bright pale purple on the upper, and a pale gold on the under side, which is very striking on the incurving florets. A very distinct variety.

Other Exhibits.

Mr. Box, West Wickham, staged Begonias.

Mr. J. Russell, Richmond, brought hardy shrubs.

Messrs. Low, Enfield, sent Carnations and *Smilax.*

Messrs. Bull, Chelsea, brought *Epiphyllum delicatum.*

Mr. W. Jinks, Staines, staged Chrysanthemums.

Messrs. Bath, Wisbech, sent Chrysanthemums.

Messrs. Williams, Cardiff, brought Chrysanthemums.

G. Ferguson, Esq., The Hollies, Weybridge (gr. Mr. Smith), sent single-flowered Chrysanthemums.

Messrs. Rochford, Turnford Hall, staged *Asparagus medeoloides aureus.* A very pale form which is said to come true from seed.

Mr. Seward, Hanwell, brought Chrysanthemums.

Mr. Nobbs, Hayward's Heath, sent Chrysanthemums.

Mr. G. Mileham, Leatherhead, staged Chrysanthemums.

Floral Committee, November 29, 1904.

Mr. May in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. J. Veitch, Chelsea, for winter-flowering Begonias.

To Mr. J. Russell, Richmond, for hardy shrubs.

To Mr. H. B. May, Edmonton, for flowering plants.

To Messrs. Ambrose, Cheshunt, for Carnations and Roses.

To Messrs. Wells, Redhill, for Chrysanthemums.

First-class Certificate.

To *Cotoneaster angustifolia* (votes, unanimous), from M. Maurice L. de Vilmorin, Paris. A very handsome new species from China. Leaves $1\frac{1}{2}$ to 2 inches long, narrow, lanceolate, very dark green above, glaucous below, berries flattish, round, deep orange in colour, and freely produced in great clusters. A valuable addition to the late berried hardy plants.

Award of Merit.

To Carnation 'Adonis' (votes 12 for, 2 against), from Messrs. Bell & Sheldon, Guernsey. A deep red winter-flowering variety, with a good scent; flowers large and of excellent form.

To Carnation 'Enchantress' (votes, 13 for), from Messrs. Bell & Sheldon. A magnificent winter-flowering variety of large size, fine form, and lovely shade of soft pink or flesh colour. Same as 'Fascination.'

To Carnation 'The President' (votes, unanimous), from Messrs. Bell & Sheldon. A very fine variety of tree Carnation with flowers, the colour of the old Clove, but with no fragrance.

All the above Carnations were raised in America.

To Chrysanthemum 'Mrs. T. Dalton' (votes, unanimous), from Mr. N. Molyneux, Rookesbury Park, Wickham. A very large Japanese variety, with reflexed florets, of a dark red shade, tinged with bronze.

To Chrysanthemum 'Mrs. Swinbourne' (votes, unanimous). A very large Japanese variety, with the florets incurved. The colour is ivory-white, with a shade of green at the centre.

To *Platycerium alcicorne Mayii* (votes, 12 for, 2 against), from Mr. H. B. May, Edmonton. A glorified form of the type, and superior to it in every way.

Other Exhibits.

The Hon. W. F. D. Smith, M.P., Greenlands, Henley-on-Thames (gr. Mr. Perkins), sent Hippeastrums.

Messrs. Bath, Wisbech, staged Chrysanthemums.

Messrs. Cannell, Swanley, brought Chrysanthemums.

Messrs. Cutbush, Highgate, staged Carnations.

Mr. Robson, Altrincham, sent Bouvardias.

Mr. Parr, Trent Park, brought Carnations.

Mr. Carpenter, Byfleet, staged Chrysanthemums.

Mr. Smith, Enfield Highway, sent Carnations.

Mr. Seward, Hanwell, brought Chrysanthemums.

J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. Mr. Page), sent Chrysanthemums.

FLORAL COMMITTEE, DECEMBER 13, 1904.

Mr. MARSHALL in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for hardy plants and shrubs.

To Messrs. Bull, Chelsea, for economic plants.

Silver Flora Medal.

To Mr. H. B. May, Edmonton, for flowering plants.

Silver Banksian Medal.

To Mr. L. R. Russell, Richmond, for hardy shrubs.

To Messrs. Wells, Redhill, for Chrysanthemums.

Other Exhibits.

Messrs. Sutton, Reading, staged Cyclamen.

Messrs. Ambrose, Cheshunt, brought Carnations and Roses.

Mr. Hortor, Hale, Liverpool, sent Chrysanthemums.

Messrs. Barr, Covent Garden, brought hardy flowers.

C. Godson, Esq., Brooke Street, Grosvenor Square, sent Roman Hyacinth, grown in sand in a drawing-room.

Mr. Godfrey, Exmouth, sent Chrysanthemums.

Mr. McBean, Plumpton, staged Chrysanthemums.

J. Rolls Hoare, Esq., West Grinstead Park, sent a fine fruit of *Stephanotis floribunda.*

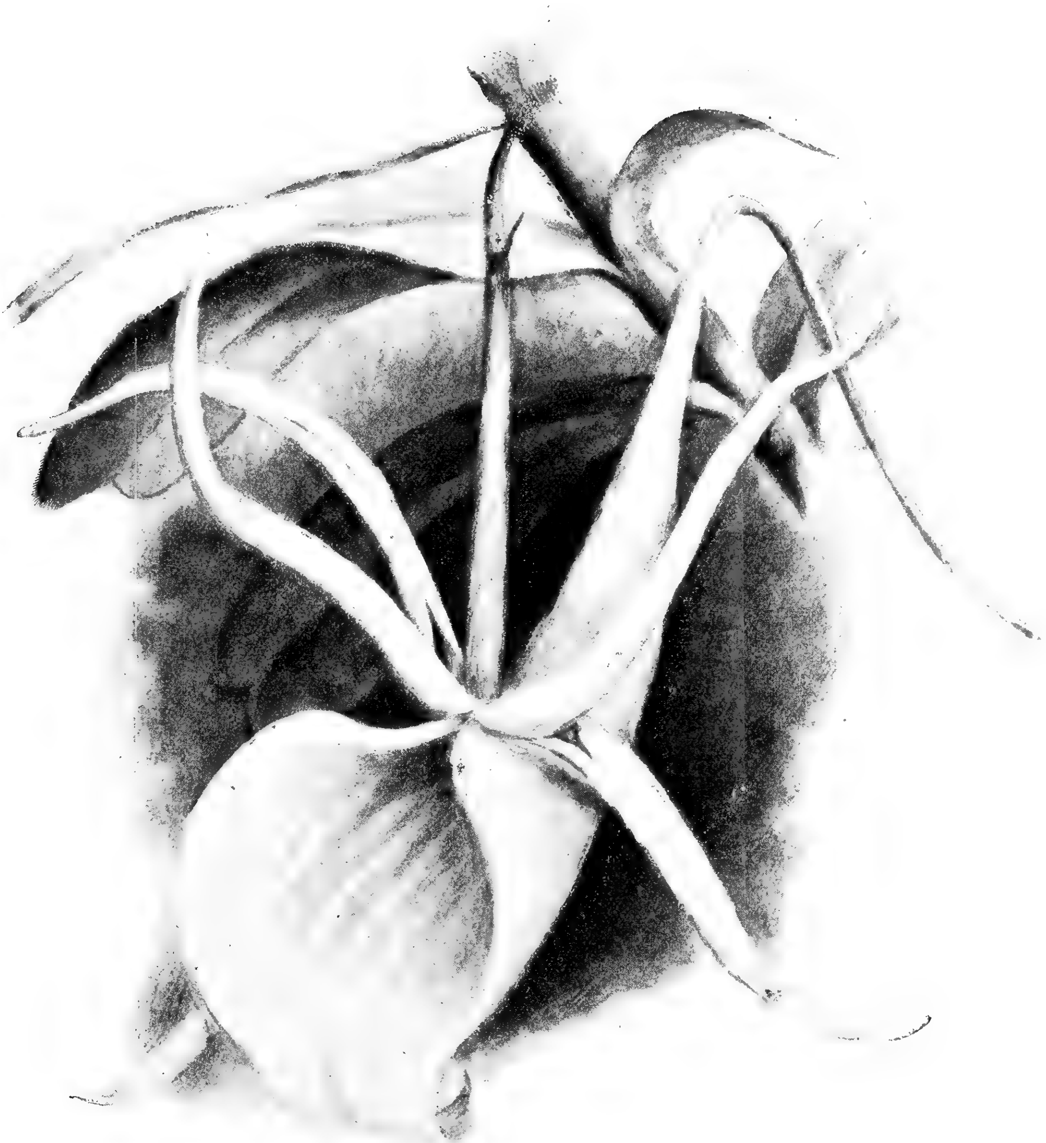


Fig. 225.—Angræcum infundibulare. (*Journal of Horticulture.*)

(*To face page* ccix.)

ORCHID COMMITTEE.

July 26, 1904.

Mr. Veitch in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Bradford, for a fine group of Orchids.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for a group of hybrid Orchids, and rare species.

To Messrs. Hugh Low, Enfield, for a group of Orchids.

Silver Banksian Medal.

To Jeremiah Colman, Esq., Gatton Park (gr. Mr. W. P. Bound), for a group of Orchids.

First-class Certificate.

To *Angræcum infundibulare* (votes, unanimous), from the Rt. Hon. Lord Rothschild, Tring Park (gr. Mr. A. Dye). A very remarkable species and the largest-flowered *Angræcum*. The labellum, which is over three inches across, is pure white in front. The basal part is continued into a greenish funnel-shaped spur six inches in length, and is prolonged into a slender tail about six inches in length, which forms a tendril-like support for the heavy flower by curving abruptly over one of the adjacent roots. The sepals and petals are greenish, lanceolate, and each over two inches in length. The flowers are borne singly on trailing stems, bearing narrowly ovate leaves. Very fragrant. This remarkable species was discovered many years ago by Barter, on Prince's Island, W. Africa, but never introduced to cultivation until Major H. B. Rattray found a few plants on the Victoria Nyanza, Uganda, in 1902. (Fig. 225.)

