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EDITED BY
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JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

Royal Horticultural Society's Gardens, Chiswick.

I. Experiments on Grafting various sorts of Fruit on different kinds of Stocks, March 1867. By Mr. A. F. Barron.

Report, July 1st.

Cerasus Mahaleb.	Grown.	Failed.
Stock grafted with Cherry, Elton	none	all
,, ,, Morello	none	all
,, ,, May Duke	none	all
,, Plum, Prince of Wales	1 strong	3
,, ,, Mitchelson's	none	5
,, ,, Greengage	started	all
,, Laurel, Portugal (grafts bad)	none	all
,, ,, Common	none	all
Common Cherry.		
Stock grafted with Cherry, Elton	none	all
,, ,, Morello	weak	2
,, ,, May Duke	3	2
,, Plum, Mitchelson's	none	all
,, ,, Prince of Wales	2	1
,, ,, Greengage	none	5
,, Laurel, Portugal	none	6
,, ,, Common	none	all
Cratægus speciosa (weakly growing variety).		
Stock grafted with Pear, Doyenné d'Eté	3	1
,, ,, Winter Nelis	2	none
,, ,, Marie Louise	2	none
,, ,, Windsor	none	none

Cratægus splendens (strong growing).	Grown.	Failed.
Stock grafted with Pear, Marie Louise..........	1	3
,, ,, Winter Nelis..........	4	none
,, ,, Doyenné d'Eté........	1	2
,, ,, Windsor..............	none	1

Cratægus acerifolia.

Stock grafted with Pear, Marie Louise..........	4 { 3 weak, 1 strong	none
,, ,, Winter Nelis..........	5 { 4 weak, 1 strong	none
,, ,, Nouveau Poiteau	4 good	none
,, ,, Doyenné d'Eté........	3 fair	1

Cratægus coccinea.

Stock grafted with Pear, Doyenné d'Eté........	3	2
,, ,, Winter Nelis..........	3 good	none
,, ,, Marie Louise..........	2 weak	2
,, ,, Nouveau Poiteau	3 { 2 strong, 1 weak	1

Pommier de Paradis.

Stock grafted with Apple, Golden Harvey	all	none
,, ,, Old Golden Pippin....	all	none
,, ,, Dumelow's Seedling ..	all	none
,, ,, Gloria Mundi........	all	none

Mussel Plum.

Stock grafted with Laurel, Common (made 4 leaves)	2	8
,, ,, Portugal	none	all
,, Amelanchier, sp.	none	all
,, Prunus padus	none	6

Prunus Damas noir.

Stock grafted with Cherry, Morello	none	all
,, ,, Elton.............	1	2
,, ,, May Duke..........	none	all
,, Plum, Greengage	6	1
,, ,, Mitchelson's	2	2
,, ,, Prince of Wales	4	1

AMELANCHIER, sp.	Grown.	Failed.
Stock grafted with Pear, Marie Louise..........	4 weak	none
„ „ Winter Nelis..........	4 weak	none
„ Apple, Old Golden Pippin....	2 weak	2
„ „ Golden Harvey	none	all
PRUNUS PADUS.		
Stock grafted with Pear, Winter Nelis..........	none	all
„ „ Nouveau Poiteau......	none	all
„ „ Doyenné d'Eté........	none	all
„ „ Marie Louise	none	all
„ Cherry, Morello............	none	all
„ „ Elton..............	none	all
„ „ May Duke..........	none	2
„ Plum, Mitchelson's	none	all
„ „ Prince of Wales	5 strong	1
„ „ Greengage	2 strong	2
SORBUS AUCUPARIA.		
Stock grafted with Pear, Marie Louise	8 weak	none
„ „ Nouveau Poiteau	7 weak	none
„ „ Winter Nelis..........	7 weak	none
„ „ Doyenné d'Eté.......	3 weak	3
COTONEASTER LAXIFLORA.		
Stock grafted with Pear, Winter Nelis..........	9 { 4 strong 5 weak	1
„ „ Nouveau Poiteau......	5 strong	none
„ „ Marie Louise	3	2
„ „ Doyenné d'Eté........	1	all
COTONEASTER FRIGIDA.		
Stock grafted with Pear, Doyenné d'Eté........	none	all
„ „ Marie Louise..........	1	3
„ „ Nouveau Poiteau......	7 good	1
„ „ Winter Nelis..........	4 strong	2
QUINCE (strong stocks).		
Stock grafted with Pear, Doyenné d'Eté........	5 { 1 strong 4 weak	none
„ „ Marie Louise	6 weak	4
„ „ Winter Nelis	2	2
„ „ Windsor.............	4 { 2 strong 2 weak	none

QUINCE (weak stocks).	Grown	Failed.
Stock grafted with Pear, Doyenné d'Eté	4 strong	1
„ „ Marie Louise	6 weak	1
„ „ Nouveau Poiteau	7 weak	none
„ „ Winter Nelis	6 strong	1
„ Amelanchier, sp. (1 broken by wind)	3 weak	

Note.—The failure of the experiments in some instances may be due to several other causes besides that of incompatibility of stock and scions, such as imperfect operations or the too greatly advanced state of the stocks themselves before cutting down, as in the case of the Quince, or, as in the case of the Cherries, the greatly advanced state of the buds on the grafts used. Laurels, again, would, without doubt, succeed better grafted in a frame or some other place with a more confined and regularly humid atmosphere, while many would perhaps succeed best by budding in the summer season.

A. F. BARRON.

II. On the Fecundation of Grasses. By Dr. SPRUCE.

I HAVE waited in the expectation that some of our active scientific observers would take up the extraordinary statement of an eminent French botanist that "grasses are *necessarily* self-fertilized," and either corroborate or contradict it; for, as the subject is equally important to the botanist, the horticulturist, and the agriculturist, plenty of evidence must surely be forthcoming. In offering some observations of my own, tending certainly to the contrary conclusion, I must premise that they were made many years ago, chiefly in the forests and mountains of Equatorial America, without any reference to this question, and are wanting in that fullness and minuteness which I should consider necessary for deciding it; moreover, a Darwin had not then arisen to show that cross-fertilization is the rule, not the exception, in plants, with its inevitable result of unceasing evolution of new forms, out of which Nature is constantly selecting those best fitted to survive, and enduing them with temporary stability. However, a plain account of what I have myself seen may be of interest, and induce some one to renew M. Bidard's experiments, not in closed rooms, but in the fields and by the river-sides, under the full influence of wind and rain, as well as of light and heat.

Without pausing to inquire how many grasses are practically diclinous, although apparently hermaphrodite, I may begin by speaking of the numerous tropical grasses (often conspicuous for their size and beauty) which have the sexes positively and permanently separated, some being monoicous, others dioicous. Here, unquestionably, there can be no fertilization before the opening of the flowers. To render this plain, let us pass in review some of those grasses which have the male and female organs in distinct flowers.

In gently flowing rivers of Tropical America grow many fine aquatic grasses, species of *Luziola, Oryza, Leersia,* &c. The following note is from my journal, under date December 1849, when threading in my canoe among the islands of the Trombetas. "This channel was lined on both sides by a beautiful grass (a species of *Luziola*) growing in deep water, and standing out of it 2 or 3 feet. The large male flowers, of the most delicate pink, streaked with deep purple, and with six long yellow stamens hanging out of them, were disposed in a lax terminal panicle; while the slender green female flowers grew on the bristle-like branches of much smaller panicles springing from the inflated sheaths of the leaves that clothed the stem. As the Indians disturbed the grassy fringe with the movement of their paddles, the pollen fell from the anthers in showers," and would doubtless, some of it, attain the female flowers disposed for its reception.

A parallel case to the above is that of the common maize (*Zea Mays*, L.) where the male flowers are borne in a long terminal raceme or panicle, and the female flowers are densely packed on spikes springing from the leaf-axils. Here the male flowers must plainly expand before the pollen contained in their anthers can be shed on the female organs below, whether of the same or of a different plant. That there are frequent cross-marriages in maize is evidenced by the numerous varieties in cultivation in countries where it is a staple article of food, as in the Andes of Ecuador, where nine kinds, varying in the colour of the grain (through white, yellow, and brown, to black), in its size, consistence and flavour, are commonly cultivated, besides many others less generally known.

In a *Tripsacum* (a tall grass that sometimes covers deserted sites in the plain and the lower Andes) the inflorescence is a long terminal spike, beset in its lower part with female, in its upper part with male flowers; the former hidden in excavations of the rachis, but stretching forth long plume-like, deep purple stigmas to court the floating pollen.

In *Pharus scaber* (H. B. K.), another tall broad-leaved grass, the spikelets stand by twos on the spike, a sessile female spikelet and a stalked male spikelet.

In the fine forest-grasses of the genus *Olyra*, whereof some species, such as *O. micrantha* (H. B. K.), rise to 10 feet high, and have lanceolate leaves above 3 inches broad, and a large terminal panicle with capillary branches like those of our *Aira cæspitosa*, it is the lower flowers that are male, with three large innate (not versatile) anthers, and the upper that are female, with two large stigmas, that are either dichotomously divided or clad with branched hairs, thus exposing a wider surface to the access of the pollen. And as the panicle is often pendulous, many of the male flowers, although placed lower down the axis, are actually suspended over the terminal female flowers.

In the curious genus *Pariana*, whose large polyandrous flowers look as if they might belong to a palm rather than a grass, the inflorescence is a terminal spike, with a nodose rachis, each node bearing a whorl of six flowers, viz. five male flowers including and hiding a solitary female flower. The male flowers contain each from fifteen to twenty-one stamens, and the large sagittate anthers put forth their tips beyond the paleæ when quite young, but rarely burst until entirely emerged; so that, although the first intention seems to have been to ensure the fertilization of the ovary while yet in the bud, the latter has really become accessible to extraneous pollen by the time the anthers of its own whorl are matured.

Gynerium sagittatum (Beauv.), the great Arrow-cane, clothes the beaches of the Amazon and springy hill-sides in the lower Andes with its graceful stems (20 or more feet high), that bear upwards a fan of distichous sword-like leaves, and are topped by an immense panicle of silver-and-purple flowers, which are truly *dioicous*. When the summer winds sweep up the Amazon, or the squalls of the rainy season burst upon it, the Arrow-canes bend like osiers, and intermingle their feathery heads, male and female; while the wind itself must, at such times, aid in conveying the pollen to the female flowers. One comprehends, after seeing this, how a dioicous grass could with difficulty maintain itself in the still depths of the forests, where, in fact, only stray individuals of this very species rarely penetrate, but do not multiply.