Cattleya × 'F. W. Wigan' *superba* (*Schilleriana* × *Dowiana aurea*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals of a delicate yellowish-cream colour, tinged with pale purple. Lip rosy-crimson, with a rich yellow blotch in the centre. (Fig. 226.)

Award of Merit.

To *Cattleya* × *Patrocinii* 'Tring Park variety' (*Loddigesii* × *Leopoldii*) (votes, unanimous), from the Rt. Hon. Lord Rothschild (gr. Mr. A. Dye). Sepals and petals broad, rose-purple with claret-purple blotches. Lip white at the base, rose on the side and front lobes.

To *Odontoglossum Uro-Skinneri splendens* (votes, 13 for, 4 against), from J. Wilson Potter, Esq., Elmwood, Croydon (gr. Mr. Young). Flowers large, sepals and petals honey-yellow, marked with dark brown; lip profusely spotted with rose colour.

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for a fine specimen of *Odontoglossum Uro-Skinneri album.*

Other Exhibits.

Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins), sent *Lælia × Iona nigrescens* and two hybrid Cypripediums.

FIG. 226.—CATTLEYA × 'F. W. WIGAN' SUPERBA. (*Journal of Horticulture.*)

de B. Crawshay, Esq. (gr. Mr. Stables), showed hybrid Odontoglossums.

E. W. Beckett, Esq., Virginia Water (gr. Mr. Baskett), sent a fine inflorescence of *Renanthera coccinea.*

W. P. Burkinshaw, Esq., Hessle, Hull (gr. Mr. Barker), sent *Cattleya Warscewiczii* 'White Queen.'

W. W. Mann, Esq., Bexley (gr. Mr. J. Simon), sent two fine specimens of *Oncidium Lanceanum*.

ORCHID COMMITTEE, AUGUST 9, 1904.

Mr. VEITCH in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Sander, St. Albans, for a group of Orchids, in the centre of which was a fine specimen of *Arachnanthe* (*Vanda*) *Lowii* with four long racemes of flowers.

To Messrs. Charlesworth, Bradford, for a group of hybrid Orchids.

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for hybrid Cattleyas, and Lælio-Cattleyas.

To Messrs. Cripps, Tunbridge Wells, for a group of nearly one hundred specimens of the scarlet *Disa grandiflora*.

Botanical Certificate.

To *Bulbophyllum Hamelinii* from F. W. Moore, Esq., Glasnevin Botanic Gardens, Dublin. A very remarkable, large-growing species, from Madagascar. The stout descending inflorescence, eight inches in length, bore a cylindrical raceme of over one hundred flowers, closely arranged, each flower having an ovate bract, in some stages exceeding the length of the flower and covering it. Both bracts and flowers whitish, spotted and tinged with purple. The flowers are malodorous, and the habit of the plant similar to that of *Oncidium ampliatum*.

Other Exhibits.

Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins), sent *Cypripedium* × 'Hiero Edenside variety,' two forms of *C.* × *Wiertzianum* and *Cattleya* × *Patrocinii*.

Messrs. Hugh Low staged a group of Cattleyas.

ORCHID COMMITTEE, AUGUST 23, 1904.

Mr. VEITCH in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To H. S. Goodson, Esq., Fairlawn, West Hill, Putney (gr. Mr. G. E. Day), for a group of Cattleyas, Cypripediums and hybrid Orchids, among which were *Lælio-Cattleya* × *Massangeana* var. 'Harry Goodson,' with bronzy sepals and petals, and bright ruby-purple labellum.

Other Exhibits.

Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins), sent *Cypripedium* × 'Bella' (*vexillarium* × *philippinense*), a pretty hybrid with rose-tinted petals and upper sepal, bearing dark lines and spotting.

Capt. G. L. Holford, Westonbirt (gr. Mr. H. Alexander), sent *Cypripedium* × 'Milo' 'Westonbirt variety,' and *Cattleya* × *Germania superba*.

C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), showed *Cattleya* × 'Admiral Togo,' a hybrid of *C. Schilleriana*, and resembling *C.* × 'Miss Harris' (*Schilleriana* × *Mossiæ*). Flowers bright lilac-rose, the labellum having purple veining and a narrow lavender-coloured margin.

R. I. Measures, Esq., Cambridge Lodge Camberwell (gr. Mr. Smith), showed *Masdevallia* × *Veitchio-fragrans* (*Veitchiana* × *fragrans*). Scape erect, four inches in height, green, spotted with purple. Flowers yellow, with purple lines on the back of the perianth, and purple papillæ on the face.

ORCHID COMMITTEE, SEPTEMBER 6, 1904.

Mr. VEITCH in the Chair, and fourteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch for hybrids.

To Messrs. Sander for a group.

Silver Banksian Medal.

To the Hon. Walter Rothschild, M.P. (gr. Mr. A. Dye), for a collection of Masdevallias, Restrepias, &c.

To Messrs. Low for a group.

Award of Merit.

To *Cattleya* × *Iris*, 'Westonbirt variety' (*bicolor* × *Dowiana aurea*) (votes, unanimous), from Capt. G. L. Holford, C.I.E. (gr. Mr. Alexander). A showy flower differing from the bronzy-petalled forms previously certified in having the sepals and petals greenish-white, delicately veined and tinged with rose. Lip bright rose-purple.

Botanical Certificate.

To *Masdevallia Burbidgeana*, Rolfe, from the Hon. Walter Rothschild. Habit of plant similar to *M. Chimæra*, but with flowers more nearly resembling those of *M. Chestertoni*. Perianth greenish-yellow, irregularly marked with chocolate-purple and studded with yellowish hairs, each of the three divisons of the perianth being furnished with a purple tail an inch in length. Lip ovate, saccate, whitish, with thickened raised yellow lines inside.

Other Exhibits.

J. Gurney Fowler, Esq., South Woodford (gr. Mr. Davis), showed four rare Cypripediums.

Gurney Wilson, Esq., Hayward's Heath, showed an imported piece of *Cattleya Loddigesii*, which had produced a very fine inflorescence of ten flowers.

C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. Bond), sent *Cattleya* × *Pittiana* 'Marshal Oyama.'

R. I. Measures, Esq., Camberwell (gr. Mr. Smith), showed *Zygopetalum* × *max-Jorisi* (*maxillare* × *Jorisianum*).

ORCHID COMMITTEE, SEPTEMBER 20, 1904.

Mr. VEITCH in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Bradford, for Odontoglossums and hybrids.

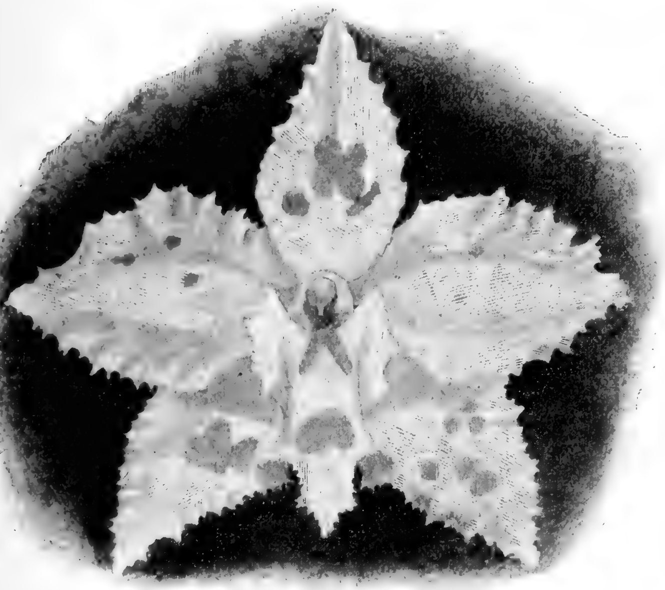


FIG. 227.—ODONTOGLOSSUM CRISPUM XANTHOTES CHARLESWORTHII. (*Journal of Horticulture.*)

Silver Flora Medal.

To Messrs. Jas. Veitch for Lælio-Cattleyas.

To Messrs. Sander for a group.

Silver Banksian Medal.

To the Hon. Walter Rothschild (gr. Mr. Dye) for Masdevallias.

To H. S. Goodson, Esq. (gr. Mr. Day), for a group.

First-class Certificate.

To *Odontoglossum crispum xanthotes Charlesworthii.* A fine pure white flower with chrome-yellow marking. (Fig. 227.)

Award of Merit.

To *Angræcum Rothschildianum* (votes, unanimous), from the Hon. Walter Rothschild. A very remarkable new species from Uganda. Flowers in racemes, white with emerald-green disc and purple base to the lip. Allied to *A. Galeandræ.*

To *Lælio-Cattleya* × 'Constance Wigan' (*L. xanthina* × *C. Rex*) (votes, 10 for, 3 against), from Sir Frederick Wigan, Bart. (gr. Mr. Young). Flowers yellow, with light purplish markings on the lip.

To *Cattleya* × *Iris aurifera* (*bicolor* × *Dowiana aurea*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals golden-yellow, lip ruby-purple.

To *Cattleya* × *Iris* 'Prince of Piedmont' (votes, 10 for, 1 against), from Messrs. Charlesworth. Sepals and petals bronzy-yellow, tinged with purple; lip claret colour, yellow at the base.

To *Lælio-Cattleya* × *eximia*, 'Sander's variety' (*L. purpurata* × *C. Warnerii*) (votes, unanimous), from Messrs. Sander. Flowers large and with very broad labellum; purplish-rose, with dark claret-purple veining on the lips.

Cultural Commendation.

To Mr. Dye, gr. to the Rt. Hon. Lord Rothschild, for a fine plant of the singular *Angræcum infundibulare.*

To Mr. Jas. Cypher for *Rodriguezia candida.*

Other Exhibits.