It is generally to be remarked of diclinous grasses, that either the male flowers are very numerous, as in *Zea Mays*, or the stamens are multiplied in each male flower, as in *Pariana*, *Leersia*, *Guadua*, &c., or the stigmatic apparatus of the female flowers is enlarged, so as almost to ensure impregnation, as in *Olyra* and *Tripsacum*.

In the Bambuseæ I have gathered, belonging to the genera *Guadua*, *Merostachys*, and *Chusquea*, the flowers are more or less polygamous, and the stamens of the male flowers often doubled. But there is scarcely a genus in the whole order which is not described as having some flowers, "by abortion," neuter or male, and especially those that have biflorous spikelets, such as the Paniceæ. Some grasses, of normally hermaphrodite genera, are not unfrequently truly unisexual, such as a certain species of *Andropogon*. I have occasionally seen panicles of *Orthocladus rariflorus* (Nees), a grass peculiar to the Amazon, quite destitute of stamens, and therefore purely female.

To come home to our own country :—is all the pollen wasted that a touch or a breath sets free from the flowers of grasses in such abundance? Watch a field of wheat in bloom, the heads swayed by the wind lovingly kissing each other, and doubtless stealing and giving pollen. Consider, too, that throughout nature, heat or motion, or both, are essential to the emanation of of the impregnating influence. In all our Festuceæ, as well as in *Cynodon*, *Leersia*, and some other genera, the stigmas are protruded from the side or from the base of the flower at an early stage, often before the stamens of the same flower are mature, thus, as it were, inviting cross-fertilization from the more precocious stamens of other plants which are already shedding their pollen.

All who have gathered grasses will have remarked that some have yellow anthers, others pink, purple, or violet anthers, and that anthers of both types of colour may coexist on distinct individuals of the same species. The same peculiarity is just as noticeable in tropical grasses; and (without professing to give a complete physiological explanation of it) this is what I have observed respecting it. The walls of the anther-cells are usually of some shade of purple, but are so very thin and pellucid that when distended with mature pollen, the yellow colour of the latter is alone visible. When the pollen is discharged, the anthers resume their original purple colour, shortly, however, to take on the pallor or dinginess of decay. Where the anthers emerge of a purple hue, and change from that to brown, it will probably be found that they have discharged their pollen while still included in the flower. These observations, made without any reference to the question now in hand, require to be renewed and tested; and in them, as in all that precedes, I am open to correction. I have not noticed in any grasses the yellow anthers with yellow pollen, and the purple anthers with green pollen, such as are combined in the same flower in many genera of Lythraceæ, Tiliaceæ (*Mollia*, *Luhea*, &c.), Leguminosæ (*Dimorphandra*, &c.), and of some other orders.

Of grasses with bisexual flowers, there are two ways in which the ovary may be fertilized, viz. either by the pollen of its own flower (closed or open), or by that of other flowers, after the manner of the diclinous species. In the latter case, the pollen may be transported by the wind, or in the fur of animals (as I have observed the seeds of Selaginellas in South America), or in the plumage of birds. The agency of insects has not been traced in the fertilization of grasses, but may exist. The little flies I have seen on the flowers of grasses seemed bent on depositing their eggs in the nascent ovaries, but may also have aided in cross-fertilization. In the Amazon valley grasses are often infested by ants, which, indeed, leave nothing organic unvisited throughout that vast region; and they also, I think, cannot help occasionally transferring grains of pollen from one flower to another.

The flowers of palms and grasses agree in being usually small and obscurely coloured, but contrast greatly in the former being in many cases exquisitely and strongly scented, whereas, in the latter, they are usually quite scentless. The odour of palm-flowers often resembles that of mignonette; but I think a whole acre of that "darling" weed would not emit more perfume than a single plant of the great Fan-palm of the Rio Negro (*Mauritia Carará*, Wallace). In approaching one of these plants through the thick forests, the sense of hearing would perhaps give the first notice of its proximity, from the merry hum of winged insects which its scented flowers had drawn together, to feast on the honey and to transport the pollen of the male to the female plants; for it is chiefly dioicous species of palms that have such sweet flowers. The absence of odoriferous flowers from the grasses seems to show that insect aid is not needed for effecting their fecundation, but does not render its accidental concurrence a whit less unlikely.

That grasses, notwithstanding their almost mathematical characters, vary much as other plants do, is plain from the multitude of osculating forms (in such genera as *Eragrostis, Panicum,* and *Paspalum*) which puzzle the botanist to decide when to combine, and when to separate, in order to obtain what are called "good species." Hence the conclusion is unavoidable, that in grasses, as in other plants, variations of surrounding conditions induce corresponding modifications of structure, and that amongst the former must be enumerated cross-marriages, however brought about.

I have above sketched the inflorescence of a few diclinous grasses, some of them, such as *Olyra*, *Pariana*, and *Gynerium*, differing so widely from one another that (excepting the characters common to the order) the separation of the sexes is almost the sole feature that assimilates them. In all these, the self-fertilization of any one flower is out of the question. In the dioicous *Gynerium*, fertilization of the ovary by the male organs of the same plant is impossible; in the monoicous genera it is not the only possible or even probable mode; and in the synoicous genera it is not essential, seeing that the anthers very often do not burst until after the flower is opened, and that the stigmas are frequently so disposed as (apparently) to prefer fertilization by the pollen of other flowers. If the flowers of grasses be sometimes fertilized in the bud, it is probably exceptional, like the similar cases recorded of Orchids and many other families. I have myself not unfrequently seen in Melastomes a precocious crop of fruit produced from unopened flowers, with this curious peculiarity, that the fruit was small, dry, and few-seeded, instead of the normal succulent many-seeded berry; but the seeds were as perfect as those yielded by the fruit of fully developed flowers.

To conclude: the more I ponder over existing evidence, the more I feel convinced that in its perfect state every being has the sexes practically separated, and that natural selection is ever tending to make this separation more complete and permanent; so that the hypothesis of Plato, that the prototype even of man was hermaphrodite, may one day be proved to be a fact!

RICHARD SPRUCE.

November 24, 1869.

III. Notes on some Changes and Variations in the Offspring of Cross-fertilized Peas. By THOMAS LAXTON, Esq.

SINCE the year 1858 I have been carrying on continued and successive courses of experiments in cross-fertilizing the cultivated varieties of the Pea, partly with a view to produce improved characters, and partly for the purpose of noting the results of artificial impregnation on a genus of plants which, although not absolutely beyond the reach of accidental cross-fertilization, is, for most practical purposes, sufficiently free from it to make the changes produced by artificial impregnation approximately reliable, at all events more so than in the majority of genera. These experiments were carried on in ignorance of the extent to which the late Mr. T. A. Knight and others had worked upon the Pea some fifty years since, and the records of which, in the 'Transactions' of this Society, I was only able to read a few months ago. I had not intended to have communicated the results of any of these experiments at present, as some of the larger courses commenced in 1866 are as yet not quite concluded; but as the seeds of peas are liable, by keeping, to change colour, and as I am desirous of gaining some information respecting the origin of the cultivated varieties, I have been induced at once to send up for the inspection of the Committee part of the seeds derived from a single experiment; amongst these seeds will be observed some of several remarkable colours, including black, violet, purple-streaked and spotted, maple, grey, greenish, white, and almost every intermediate tint, the varied colours being apparently produced on the outer coat or envelope of the cotyledons only. The peas were selected, for their colours &c., from the third year's sowing in 1869 of the produce of a cross in 1866 of the early round white-seeded and white-flowered garden variety "Ringleader," which is about 2½ feet in height, fertilized by the pollen of the common purple-flowered "Maple" Pea, which is taller than "Ringleader," and has slightly indented seeds. I effected impregnation by removing the anthers of the seed-bearer, and applying the pollen at an early stage. This cross produced a pod containing five round white peas, exactly like the ordinary "Ringleader" seeds.

In 1867 I sowed these seeds, and all five produced tall purple-flowered purplish-stemmed plants; and the seeds, with few exceptions, had all maple or brownish-streaked envelopes of various shades; the remainder had entirely violet or deep purple-coloured envelopes: in shape the peas were partly indented; but a few were round. Some of the plants ripened off earlier than the "Maple," which, in comparison with "Ringleader," is a late variety; and although the pods were in many instances partially abortive, the produce was very large.

In 1868 I sowed the peas of the preceding year's growth, and selected various plants for earliness, productiveness, &c. Some of the plants had light-coloured stems and leaves; these all showed white flowers, and produced round white seeds. Others had purple flowers, showed the purple on the stems and at the axils of the stipules, and produced seeds with maple, grey, purple-streaked or mottled, and a few only, again, with violet-coloured envelopes. Some of the seeds were round, and some partially indented. The pods on each plant, in the majority of instances, contained peas of like characters; but in a few cases the peas in the same pod varied slightly, and in some instances a pod or two on the same plant contained seeds all distinct from the remainder. The white-flowered plants were generally dwarfish, of about the height of "Ringleader;" but the coloured-flowered sorts varied altogether as to height, period of ripening, and colour and shape of seed. Those seeds with violet-coloured envelopes produced nearly all maple- or particoloured seeds, and only here and there one with a violet-coloured envelope; that colour, again, appeared only incidentally, and in a like degree in the produce of the maple-coloured seeds. In 1869 the seeds of various selections of the previous year were again sown separately; and the white-seeded peas again produced only plants with white flowers and round white seeds. Some of the coloured seeds, which I had expected would produce purple-flowered plants, produced plants with white flowers and round white seeds only; the majority, however, brought plants with purple flowers and with seeds principally marked with purple or grey, the maple- or brown-streaked being in the minority. On some of the purple-flowered plants were again a few pods with peas differing entirely from the remainder on the same plant. In some pods the seeds were all white, in others all black, and in a few, again, all violet; but those plants which bore maple-coloured seeds seemed the most constant and fixed in character of the purple-flowered seedlings, and the purplish and grey peas, being of intermediate characters, appeared to vary most. The violet-coloured seeds again produced almost invariably purplish, grey, or maple peas, the clear violet colour only now and then appearing, either wholly in one pod or on a single pea or two in a pod. All the seeds of the purple-flowered plants were again either round or only partially indented; and the plants varied as to height and earliness. In no case, however, does there seem to have been an intermediate-coloured flower; for although in some flowers I thought I found the purple of a lighter shade, I believe this was owing to light, temperature, or other circumstances, and applied equally to the parent maple. I have never noticed a single tinted white flower nor an indented white seed in either of the three years' produce. The whole produce of the third sowing consisted of seeds of the colours and in the approximate quantities in order as follows, viz.:—1st, white, about half; 2nd, purplish, grey, and violet (intermediate colours), about three-eighths; and, 3rd, maple, about one-eighth.