Francis Wellesley, Esq. (gr. Mr. Hopkins), showed three hybrid Orchids.

Sir Frederick Wigan, Bart., showed several rare Orchids.

Jeremiah Colman, Esq. (gr. Mr. Bound), sent *Cattleya* × *intermedio-Warscewiczii.*

H. Little, Esq., showed the original *Lælio-Cattleya* × *elegans Littleiana.* F.C.C. August 25, 1885.

Orchid Committee, October 18, 1904.

Mr. Little in the Chair, and twenty-one members present.

Awards Recommended:—

Gold Medal.

To Messrs. Charlesworth, Bradford, for a large collection of hybrid Orchids.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for a group.

To Messrs. Jas. Veitch, Chelsea, for hybrids.

To Messrs. Cypher, Cheltenham, for a group of Dendrobiums, Phalænopsis, Cypripediums, &c.

Silver Banksian Medal.

To Leopold de Rothschild, Esq. (gr. Mr. Reynolds), for a group of *Cattleya labiata*

To the Hon. Walter Rothschild (gr. Mr. Dye) for a collection Masdevallias and Restrepias.

To Messrs. Stanley for *Cattleya labiata.*

To Messrs. Hugh Low for a group.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whitelegge), for a group.

FIG. 228.—CYPRIPEDIUM 'F. K. SANDER.' (*The Garden.*)

First-class Certificate.

To *Cypripedium* × 'Fred. K. Sander' ('Annie Measures' × *bellatulum*) (votes, unanimous), from Messrs. Sander. Flowers formed like *C. bellatulum*, but much larger; cream-white, spotted with purple. (Fig. 228.)

To *Lælio-Cattleya* × *Digbyano-Mossiæ* 'Queen Alexandra' (*L. Digbyana* × *C. Mossiæ Wageneri* (votes, unanimous), from Messrs.

Charlesworth. Flowers white, the sepals tinged with green, and the disc of the lip primrose.

Award of Merit.

Cypripedium × 'King Edward VII.' (*Rothschildianum* × *nitens magnificum*) (votes, unanimous), from Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins). A showy and distinct hybrid, with large yellowish flowers, the upper sepal and petals bearing irregular lines of chocolate-purple. (Fig. 229.)

To *Cypripedium callosum Sanderæ*, 'Hye's variety' (votes, unanimous), from Messrs. Sander. Whiter than the original form. Sepals and petals white, with emerald-green lines; lip primrose tinged with green.

To *Cattleya* × 'Rosa Leemann' (*amethystoglossa* (*guttata Prinzii*) × *Dowiana aurea*) (votes, 10 for, 5 against), from Messrs. Charlesworth. Sepals and petals Indian yellow, spotted and tinged with purple. Front lobe of the lip violet-crimson.

To *Cattleya* × *Iris* 'Fascinator' (*bicolor* × *Dowiana aurea*) (votes, 11 for, 3 against), from Messrs. Charlesworth. Flowers, yellow tinged with red. Lip slightly freckled with rose.

Cattleya × 'Portia,' 'Chardwar variety' (*labiata* × *Bowringiana*), from G. F. Moore, Esq., Bourton-on-the-Water. Flower rosy-purple, with claret disc to the lip.

Botanical Certificate.

To *Restrepia aspasicensium*, from the Hon. Walter Rothschild. Flowers small, with the lower segments of the perianth concave; yellow, spotted with purple.

To *Cœlia macrostachya*, from the Hon. Walter Rothschild. Flowers numerous, on ascending spikes; white, tinted with rose-pink.

To *Bulbophyllum Weddelii*, from the Botanic Gardens, Glasnevin (curator, Mr. F. W. Moore). A very singular Brazilian species, with a nodding raceme of pale green flowers with dark purple and white labellums.

Other Exhibits.

C. J. Lucas, Esq. (gr. Mr. Duncan), showed *Cypripedium* × 'Chameleon' (*nitens superbum* × *Williamsianum*).

M. Chas. Vuylsteke, Ghent, sent hybrid Cypripediums.

Mr. H. A. Tracy showed a fine pan of *Cypripedium Spicerianum* raised from seed.

The St. George's Nursery Co., Hanwell, sent *Vanda cærulea*.

C. C. Mann, Esq., Gourock, Glasgow, sent a hybrid Cypripedium.

Orchid Committee, November 1, 1904.

Mr. Gurney Fowler in the Chair, and nineteen members present.

Awards Recommended :—

Gold Medal.

To Jeremiah Colman, Esq., Gatton Park (gr. Mr. Bound), for a very magnificent group, amongst which we noticed *Lælia præstans alba*. (Fig. 231.)

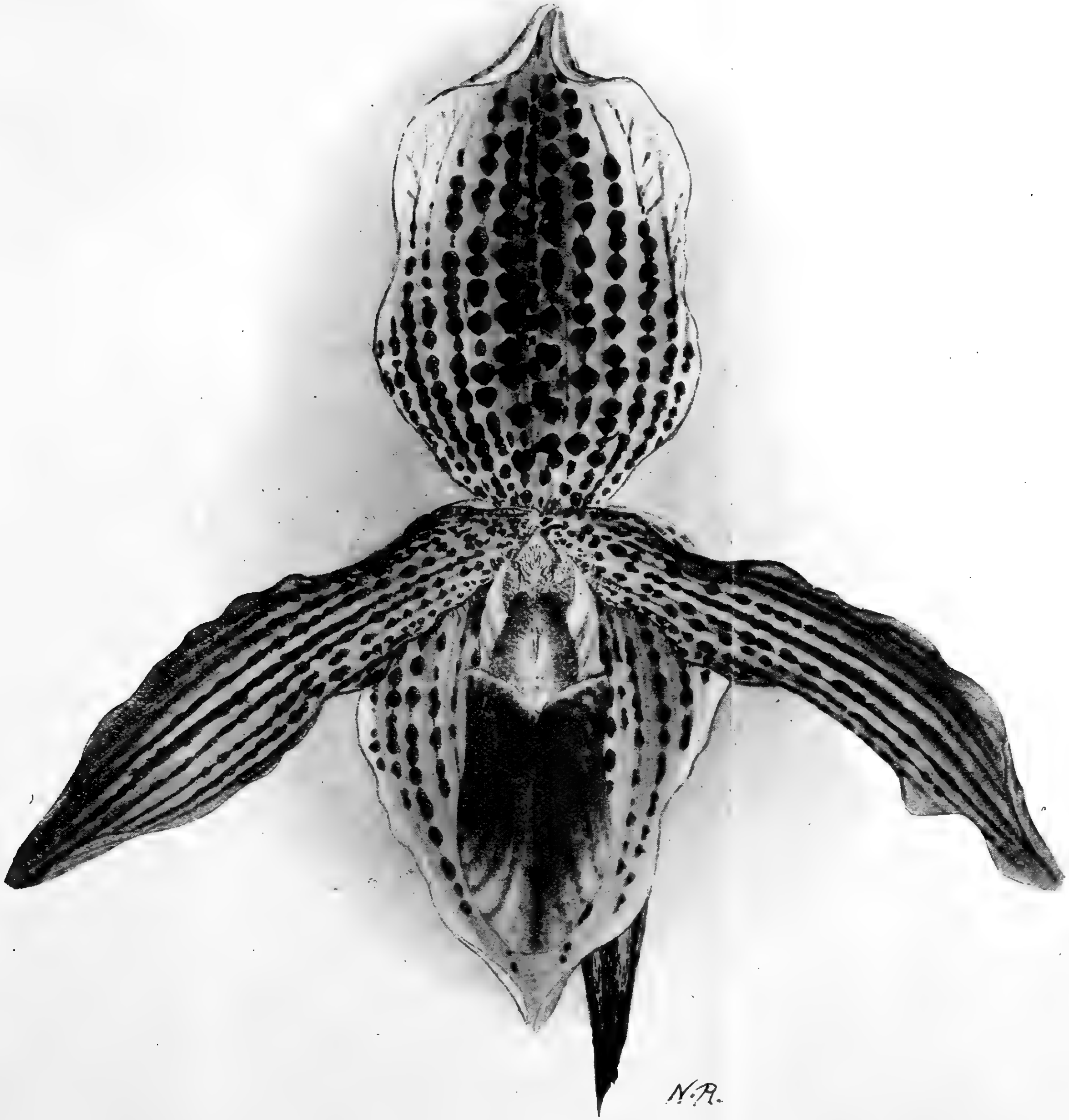


FIG. 229.—CYPRIPEDIUM 'KING EDWARD VII.'

(*To face page* ccxvi.)

FIG. 230.—LÆLIO-CATTLEYA CAPPEI 'CHARLESWORTH'S VARIETY.'

(*To face page* ccxvii.)

Silver-gilt Flora Medal.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whitelegge), for a group.
To Messrs. Charlesworth for hybrid Orchids.

Silver Flora Medal.

To Messrs. Sander for a group.

Silver Banksian Medal.

To Messrs. Jas. Veitch for hybrid Orchids.
To Messrs. McBean for Odontoglossums.
To H. S. Goodson, Esq. (gr. Mr. Day), for a group.

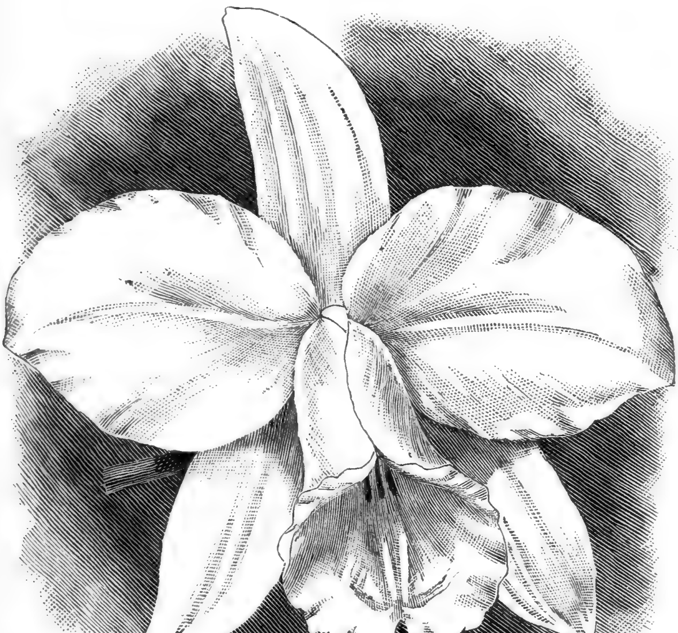


FIG. 231.—LÆLIA PRÆSTANS ALBA. (*Journal of Horticulture.*)

To R. Briggs-Bury, Esq. (gr. Mr. Wilkinson), for Cypripediums.
To Messrs. Stanley for a group.
To Messrs. Hugh Low for a group.