From the above I gather that the white-flowered white-seeded pea is (if I may use the term) an original variety well fixed and distinct entirely from the maple, that the two do not thoroughly intermingle (for whenever the white flower crops out, the plants and its parts all appear to follow exactly the characters of the white pea), and that the maple is a cross-bred variety which has become somewhat permanent and would seem to include amongst its ancestors one or more bearing seeds either altogether or partly violet- or purple-coloured; for although this colour does not appear on the seed of the "maple," it is very potent in the variety, and appears in many parts of the plant and its offspring from cross-fertilized flowers, sometimes on the external surface or at the sutures of the pods of the latter, at others on the seeds and stems, and very frequently on the seeds; and whenever it shows itself on any part of the plant, the flowers are invariably purple. My deductions have been confirmed by intercrosses effected between the various white-, blue-, some singularly brightgreen-seeded peas which I have selected, and the maple- and purple-podded and the purple-flowered sugar-peas, and by reversing those crosses. I have also deduced from my experiments, in accordance with the conclusions of the late Mr. Knight and others, that the colours of the envelopes of the seeds of peas immediately resulting from a cross are never changed. I find, however, that the colour and, probably, the substance of the cotyledons are sometimes, but not always, changed by the cross fertilization of two different varieties; and I do not agree with Mr. Knight that the form and size of the seeds produced are unaltered; for I have on more than one occasion observed that the cotyledons in the seeds directly resulting from a cross of a blue wrinkled pea fertilized by the pollen of a white round variety have been of a greenish-white colour, and the seeds nearly round and larger or smaller accordingly as there may have been a difference in the size of the seeds of the two varieties. I have also noticed that a cross between a round white and a blue wrinkled pea will in the third and fourth generations (second and third year's produce) at times bring forth blue round, blue wrinkled, white round, and white wrinkled peas in the same pod, that the white round seeds, when again sown, will produce only white round seeds, that the white wrinkled seeds will, up to the fourth or fifth generation, produce both blue and white wrinkled and round peas, that the blue round peas will produce blue-wrinkled and round peas, but that the blue wrinkled peas will bear only blue wrinkled seeds. This would seem to indicate that the white round and the blue wrinkled peas are distinct varieties derived from ancestors respectively possessing one only of those marked qualities; and, in my opinion, the white round peas trace their origin to a dwarfish pea having white flowers and round white seeds, and the blue wrinkled varieties to a tall variety having also white flowers but blue wrinkled seeds.

It is also noticeable that from a single cross between two different peas many hundreds of varieties, not only like one or both parents and intermediate, but apparently differing from either, may be produced in the course of three or four years (the shortest time which I have ascertained it takes to attain the climax of variation in the produce of cross-fertilized peas, and until which time it would seem useless to expect a fixed seedling variety to be produced), although a reversion to the characters of either parent, or of any one of the ancestors, may take place at an earlier period. These circumstances do not appear to have been known to Mr. Knight, as he seems to have carried on his experiments by continuing to cross his seedlings in the year succeeding their production from a cross and treating the results as reliable; whereas it is probable that the results might have been materially affected by the disturbing causes then in existence arising from the previous cross fertilization, and which, I consider, would, in all cases where either parent has not become fixed or permanent, lead to results positively perplexing and uncertain, and to variations almost innumerable. I have again selected, and intend to sow, watch, and report; but as the usual climax of variation is nearly reached in the recorded experiment, I do not anticipate much further deviation, except in height and period of ripening—characters which are always very unstable in the pea. There are also important botanical and other variations and changes occurring in cross-fertilized peas to which it is not my province here to allude; but in conclusion I may, perhaps, in furtherance of the objects of this paper, be permitted to inquire whether any light can, from these observations or other means, be thrown upon the origin of the cultivated kinds of peas, especially the "maple" variety, and also as to the source whence the violet and other colours which appear at intervals on the seeds and in the offspring of cross-fertilized purple-flowered peas are derived.

IV. Disease in the Sugar-cane in Bahia*, translated from a memoir by F. M. Dränert in the 'Zeitschrift für Parasitenkunde.' By the Rev. M. J. Berkeley, F.R.H.S.

The Sugar-cane has for some years been affected, in Brazil, with a disease for which the most contradictory causes have been assigned and without leading to the discovery of any remedy. Loud complaints have also been made in Cuba on the same subject, and in the province of St. Catherine its cultivation has been abandoned in several places. Von Tschudi advised the colonists in South Brazil to the same effect, and in truth considered the climate adverse; for, according to observations made from August 1867 to July 1868, the mean temperature was 70°·7 Fahr., whereas the Sugar-cane requires a mean temperature of 75°·2 Fahr. It could scarcely be expected that so succulent a plant could be subjected, without injury to its organic activity, to so low a temperature as 39°·2 Fahr., which occurred on the 23rd of August, 1868, in the province of Blumenau, and which, indeed, is often registered in the rainy season. The cultivation of sugar, however, is still

* Some remarks on a disease in the Sugar-cane in the Malayan peninsula were brought before the Scientific Committee, April 20, 1869, of which a précis was given at the time. The accompanying observations, translated from an article in Dr. Hallier's Journal, which have already appeared in the 'Gardeners' Chronicle,' may be of interest in connexion with the same subject, and have been deferred to the present time only for want of room. The diseases, though prevailing in such distant countries, seem to be identical.

carried on in that province, and is esteemed profitable; whereas, on the contrary, in the more northerly and hot province of Rio Janeiro and the neighbouring departments, coffee is preferred. In Bahia, the most important part of Brazil as regards sugar, where the occupiers of the coast devote themselves almost exclusively to the cultivation of the sugar-cane, the disease has appeared for the last six years in the most threatening form. At Nazareth, near the town of Bahia, the harvest for three years has been almost annihilated by the malady; and it has since spread to the northern parts of the province. Repeated inquiries, under the direction of the Government, have at present led to no result. New varieties have indeed been introduced, and amongst them one from Salangore, very rich in juice; this, however, has been by no means entirely exempt from the malady, which, notwithstanding the extraordinary drought (from September 1868 to the end of January 1869), begins already to be established.

My observations of this malady were directed especially to the investigation of the insects which live on the sugar-cane, since certain commissions, and even men of science, have given it as their opinion that it is due to their agency. It was recorded as the result of a commission of inquiry in Santa Catharina, that a caterpillar known under the name of "borer" was the cause of the disease. I have occasionally found it, as well as the pupa, in the stem of the cane. The caterpillar eats its way from without into the stem and forms bores. Large holes also are formed in the uppermost joints, by which the vegetation is impeded; and this is equally the case when the young cane is perforated by the insect. The last-mentioned cavities, however, are far more rare; and the bores from about one-eighth to one-sixth of an inch in diameter in nearly mature strong canes, though frequent enough, do not impede the vegetation, though, through the admission of air and the consequent oxidation, the surrounding layers of cells become red and the quality of the sugar-sap is somewhat impaired. In spite of all, the sugar-cane thus affected yields good sugar; and intelligent cultivators have discovered a different indication of the disease.

Another insect, which is sometimes found abundantly between the sheaths and the stem, is a female Coccus, whose habits, as far as my observations go, agree with those of its allies. Allowing that it robs both leaves and stem of a quantity of juice, it yet appears that the injury is too slight to prevent the development of sugar, added to which the presence of the Coccus is not the necessary cause of the above-mentioned indications of disease, which have been generally recognized for the last three years. I have had occasion to observe plantations much affected with Scale which have yielded good sugar, and in which not a single cane exhibited the disease in question. No other insect, in spite of repeated observations, has been discovered to which the malady could be attributed.

A ruddy tint in the wood- and cambium-tissue in the neighbourhood of the joints is an infallible sign of the malady. As the disease advances, this colour permeates these tissues through the whole of the stem, whereas the parenchyma at first retains its natural transparency. When the disease is fully established, a thick yellow substance flows from these vessels, which hardens when exposed to the air, but dissolves in water, and under high powers of the microscope exhibits a granular structure. Minute cells appear, either collected in irregular heaps or disposed in moniliform rows, which, when placed in a solution of sugar, are developed in the course of from six to eight days into a beautiful filiform Alga *. To assure myself that this did not arise from spores derived from the air, I placed repeatedly, and in different places, a solution of sugar under a bell-glass, but never obtained the same Alga, while it always occurred in the yellow substance placed in a similar solution. In confirmation of its deleterious influence, I have found the Alga itself in diseased canes ; I have observed also its infusorial spores and their fermentative action in the manufacture of sugar. Sporangia sown on the sheaths of the cane generate the Alga in the tissues in from one to two days. Hydrogen and carbonic acid are generated with such energy and speed in the juice of the cane when placed in the caldron and acted on by the fermentation produced by the sporangia, especially at the commencement of the development of heat, that the scum runs over the brim of the caldron in great quantities. The organic acids developed by fermentation in the further process of boiling effect a change into uncrystallizable sugar. The extremely small quantity of crystallizable sugar (it being premised that the disease has not advanced too far) is very dark and of a very indifferent quality. In the moulds from which the molasses have run, where, as is the custom here, a mixture of clay is used for refining, the fermentation recommences so energetically that the melted sugar flows over the margin of the mould.

* Or, rather, Fungus ; no Alga is ever developed under such circumstances.—M. J. B.

The spore-cells of the Alga are about the 700th of a millimetre in diameter, while the partly simple partly branched threads of different lengths vary from $\frac{1}{200}$ to $\frac{1}{500}$. I distinguish two forms, which appear almost contemporaneously. In the young state we find mother cells arranged in a row, filled with a quantity of daughter cells. These last are elongated into threads, but are still surrounded by the mother cells. I have not been able to observe the formation of the spore-cells at present; but I think it probable that the cells distinctly visible within the membrane of the mother cells, after its disappearance form these masses of spores, which I once found on the wall of a perfectly closed cavity in the stem of a Sugar-cane more than one-third of an inch in diameter. Even in a very small glass tube closed with a cork, in which I kept the yellow nests of spores, there was in moist weather a coating of white powder, in which I recognized the same spore-cells as in the watery solution. This white powder can be easily dispersed in the air, and can penetrate the bores of insects or through the root into the body of the Cane. The latter way is so much the easier as from the practice here of planting eyes, the tips of the stem with the terminal bud being for the time uncovered, or only slightly covered, remain exposed to air and moisture. That moisture is active in the diffusion of the Alga appears not only from the foregoing observations, but from the fact that the years in which the disease was most prevalent have been remarkably rainy, while in the late abnormally hot year it has almost disappeared. We have, then, every reason to regard this cellular plant as the cause of the disease, especially as at its commencement the cane vegetates strongly, and decays only at a late period, when the Alga decomposes the sugary juice, the masses of spores in the vessels hinder the flow of sap, the leaves turn yellow, and the terminal bud rots. As the best remedy, I regard a mode of culture in future more consonant with the investigations of science than prevails at present in Brazil—repeated manuring with quicklime, as also the washing with liquid lime (lime-wash) the eyes or truncheons before planting.