First-class Certificate.

To *Lælio-Cattleya* × *Cappei* 'Charlesworth's var.' (*L. cinnabarina* × *C. Warscewiczii*) (votes, unanimous), from Messrs. Charlesworth. Flowers bright yellow, with crimson lip. (Fig. 230.)

Award of Merit.

To *Lælio-Cattleya* × Illustris (L. × Latona × *C. Dowiana aurea*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals yellow, veined and tinged with rose; lip claret-crimson.

To *Cattleya labiata* 'Mrs. Francis Wellesley' (votes, unanimous), from F. Wellesley, Esq. (gr. Mr. Hopkins). A beautiful variety with silver-white flowers, tinted with rose-pink. (Fig. 232.)

To *Cypripedium* × 'W. R. Lee,' Oakwood variety (*superbiens* × *Rothschildianum*) (votes, unanimous), from Norman C. Cookson, Esq. (gr. Mr. Chapman).

To *Lælio-Cattleya* × *Digbyano-Warneri* 'Eric Lucas' (*L. Digbyana* × *C. Warneri*) (votes, 13 for, 3 against), from C. J. Lucas, Esq. (gr.

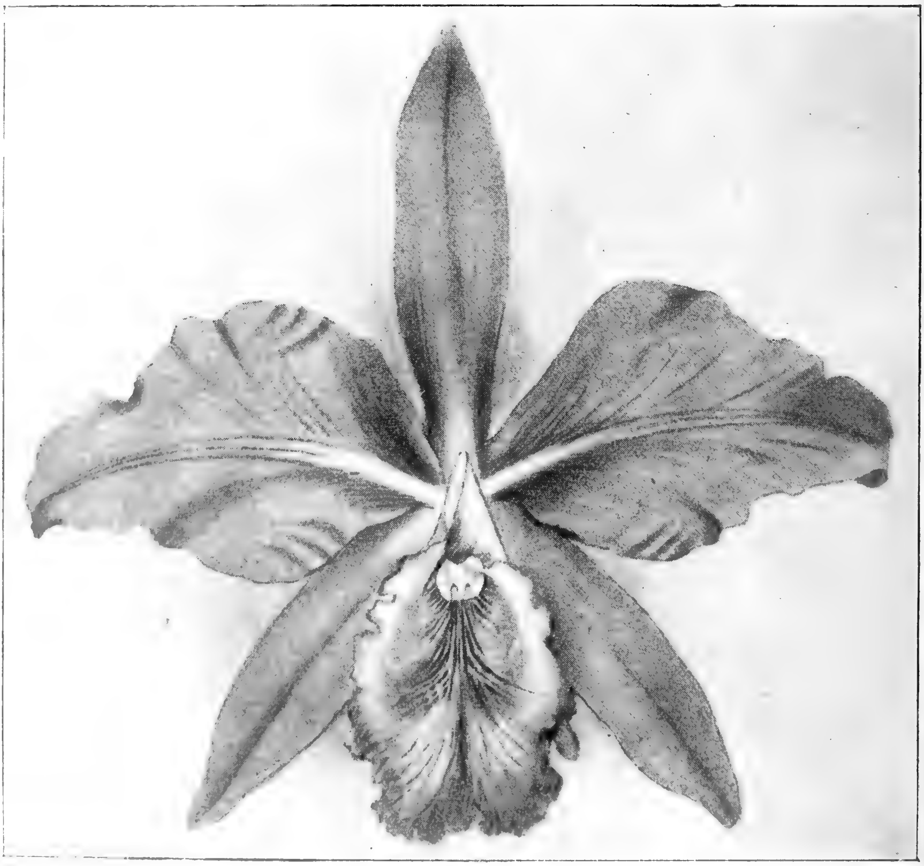


FIG. 232.—CATTLEYA LABIATA 'MRS. FRANCIS WELLESLEY.'

Mr. Duncan). Flowers rose colour, disc of lip pale yellow; front fringed.

To *Cattleya labiata* 'Miss Kate Brazier' (votes, unanimous), from Messrs. Sander. Flowers large, white, with some purple markings on the lip.

To *Cattleya* × G. W. Law-Schofield (*Schilleriana* × *labiata*) (votes, 13 for, 3 against), from Messrs. Sander. Flowers silver-white, tinged with rose; lip fringed deep rose, disc yellow.

Botanical Certificate.

To *Liparis fulgens* from the Royal Botanic Gardens, Glasnevin. Spike nine inches, bearing numerous red flowers.

Cultural Commendation.

To Messrs. McBean, Cooksbridge, for *Cypripedium* × *Morganiæ*, with five spikes bearing together sixteen flowers.

Other Exhibits.

The Hon. Walter Rothschild, M.P., staged an interesting collection of Masdevallias.

H. L. Bischoffsheim, Esq. (gr. Mr. Ellis), sent *Dendrobium Phalænopsis hololeucum.*

Miss Violet Fellowes, Shotesham Park (gr. Mr. L. Smith), sent a richly coloured *Cattleya labiata.*

ORCHID COMMITTEE, NOVEMBER 15, 1904.

Mr. VEITCH in the Chair, and sixteen members present.

Awards Recommended:—

Gold Medal and *Lindley Medal* for culture to G. F. Moore, Esq., Bourton-on-the-Water (gr. Mr. Page), for a magnificent group of about four hundred specimens of Orchids, principally Cypripediums.

Silver Flora Medal.

To Messrs. Jas. Veitch for hybrid Orchids.
To Messrs. Charlesworth for a group.
To Messrs. Sander for a group.
To Messrs. Low for *Cattleya labiata.*

First-class Certificate.

To *Cypripedium* × 'Niobe,' 'Westonbirt variety' (*Spicerianum* × *Fairieanum*) (votes, unanimous), from Capt. G. L. Holford, Westonbirt (gr. Mr. Alexander). Flower rounder than the original; dorsal sepal rose-purple, margined white. (Fig. 233.)

To *Cypripedium* × 'Helen II.' var. 'Fascinator' (*bellatulum* × *insigne Chantinii*) (votes, 6 for, 2 against), from Messrs. Sander, St. Albans. Flower formed like *C. bellatulum*, cream-white, marked with purple.

To *Odontoglossum* × *Andersonianum Crawshayanum* (votes, 7 for, 3 against), from N. C. Cookson, Esq. (gr. Mr. Chapman). A fine flower approaching *O. crispum* in form; white, heavily blotched with purple. (Fig. 234.)

Award of Merit.

To *Cattleya labiata reedleyensis* (votes, 7 for, 3 against), from Messrs. Hugh Low. Flowers white, with orange-coloured markings on the lip.

To *Cypripedium* × *triumphans magnificum* (*Sallieri* × *œnanthum superbum*) (votes, unanimous), from Capt. G. L. Holford. A very dark and richly coloured form; dorsal sepal heavily blotched with chocolate and flushed with rose; upper part white.

To *Cypripedium insigne sylhetense giganteum* (votes, unanimous), from G. F. Moore, Esq. (gr. Mr. Page). A very large flower, with fine round dorsal sepal, green on the lower half, blotched with brown, and white above.

Cultural Commendation.

To Mr. Chapman, gr. to N. C. Cookson, Esq., for a fine specimen of *Cattleya labiata oakwoodiensis.*

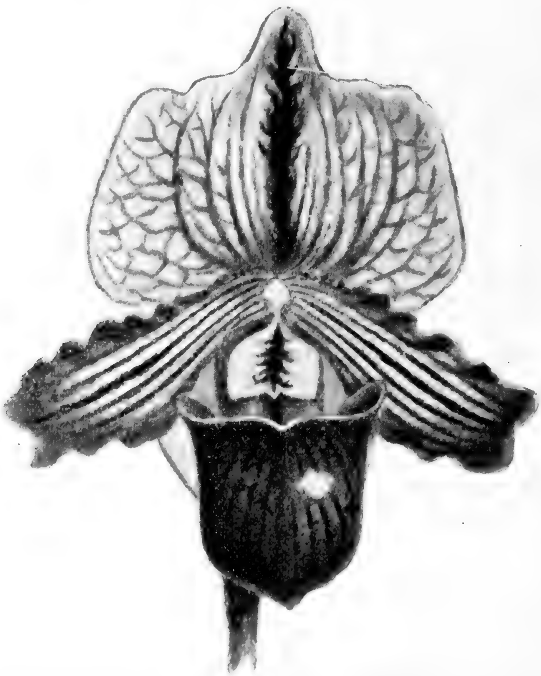


FIG. 233.—CYPRIPEDIUM × 'NIOBE,' 'WESTONBIRT VARIETY.'
(*Journal of Horticulture.*)

Other Exhibits.

Francis Wellesley, Esq. (gr. Mr. Hopkins), showed *Cattleya labiata* 'Minnie' and *C. l.* 'Westfield variety,' both remarkably large forms; *C. insigne* 'Mrs. F. W. Moore' and *C. i. citrinum Truffautianum,* two good yellow varieties.