V. Observations on his Hybrid Primulas, &c., in two Letters to Dr. Masters. By I. Anderson-Henry, Esq.

"*Primulas.*—As allusion has been made to my seedling flower-foliate Primulas (so to call them), I beg leave to forward a spike of one of the most advanced of that particular form. It is odd enough that some go on, like the specimen sent, to the extreme development of the leafy calyx, others pass into a pure 'hose-in-hose' form (I have one just now coming into bloom), of which the lowest is as perfect a corolla as the uppermost, while both are of fine, dark, velvet-like texture. But I must defer till another opportunity to allude to the experiments I undertook in order to intermix, if I could, the other members of this interesting tribe. I may only observe generally that Nature refuses to be driven so far as I had expected; but in rare cases some rare things do result—*e. g.* in the specimens on the cards enclosed (the lower part of a seedling 'hose-in-hose') where, while the upper part, or corolla proper, is red, the lowest part is regularly flaked red and pale or ash-coloured white.

"*Self-sown Hybrid Seedling Rubus biflorus.*—It is well known to all who have tried their hand on the Rubus tribe how intractable they are to cross one with another. Mr. Darwin and others of note have remarked upon this; and I have often tried, but with doubtful success, to produce a hybrid between the Blackberry and Raspberry, though now I do think I have succeeded with the *R. biflorus* crossed on the Raspberry. But of this again, perhaps. At present I speak only of the seedlings sent, which I gather abundantly every year beneath a large plant of *R. biflorus* growing on a gable, away from all Raspberries. At first I got, perhaps, as many pure as hybrid seedlings, now not one pure among three mixed. I send with the hybrid plant:—(1) cuttings of an advanced hybrid self-sown, now opening into bloom; (2) cuttings of a pure *R. biflorus*; (3) cuttings from the common garden Raspberry, for comparison. In such small specimens the difference, so marked in the growing bushes, is not nearly so discernible; yet to an educated eye it may easily be detected. A friend of mine, to whom I gave seeds, flowered the same bee-produced hybrid, and fruited it last year; and the fruit, instead of being amber-coloured, as in the *R. biflorus*, was red, as in the Raspberry. It is worthy of remark that at my place in Strathearn the self-sown seedlings are all of them pure *R. biflorus*, with the same milky stems as the parent; whereas here they are all less or more tinted purple, and much more thickly set with spines, as in the young Raspberry, which I believe to be the male parent, the pollen being communicated by the bees. It is due to Mr. Rivers to say that, when writing long ago on this tribe, he most kindly sent me plants of a Raspberry which he believed (and showed as good reasons as I can now for his belief) to be self-produced hybrids between a Raspberry and a Blackberry, and of which I have still plants now in my garden. All this, I opine, shows how much Nature, if left to her own means, works out those varieties many of which, from their origin being unconsidered, we have been accustomed to regard as species; and thus, too, if all the lost links were recovered, might all vegetable forms be united in a bond of brotherhood.

"*Rhododendron Dalhousiæ.*—Permit me, ere I close, to direct the attention of the Committee to another singular instance of divergence, which Dr. Hooker some years ago, in putting a question, has fixed my attention to year by year since. He asked if the blooms of the *Rhododendron Dalhousiæ*, which when first flowered in Britain were, as in their Himalayan homes, pure white, had since become with us here also, as they had at Kew, of a primrose-yellow colour. That was the first year, I believe, he had observed the change, and it was the first year I observed it here; and it has so continued; and this season I think it is more yellow than before; but whereas formerly it was spotted, as if by decay, I have observed few or no spots this season."

VI. Report on the Observations made in the Gardens of the Royal Horticultural Society at Chiswick as to the Effect of Various Manures on particular Species of Plants. By Dr. M. T. Masters, F.R.S.

The object and mode of conducting these experiments may be gleaned from the following extracts from a Report laid before the Scientific Committee by Dr. A. Voelcker:—

"At the Meeting of the Scientific Committee of the Royal Horticultural Society, held June 2nd, 1868, Dr. Gilbert brought forward the subject of 'the characters of growth by virtue of which one plant dominates over another in mixed herbage under the influence of different manures &c.'

"This subject, having excited considerable interest and discussion, was referred to the Chemical Subcommittee, with the request to report whether the Subcommittee deem it desirable to recommend experiments to be tried as likely to throw further light on various questions relating to vegetable growth and the specific action of certain fertilizing elements, such as potash, phosphate of lime, nitrogenous matters, &c.

"It will be remembered that Dr. Gilbert, at the above-named Meeting, referred to some very striking experiments conducted for many years at Rothamsted Park by Mr. Lawes and himself on permanent pasture which has been under grass probably for centuries.

"Under ordinary management this herbage yielded about fifty species of graminaceous, leguminous, and other plants usually found in permanent meadows."

"The number of species of plants was but little changed on those experimental plots in the park to which a complex, but purely mineral, manure was applied, consisting of salts of potash soda, magnesia, and sulphate and phosphate of lime.