N. C. Cookson, Esq., showed *Cypripedium* × 'Niobe' Oakwood variety, and two forms of *C.* × *Actæus.*

Drewett O. Drewett, Esq. (gr. Mr. Renwick), showed seedling *Cypripedium insigne.*

C. J. Lucas, Esq. (gr. Mr. Duncan), sent *Sophro-Cattleya* × *warnhamensis* and two Lælio-Cattleyas.

Mrs. Hollond, Wonham, Bampton (gr. Mr. Austin), sent a flower of *Cypripedium* × 'Nina E. Hollond' (*insigne* × *Lathamianum*).

Mrs. Nickalls, Redhill, sent *Stanhopea oculata.*

Mrs. T. Fielden, Tadcaster (gr. Mr. Clayton), showed *Cattleya labiata*.

Frank A. Rehder, Esq. (gr. Mr. Norris), showed hybrid Cypripediums.

W. Thompson, Esq., Stone (gr. Mr. Stevens), showed *Odontoglossum crispum* 'William Stevens,' raised by crossing a good typical *O. crispum*

FIG. 234.—ODONTOGLOSSUM ANDERSONIANUM CRAWSHAYANUM. (*Journal of Horticulture.*)

with a blotched form. Seeds sown August 27, 1900. Flower finely blotched.

Messrs. Hooley Bros., Southampton, showed forms of *Cattleya labiata*.

ORCHID COMMITTEE, NOVEMBER 29, 1904.

Mr. VEITCH in the Chair, and eighteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Geo. C. Raphael, Esq., Castle Hill, Englefield Green (gr. Mr. H. Brown), for a fine collection of varieties of *Cypripedium* × *Leeanum* raised at Castle Hill.

Silver Flora Medal.

To Messrs. Jas. Veitch for a collection of hybrid Orchids.

First-class Certificate.

Laelio-Cattleya × 'Pallas' *magnifica* (*L. crispa* × *C. Dowiana*) (votes, 9 for, 4 against), from G. F. Moore, Esq., Bourton-on-the-Water (gr. Mr. Page). Lip much broader and less elongated than in the type. Sepals and petals magenta-rose, lip claret-crimson.

To *Catasetum pileatum aureum* (votes, unanimous), from L. B. Schlesinger, Esq., Bedales, Hayward's Heath. A lemon-yellow form of the white-flowered species usually known in gardens as *C. Bungerothi.*

Award of Merit.

To *Cypripedium* × 'Miss Blanche Moore' (parentage unrecorded) (votes, unanimous), from G. F. Moore, Esq. (gr. Mr. Page). A large flower with a resemblance to *C. Leeanum,* but with the colours of *C. insigne sylhetense.*

To *Cypripedium* × *Rolfei superbum* (*bellatulum* × *Rothschildianum*) (votes, 11 for, 3 against), from M. C. Beranek, Paris. Flowers white finely marked with dotted lines of purple. (Fig. 235.)

Other Exhibits.

Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins), sent *Cypripedium* × 'Norma' *magnificum, C.* × *Leeanum* 'Queen of Portugal,' *C.* × *L. aureum* 'Westfield variety,' and *C. insigne Chantini Lindeni.*

G. F. Moore, Esq., showed *Cypripedium* × 'Miss Louisa Fowler' and a fine *C.* × *Euryades.*

Walter Cobb, Esq., showed a small plant of *Odontoglossum crispum* 'Elva,' a blotched variety.

Messrs. Hugh Low staged a group of Orchids.

M. C. Beranek, Paris, sent a white *Cattleya labiata* with a pink tint on the lip.

Orchid Committee, December 13, 1904.

Mr. Gurney Fowler in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Bradford, for a group of hybrid Orchids.

Silver Banksian Medal.

To Sir W. Clayton, Bart., Harleyford, Marlow (gr. Mr. J. Sharpe), for a group of *Calanthe Veitchii.*

Award of Merit.

To *Cypripedium* × 'Dom Carlos' (*Godefroyæ leucochilum* × *Lawrenceanum*) (votes, unanimous), from N. C. Cookson, Esq., Wylam (gr. Mr. Chapman). Flower cream-white, tinged with green and rose colour. Dorsal sepal, petals, and inner margin of the lip spotted with purple.

To *Cypripedium* × *Tracyanum* (*aureum* × *Leeanum giganteum*) (votes, unanimous), from Mr. H. A. Tracy, Twickenham. A very fine flower,

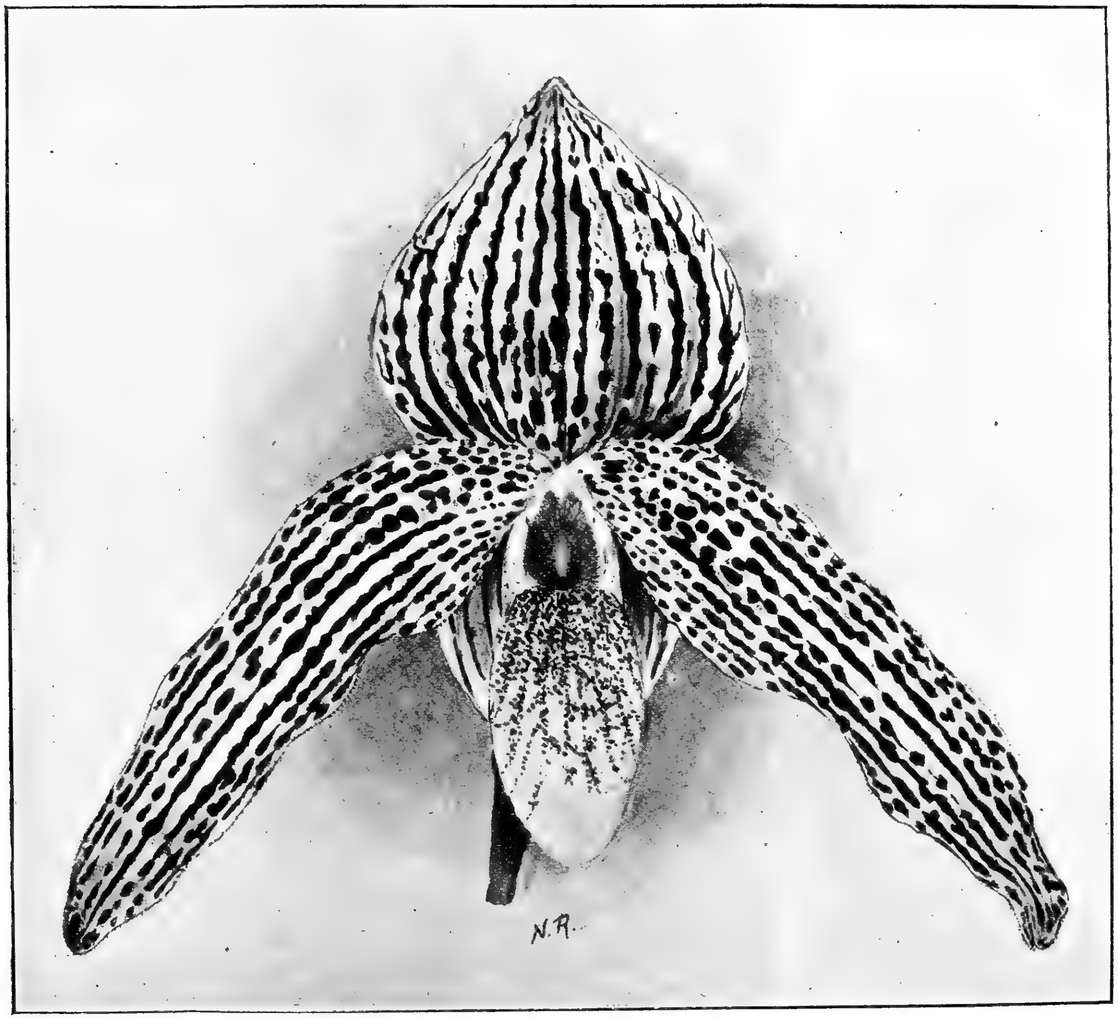


FIG. 235.—CYPRIPEDIUM ROLFEI SUPERBUM.

(To face page ccxxii.)

Fig. 236.—Cypripedium Tracyanum.

(*To face page* ccxxiii.)

larger than *C.* × *aureum*, the dorsal sepal being broad, and pure white on the upper half, the lower greenish with a broad purple band. Lip and petals greenish-yellow, tinged with purple. (Fig. 236.)

To *Cypripedium* × *aureum Lambianum* (*Sallieri Hyeanum* × *Spicerianum*) (votes, 6 for, 4 against), from Elijah Ashworth, Esq., Harefield Hall (gr. Mr. Holbrook). Flowers yellowish-green, with the upper part of the dorsal sepal white.

To *Cattleya labiata* 'Mrs. Gustave H. Muller' (votes, 9 for, 4 against), from Messrs. Hugh Low, Enfield. A distinct variety with pale lavender-tinted flowers.

Botanical Certificate.

To *Gomesa Binotii* from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A very elegant little Brazilian species. The specimen shown bore twenty racemes of orange-coloured flowers.

Cultural Commendation.

To Mr. Holbrook, gr. to Elijah Ashworth, Esq., for a fine plant of a singular *Dendrobium*, which was referred to Kew for identification.

Other Exhibits.

The Marquis de Wavrin, Château de Ronsele, Ghent, sent *Lælio-Cattleya* × *ronselensis* (*C. Forbesii* × *L. cinnabarina*) flowered in two years and seven months from the time the seeds were sown.

Francis Wellesley, Esq. (gr. Mr. Hopkins), sent several hybrid Cypripediums, including the handsome *C.* × *westfieldiense* (*Leeanum superbum* × *Pollettianum*).

Captain G. L. Holford (gr. Mr. H. Alexander) sent *Epi-Cattleya* × *Lilianæ* (*E. costaricense* × *C. Gaskelliana alba*) and other Orchids.

Sir Trevor Lawrence, Bart., showed the fine Burford variety of *Odontoglossum* × *Duvivierianum*, and *Cypripedium* × *Sandero-selligerum*.

N. C. Cookson, Esq., showed *Odontoglossum* × *Andersonianum* 'Oakwood variety,' *O. Pescatorei Charlesworthii*, and *Cypripedium* × *Leeanum Clinkaberryanum*.

Messrs. Sander staged a group of Orchids.

W. M. Appleton, Esq. (gr. Mr. Brooks), showed hybrid Cypripediums.

Messrs. Stanley, Southgate, showed Cattleyas.

J. W. Potter, Esq sent the fine *Odontoglossum* × *waltoniense* 'Elmwood variety.'

Patrons of the Society.

QUEEN CAROLINE.

KING GEORGE IV.

KING WILLIAM IV.

QUEEN VICTORIA.

HIS MAJESTY THE KING.

HER MAJESTY QUEEN ALEXANDRA.

Presidents of the Society.

Earl of Dartmouth (1804-11).
Thomas Andrew Knight (1811-38).
Duke of Devonshire (1838-58).
H.R.H. The Prince Consort (1858-61).
Duke of Buccleuch (1862-73).
Lord Bury (1873-74).
Lord Aberdare (1874-85).
Sir Trevor Lawrence, Bart., K.C.V.O. (1885-).

Secretaries of the Society.

Rev. Alexander Cleeve (1804-5).
Richard Anthony Salisbury (1805-16).
Joseph Sabine (1816-30).
George Bentham (1830-41).
Alex. Henderson, M.D. (1841-45).
James Robert Gowen (1845-50).
Dr. Daniel (1850-51).
Dr. Royle (1851-58).
Dr. Lindley (1858-62).
William Wilson Saunders (1863-66).
Lt.-Col. Henry Y. D. Scott, R.E, (1866-73).
Dr. Lindsay (1873-76).
Dr. Robert Hogg (1876-84).
Major T. Mason (1884-86).
William Lee (1886-88).
Rev. W. Wilks (1888-).

Treasurers of the Society.

John Wedgwood (1804-06).
Rt. Hon. Charles Greville (1806-09).
John Elliot (1809-29).
R. H. Jenkinson (1829-30).
Alexander Seton (1830-35).
Thomar Edgar (1835-48).
Robert Hutton (1848-50).
James Robert Gowen (1850-55).
Dr. Jackson (1855).
William Wilson Saunders (1855-62).
John Clutton (1863-64).

Note.—Sir Daniel Cooper and Mr. Bonamy Dobree were both Treasurers in Interregna.

John Kelk (1865-66).
George F. Wilson, F.R.S. (1866-68).
John Clutton (1868-73).
H. Webb (1873-81).
William Haughton (1884-88).
Dr. (now Sir D.) Morris (1888-91).
Philip Crowley (1891-99).
J. Gurney Fowler (1899).

[This Form can be easily detached for use.]

THE ROYAL HORTICULTURAL SOCIETY.

Established A.D. 1804. Incorporated A.D. 1809.

VINCENT SQUARE, WESTMINSTER, S.W.

Telegrams: "HORTENSIA, LONDON." Telephone No.: 5363, Westminster.

Form of Recommendation for a FELLOW of the ROYAL HORTICULTURAL SOCIETY.

Name ....

Description ....

Address ....

....

being desirous of becoming a FELLOW of the ROYAL HORTICULTURAL SOCIETY, we whose Names are underwritten beg leave to recommend him (her) to that honour; he (she) is desirous of subscribing *.......... Guineas a year.

Proposed by..

Seconded by..

* Kindly enter here the word *four* or *two* or *one*.

It would be a convenience if the Candidate's Card were sent at the same time.

Signed on behalf of the Council, this............ day of 190

.... CHAIRMAN.

[P.T.O.

THE ROYAL HORTICULTURAL SOCIETY.

Privileges of Fellows.

1.—Anyone interested in Horticulture is eligible for election, and is invited to become a Fellow.

2.—Candidates for election are proposed by two Fellows of the Society.

3.—Ladies are eligible for election as Fellows of the Society.

4.—The Society being incorporated by Royal Charter, the Fellows incur no personal liability whatsoever beyond the payment of their annual subscriptions.

5.—Forms for proposing new Fellows may be obtained from the Offices of the Society, Vincent Square, Westminster, S.W.

6.—If desired, the Secretary will, on receipt of a letter from a Fellow of the Society suggesting the name and address of any lady or gentleman likely to become Fellows, write and invite them to join the Society.

FELLOWS.

A Fellow subscribing Four Guineas a year (or commuting for Forty Guineas) is entitled—

1.—To ONE Non-transferable (personal) Pass and FIVE Transferable Tickets admitting to all the Society's Exhibitions, and to the Gardens.

N.B.—Each Transferable Ticket or Non-transferable personal Pass will admit three persons to the Gardens at Wisley on any day *except* days on which an Exhibition or Meeting is being held, when each Ticket or Pass will admit One Person only. The Gardens are closed on Sundays, Good Friday, and Christmas Day.

2.—To attend and vote at all Meetings of the Society.

3.—To the use of the Libraries at the Society's Rooms.

4.—To a copy of the Society's JOURNAL, containing the Papers read at all Meetings and Conferences, Reports of trials made at the Gardens, and descriptions and illustrations of new or rare plants, &c.

5.—To purchase, at reduced rates, such fruit, vegetables, and cut flowers as are not required for experimental purposes.

6.—To a share (in proportion to the annual subscription) of such surplus or waste plants as may be available for distribution. Fellows residing beyond a radius of 35 miles from London (by the A B C Railway Guide) are entitled to a double share.

7.—Subject to certain limitations, to obtain Analysis of Manures, Soils, &c., or advice on such subjects, by letter from the Society's Consulting Chemist, Dr. J. A. Voelcker, M.A., F.I.C.

8.—To have their Gardens inspected by the Society's Officer at the following fees:—One day, £2. 2*s.*; two days, £3. 3*s.*; *plus* all out-of-pocket expenses.

9.—To exhibit at all Shows and Meetings, and to send seeds, plants, &c., for trial at the Society's Gardens.

10.—To recommend any ladies or gentlemen for election as Fellows of the Society.

A Fellow subscribing Two Guineas a year (or commuting for Twenty-five Guineas) is entitled—

1.—To ONE Non-transferable Pass and Two Transferable Tickets, and to all the other privileges mentioned in Nos. 2 to 10 above.

2.—To the same privileges as mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.

A Fellow subscribing One Guinea a year, with an Entrance Fee of £1. 1s. (or commuting for Fifteen Guineas), is entitled—

1.—To ONE Transferable Ticket (in lieu of the non-transferable personal Pass), and the privileges mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.

[*Bonâ fide* Gardeners earning their living thereby, and persons living permanently abroad, are exempt from the payment of the Entrance Fee.]

ASSOCIATES.

An Associate subscribing 10s. 6d. a year is entitled—

1.—To ONE Non-transferable Pass, and to privileges as mentioned in Nos. 3, 4, and 9.

N.B.—Associates must be *bonâ fide* Gardeners, or employés in a Nursery, Private or Market Garden, or Seed Establishment, and must be recommended for election by Two Fellows of the Society.

Local Horticultural and Cottage Garden Societies may be Affiliated to the Royal Horticultural Society, particulars as to which may be had on application.

ESTABLISHED 1804.

INCORPORATED 1809.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. NOTICES TO FELLOWS.

A page or so of Notices to Fellows is always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number **5363, WESTMINSTER.**
"**HORTENSIA, LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be very greatly obliged for any of the following back numbers:—Vol. V., Part 1; Vol. VII., Part 2; Vol. X.; Vol. XIII., Part 1; Vol. XVI., Parts 2 and 3; Vol. XVII., Parts 1 and 2; Vol. XVII., Parts 3 and 4; Vol. XIX., Part 1; Vol. XIX., Part 2; Vol. XX., Part 3; Vol. XXII., Part 3; Vol. XXII., Part 4; Vol. XXV., Part 3; Vol. XXVI., Part 4; Vol. XXVII., Part 1; Vol. XXVII., Part 4; Vol. XXVIII., Parts 3 and 4; and Vol. XXIX., Parts 1, 2, and 3.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1 of each year. To avoid the inconvenience of remembering this, 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. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Forms for the purpose may be obtained from the R.H.S. Offices at Vincent Square, Westminster, S.W. 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 and County Bank, Westminster."

6. ADDITIONAL TICKETS.

Fellows very often say they would like to send tickets to friends, but are afraid to risk the loss of their own Fellows' passes. The Council have therefore consented to issue (to Fellows only) tickets admitting to any of the ordinary Shows at the Royal Horticultural Hall, Vincent Square, during the year 1906. They will be issued in books of ten 2*s.* 6*d.* tickets for £1, and any of the ten unused during 1906 can be returned and counted as representing 2*s.* each in sending the purchase money for a fresh book for 1907, but cannot be accepted at the doors after December 31, 1906, nor accepted in exchange for a new book after 1907. The face of the ticket bears the following inscription:

ROYAL HORTICULTURAL SOCIETY.

Established 1804. Incorporated 1809.

VINCENT SQUARE, WESTMINSTER, S.W.

Available only during 1906.

TICKET of ADMISSION for One Person to any ONE of the Society's ordinary fortnightly Exhibitions and Meetings in the Royal Horticultural Hall, Vincent Square, but not elsewhere.

Doors open at 1 p.m.

W. WILKS,
Secretary R.H.S.

With the Compliments of ______________________

P.T.O.

This Ticket must be given up at the entrance.

and on the back of the ticket is a map (see p. ccxxxii) showing the exact position of the Hall and its main approaches.

Nota bene.—Fellows are not allowed to sell these tickets: they are only issued on that condition, and as a convenience to Fellows wishing to invite their friends; nor can they be exchanged for money.

7. 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].*

8. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at p. ccxl, and fuller ones at page 10 in the "Book of Arrangements."

9. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the addresses insufficient, they are requested to inform the Secretary at once. Another use which all Fellows might make of this list is to consult it with reference to their friends' names, and if any of them are not found recorded therein they might endeavour to enlist their sympathies with the Society, and obtain their consent to propose them as

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

Fellows forthwith. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL and the "Book of Arrangements," each year. (See pp. ccxxv, ccxxvi above.)

10. NEW FELLOWS.

On March 6 next the Society completes its 102nd year, and before that day arrives will all the Fellows do their best to extend the usefulness of the Society by enlisting the sympathy of all their friends and persuading them to join the ranks of the Society? A list of the privileges of Fellows will be found at page ccxxvi above, and just a line addressed to the Secretary, R.H.S., Vincent Square, Westminster, containing the name and address of the proposed new Fellow, will suffice. Should it be preferred, the Secretary will, upon receipt of a postcard or letter giving the names and addresses of any persons likely to join the Society, write direct and invite them to allow their names to be proposed for election.

11. AN APPEAL.

What has been accomplished for the Society since 1887 (see page 247) is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially in—

1. Increasing the number of Fellows;
2. Extinguishing the debt on the Hall, £10,000;
3. Providing a properly equipped Horticultural Research Station at the Wisley Garden.

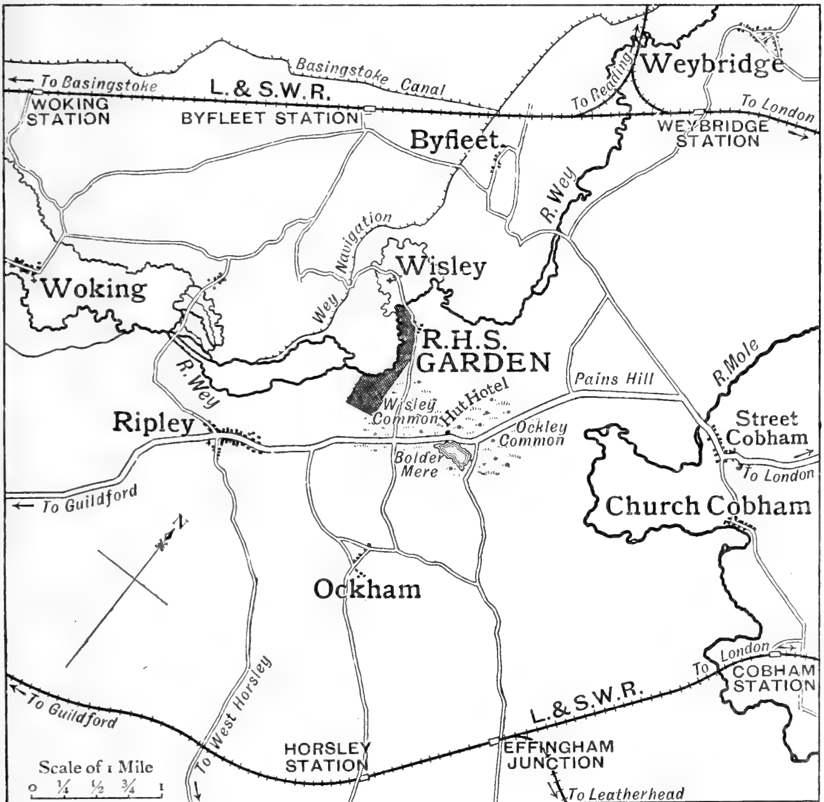
A photographic outfit and plants are wanted at Wisley; and books are required to fill the gaps in the Library. Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary, therefore, asks those who read these lines to do their best to help in any of the manners above indicated. (See p. 697.)

12. THE SOCIETY'S GARDEN AT WISLEY.

The Garden is open daily to Fellows and others showing Fellows' Transferable Tickets from 9 A.M. till sunset, except on Sundays, Good Friday, and Christmas Day. Each Fellow's ticket admits three to the Garden. The public are not admitted. There is much of interest to be seen at Wisley throughout the year. The late Mr. G. F. Wilson's garden included a wild wood-garden, a bank of flowering shrubs, a series of ponds and pools, and a fine collection of Japanese Iris, Primulas, Lilies, Rhododendrons, &c. The Society has added a fine collection of the best varieties of hardy fruit trees and bushes, and of ornamental trees and flowering shrubs, for the most part kindly given by the leading nurserymen. A very large sum of money has also been spent in the erection of a fine series of glass-houses; of a dwelling-house for the Superintendent;

a cottage for the Fruit Foreman; and in establishing a complete system of water supply and drainage works, and in road-making.

The Gardens are situated about 2 miles from Ripley; and about $3\frac{1}{2}$ miles from Horsley and $5\frac{1}{2}$ miles from Weybridge, both stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing



POSITION OF THE SOCIETY'S GARDEN.

to Mr. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge 10*s*., or to and from Horsley 7*s*. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Garden, and also at the Hautboy at Ockham.

13. DISTRIBUTION OF SURPLUS PLANTS.

Fellows are particularly requested to note that a list to choose from of all the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." The ballot for order of being served will be made on March 1, and the distribution proceeded with as quickly as possible. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next distribution. The work of the Gardens cannot be disorganised by the sending out of plants at any later time in the year. All Fellows can participate in the Annual Distribution *following* their election.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

14. POPPY SEED.

The Secretary will be pleased to send a packet of his 1905 crop of Shirley Poppy Seed to any Fellows who like to send to Rev. W. Wilks, Shirley Vicarage, Croydon, a stamped envelope ready addressed to themselves. The seed should be sown as early as possible in March. This is an offer made by the Secretary in his private capacity, and it causes much inconvenience when requests for seed are mixed up with letters sent to the office in London, instead of as above directed. Two thousand packets were given away last season. This season the crop of seed has suffered terribly from a plague of rats, and only about 1,000 will be available.

15. THE SOCIETY'S NEW HOME.

The Royal Horticultural Hall is now occupied by the Society for its Shows, Meetings, Library, and Offices. Vincent Square lies straight through Ashley Gardens from Victoria Street, Westminster, and is about

Position of the Society's Hall.

five minutes' walk from the Victoria and St. James's Park Stations. The accommodation for the Shows is double what it was in the old Drill Hall. The Lectures are delivered in a room specially equipped and devoted to that purpose, and the Library is now housed in a manner worthy of the unique and valuable collection of books which it contains, and as the shelf accommodation is at least double what it was in Victoria Street the Council hope that all Fellows will send such horticultural and botanical books as they can spare from their own shelves, as well as any articles and papers they may themselves publish on such subjects.

16. LETTING OF HALL.

Fellows are earnestly requested to make known among their friends and among other institutions that the Royal Horticultural Hall is available, twelve days in each fortnight, for Meetings, Shows, Exhibitions, Concerts, Conferences, Lectures, Balls, Banquets, Bazaars, Receptions, and other similar purposes. The Hall has a floor surface of 13,000 square feet. It is cool in summer and warm in winter. For a Concert it will seat 1,500, or for a public meeting 2,000. It is undoubtedly the lightest Hall in London, and its acoustic properties have been pronounced excellent by some of our greatest authorities. The charges, which are very moderate, include lighting, warming in winter or cooling of the air in summer, seating, and use of trestle-tabling and platform. The first floor, consisting of four fine rooms, may also be hired for similar purposes, either together with or separately from the Great Hall. This accommodation can also be divided up if desired. Ample cloak rooms for ladies and for gentlemen are available. In fact, the Hall is not only the most suitable Hall in London for special shows of a high-class character, but it is also second only to the Queen's Hall and the Royal Albert Hall for the purposes of Concerts and Meetings. Reduction is made to Charities, and also to Societies kindred or allied to horticulture. The regulations &c. for hiring the Hall are printed in the "Book of Arrangements," and full particulars may be obtained on application to the Secretary, R.H.S., Vincent Square, Westminster, S.W., with whom dates may be booked.

17. EXHIBITIONS, MEETINGS, AND LECTURES IN 1906.

A full programme for 1906 will be issued about the end of January 1906 in the "Book of Arrangements" for 1906. It will be noticed that an Exhibition and Meeting is held in the Royal Horticultural Hall practically every fortnight throughout the year, and a short lecture on some interesting subject connected with horticulture is delivered during the afternoon. Special Fruit and Flower Shows have also been arranged on days other than those of the Society's own Exhibitions.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (30) of halfpenny cards *ready addressed* to himself.

18. THE TEMPLE SHOW.

The nineteenth great annual Flower Show in the Inner Temple Gardens, Thames Embankment, will be held, by kind permission of the Treasurer and Benchers of the Inner Temple, on Tuesday, Wednesday, and Thursday, May 29, 30, and 31.

As on previous occasions, a large number of Silver Cups and Medals will be awarded according to merit. The VEITCHIAN CUP, value 55 guineas, will also be awarded on this occasion.

Fellows of the Society are admitted free on showing their tickets. N.B.—Each Personal Pass is strictly non-transferable, and will admit only the Fellow to whom it belongs, but no one else. Fellows' *Transferable Tickets* are available for themselves or a friend. The general public are admitted by purchased tickets :—On Tuesday, May 29, from 12.30 to 7 P.M., 7*s.* 6*d.* On Wednesday, from 9 A.M. to 7 P.M., 2*s.* 6*d.* On Thursday, from 9 A.M. to 6 P.M., 1*s.*

To avoid the inconvenience of crowding, tickets may be obtained beforehand at the Society's Offices, Vincent Square, Westminster, S.W. The Offices at Westminster will be closed on the days of the Show, and consequently no letters should be addressed there on the previous day.

On the days of the Show, tickets will only be on sale near the entrance to the Gardens (Thames Embankment Gate).

Members of Affiliated Societies, and *bona fide* Gardeners, may obtain 2*s.* 6*d.* tickets for 1*s.*, which will admit them to the exhibition on Wednesday. Members of Affiliated Societies *must* apply *only through the Secretary of their own Society* if they wish to take advantage of this privilege. These tickets *can only be obtained* on or before May 26 *from the Society's Office,* Vincent Square, Westminster, S.W., and a large stamped and directed envelope must be sent with Postal Order in every case.

19. SHOW OF FLORAL DECORATIONS.

The Council have decided to hold a special Show on June 20, 1906, of "Floral Decorations," including dinner-table decorations, vases, bouquets, baskets, &c., and have arranged special classes for professional decorators and for amateurs, the term amateur including gentlemen's gardeners and other servants, as well as the ladies and gentlemen themselves (*see* Arrangements, 1906). In consequence of the space being limited, only a certain number of entries can be accepted, and these *must* be made on or before June 10, but priority of entry before that date will be advantageous to the exhibitor.

20. HOLLAND HOUSE SHOW, 1906.

By the kind permission of the Earl and Countess of Ilchester the Summer Show will be held at Holland House on July 10 and 11, full particulars of which will be published in the "Book of Arrangements," 1906. The rules for the Temple Show apply as far as possible to Holland House, but there is sufficient space to allow of a Sundries Tent.

An arrangement is also in process of being made with the Royal Meteorological Society to organise an Exhibition of Meteorological Instruments, comprising rain-gauges, sunshine-recorders, barometers, thermometers, photographs illustrating meteorological phenomena, diagrams illustrating the influence of the weather upon garden and other crops, &c., and also a typical open-air Climatological Station in working order. It is also hoped that Mr. William Marriott, the Assistant Secretary of the

Royal Meteorological Society, will give a short address each day at 3.30 P.M. on "Meteorology in Relation to Gardening," and will explain the nature and working of the instruments shown.

21. INTERNATIONAL CONFERENCE ON PLANT BREEDING.

Very successful Conferences on Plant Breeding, whether by hybridisation or by cross-fertilisation, have been held already, one in London under the Society's auspices in 1899, and a second in New York under the auspices of the Horticultural Society of New York, U.S.A., in 1902. A third has now been arranged to take place in London, commencing on July 30, and concluding on August 3, 1906.

The programme, as far as at present arranged, is as follows:—

Monday, July 30.

9 P.M. to 10.30. Conversazione in the Society's Great Hall.

9.30. Address of Welcome by the President of the Society, Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., &c.

10. Lantern slides of various hybrids. The loan of any interesting slides would be greatly esteemed.

Refreshments will be served during the evening.

The price of tickets for the Conversazione will be, to Fellows, 2*s.* 6*d.*

Tuesday, July 31.

10.30 A.M. to 1. First Session of the Conference. Opening Address by W. Bateson, Esq., F.R.S., President of the Conference.

1.15. Light luncheon.

2.30 to 5. Second Session of the Conference.

6.30. Dinner at the Hotel Windsor, at the invitation of the Horticultural Club.

Wednesday, August 1.

10.30 A.M. to 12.45. Third Session of the Conference.

1.30. Luncheon at Burford, at the kind invitation of the President of the Society, Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., &c.

Thursday, August 2.

10.30 A.M. to 1. Fourth Session of the Conference.

1.15. Light luncheon.

2.30 to 5. Fifth Session of the Conference.

7. Banquet in the Great Hall.

Friday, August 3.

10.30 to 11.30. Visit the Natural History Museum.

12. Visit the gardens of Gunnersbury House and Park.

1. Luncheon at Gunnersbury, at the kind invitation of Mr. Leopold de Rothschild.

3 to 4. Visit Kew Gardens.

5. Tea in the gardens of Holland House, at the kind invitation of the Rt. Hon. the Earl of Ilchester.

The presence of ladies, both at the conversazione and at the banquet, will be most gladly welcomed. The charge to Fellows for tickets for the conversazione will be 2*s.* 6*d.*, and for the banquet probably £1. 1*s.* Fellows will be allowed to introduce friends to both these gatherings.

Fuller particulars will be issued later.

22. BRITISH FRUIT SHOW.

The Great Autumn Show of British-grown Hardy Fruits, which the Society has held for so many years past, has become as much a thing to be regularly looked for by fruit-growers as the Show at the Temple in May is looked for by growers of flowers.

The thirteenth of these Shows will be held on October 16 and 17, 1906, in the Society's Hall, and, being in the very heart of London, should prove very attractive to the public.

23. COLONIAL-GROWN FRUIT SHOWS.

The President and Council have decided to hold Shows of Colonial-grown Fruit at their New Hall, on March 22 and 23, June 6 and 7, and December 4 and 5, 1906.

The object of fixing these dates is, if possible, to suit the season which is most likely to find the produce of Canada, British Columbia, and the West Indies; of India and the Cape; and of Australia, Tasmania, and New Zealand, in the greatest perfection in London. Opportunity is afforded for each Colony to make collective exhibits in addition to the exhibits of individual firms. The Agents General and Crown Agents are most kindly rendering every assistance, and we trust that both growers and shippers will do their best to send in exhibits worthy of our Colonies, and to show what can be produced for the Home markets. No entrance fee or charge for space is made and tabling is also provided free of expense. If desired any produce may be consigned direct to the Society, and it will be stored in the cellars at Vincent Square and staged by the Society's officials, but the Society cannot undertake to repack and return any exhibits. Medals and other Prizes are offered by the Council in each class.

Particulars of the shows can be obtained from the Secretary, R.H.S., Vincent Square, Westminster, S.W., by enclosing one penny stamp in order to cover the cost of postage.

24. SHOWS OF KINDRED SOCIETIES TO WHICH FELLOWS OF THE R.H.S. HAVE FREE ADMISSION.

The following dates are liable to alteration by each individual Society, but are correct so far as is known at the time of going to press:—

April 17.—Auricula and Primula Society.

July 5.—Sweet Pea Society.

July 24.—Carnation and Picotee Society.

September 19.—National Rose Society.

December 13 and 14.—The Potato Society.

Copies of the Schedules for these Shows may be obtained from the Honorary Secretary of each Society.

25. LECTURES.

The new Lecture Room is fitted with an electric lantern of the most modern construction; electric current, gas, and water are laid on, and every provision has been made for the due illustration and delivery of Lectures.

Any Fellows willing to Lecture, or to communicate Papers on interesting subjects, are requested to communicate with the Secretary.

26. EXAMINATIONS.

1. The Society will hold an examination on Thursday, January 11, 1906, specially intended for gardeners employed in Public Parks and Gardens belonging to County Councils, City Corporations, and similar bodies. This examination will be conducted in the Royal Horticultural Society's Hall, Vincent Square, Westminster, S.W. No entry can be accepted after December 31, 1905.

2. The Society's Annual Examination in the Principles and Practice of Horticulture will be held on Wednesday, March 28, 1906. Candidates should send in their names not later than March 1. Full particulars may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1905 (price 1*s.* 9*d.*, or 10*s.* a dozen) may also be obtained from the office. The Society is willing to hold an examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

In connection with this examination a scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners to be awarded after the 1906 examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Royal Horticultural Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Master of the Worshipful Company of Gardeners, and by the Council of the Royal Horticultural Society. In case of two or more eligible students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

3. The Society will hold an Examination in Cottage and Allotment Gardening on Wednesday, April 11, 1906. This examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the

Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test whatever of such competence. The general conduct of this examination will be on similar lines to that of the more general examination.

27. STUDENTS.

The Society admits a limited number of young men to study Gardening in their Gardens at Wisley. These Working Students have also the advantage of attending most of the Society's meetings and Shows at the Royal Horticultural Hall and elsewhere.

28. INFORMATION.

Fellows may obtain information and advice free of charge from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid 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.

29. 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 £2. 2*s.* for one day (or £3. 3*s.* 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 garden.

30. AFFILIATED SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of all local Horticultural, Floral, and Gardening Societies by a scheme of affiliation to the R.H.S. Since this was initiated, no less than 200 Societies have joined our ranks, and that number is steadily increasing.

Secretaries of Affiliated Societies can now obtain on application a specimen copy of a new Card which the Council have prepared for the use of Affiliated Societies wishing to have a Card for Certificates, Commendations, &c. It can be used for Fruit or Flowers or Vegetables, and is printed in two colours—art shades of deep blue and green. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

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, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the medal if ordered—price 6*d.* each.

31. RULES FOR JUDGING.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors" was revised in October last and considerably modified from the experience gained during the last five years. The Secretaries of Local Societies are therefore strongly advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.* addressed to the Secretary, Horticultural Hall, Vincent Square, Westminster, S.W.

32. 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. An Index to the Advertisements will be found on pages 34 and 35.

⁂ *The Secretary requests all Fellows who complain of the delay in the issue of this Number of the "Journal" to be so good as to read the Prefatory Notice which will be found on the loose inset sheet containing the Title Page and Table of Contents.*

FELLOWS' PRIVILEGES OF CHEMICAL ANALYSIS.

(Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.)

The Council have fixed the following rates of charges for Chemical Analysis to Fellows of the Society being *bonâ fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bonâ fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners, when forwarding samples, are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made.

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s.* 6*d.*
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s.*
3.	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s.*
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s.*
7.	Determination of potash in potash salts, compound manures, &c.	7*s.* 6*d.*
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s.* to £1
9.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s.*
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
14.	Analysis of water of land-drainage, and of water used for irrigation	£1
15.	Analysis of water used for domestic purposes	£1 10*s.*
16.	Consultation by letter	5*s.*

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. Augustus Voelcker, 22 Tudor Street, New Bridge Street, London, E.C.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

Instructions for selecting, drawing, and sending samples for analysis will be found in the Society's "Book of Arrangements," or can be obtained on application to the Society's Office, Vincent Square, S.W.

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FIGURES AND ILLUSTRATIONS.

INDEX No. II.

FUNGOID PESTS OF THE ORNAMENTAL SHRUBBERY, AND FOREST TREES.

IN VOL. XXIX.

By M. C. Cooke, M.A., LL.D., V.M.H., A.L.S.

This Index has been most kindly compiled by Mrs. A. Stuart, F.R.H.S.

INDEX No. III.

OR

GENERAL INDEX.


A.T.