"On the other hand, salts of ammonia, nitrate of soda, applied by themselves, or the addition of nitrogenous manures to mineral fertilizing matters, greatly diminished the number of species in the herbage.

"According to the particular kind of nitrogenous manure used, and the quantity and combination with other fertilizing matters in which nitrogenous manures were employed, the diminution in the number of species varied; but in all cases it was strikingly apparent, and in some instances amounted to about one-half of the species in the herbage from the unmanured part of the park, or those parts dressed with purely mineral manures.

"Attention was further directed to the fact that not only the weight of the produce reaped per acre was much influenced by the description of the manures which were put on the different experimental plots, but likewise the relative proportions of graminaceous and of leguminous and miscellaneous plants in the produce were found to vary considerably with the manures employed.

"Thus, to cite only a few examples, the weight of the graminaceous plants in the produce from the unmanured plots and those dressed with purely mineral manures, in round numbers, amounted to about 60 per cent. of the whole produce. Dressed with salts of ammonia or nitrate of soda and other purely nitrogenous manures, the herbage yielded from 70 to 80 per cent. of the whole weight of produce in graminaceous plants; and in some instances, in which both nitrogenous and mineral manures were employed together in abundance, the weight of the graminaceous plants in the whole produce amounted to nearly 95 per cent.

"The effect of nitrogenous manures in encouraging the growth of true grasses and raising the weight of graminaceous produce, and the corresponding diminution of the weight of the leguminous and miscellaneous plants in the produce, were strikingly exemplified in these experiments.

"On the other hand, it was found that purely mineral manures, such as salts of potash and phosphate of lime, favoured materially the growth of the clover tribes, and greatly increased the percentage by weight of the leguminous plants in the whole produce of the permanent pasture.

"At a subsequent Committee-meeting it was agreed to call together the Chemical Subcommittee, who, regarding the cooperation of botanists and others interested in vegetable physiology as desirable, were accordingly joined by Dr. Masters, Dr. Hogg, Mr. Murray, Major Trevor Clarke, and Mr. Miers, Dr. Hooker and Mr. Bentham expressing regret at being unable to attend the Meetings of the Subcommittee.

Accordingly the Subcommittee met on Thursday, June 18th, the following members being present:—

Prof. Abel,	Dr. Gilbert,
Mr. G. F. Wilson,	A. Murray,
Dr. Masters,	Dr. Voelcker.

"The Subcommittee discussed the manner in which manuring experiments on graminaceous and other plants occurring in pastures might with advantage be instituted, and considered it advisable to investigate rather the more strictly scientific physiological questions which were likely to suggest themselves in the course of the experiments than to bear in mind the purely agricultural and economic points of interest which they may present.

"Instead of growing together a number of plants such as are common in pastures, it was deemed desirable to study the influence of various manures on particular species grown separately, in wooden boxes, 2 feet square and 18 inches deep, filled with poor soil, such as is found in unmanured and rather exhausted soils of our fields, and not with good garden-mould.

"After due deliberation the Subcommittee selected the following plants for experiments:—

i. Dactylis glomerata.
ii. Anthoxanthum odoratum.
iii. Lolium perenne.
iv. Poa pratensis.

v. Poa trivialis.
vi. Bromus mollis.
vii. Trifolium pratense (perenne), red clover.
viii. Lotus corniculatus „ yellow clover.
ix. Trifolium repens „ white or Dutch clover.
x. Plantago lanceolata.
xi. Achillea millefolium.
xii. Carum carui.'

"It will be seen that, of the dozen plants experimented on, six are true grasses, three clovers, and three common weeds in pastures.

"For each of the preceding plants six boxes, each 2 feet wide and 18 inches deep, were sunk in the land, level with its surface, in order to protect the soil in them from excessive evaporation.

1. One box was left unmanured.
2. Manured with a purely mineral mixture.
3. „ ammonia only.
4. „ nitrate of soda only.
5. „ ammonia and mineral manures.
6. „ nitrate of soda and mineral manures.

"The following manures and quantities were supplied :—

	ounce.		per acre.
"For box 2.	1·47	sulphate of potash, or at the rate of	1,000
	1·47	carbonate of lime	1000
	·15	sulphate of magnesia	100
	·15	chloride of sodium	100
	1·47	bone-ash	1000
treated with	1·10	sulphuric acid	750
For box 3.	·59	sulphate of ammonia	400
	·59	chloride of ammonium	400
For box 4.	1·62	nitrate of soda	1100
For box 5.	The manures used for 2 and 3.		
For box 6.	„ „ 2 and 4.		

"The amount of nitrogen in the preceding quantity of nitrate of soda recommended for box 4, it may be observed, is the same as that in the sulphate of ammonia and chloride of ammonium employed in box 3.

"Dr. Gilbert kindly furnished the preceding manures, which were intimately incorporated with the whole of the soil in the several boxes, the soil itself being procured from Ealing, that in the Society's grounds being deemed too rich for the purpose.

"In conformity with these recommendations, seeds of the various plants above named were sown broadcast in the several boxes on the first day of April, 1869. The seeds in due time germinated; the plants grew, were thinned and weeded; but no water was artificially supplied to them during the whole course of the experiments. Observations were taken, from time to time, as to the condition and progress of the plants; and it is the object of this communication to furnish a summary of the results thus obtained. The observations taken were very numerous, and were made with much care and at a great expenditure of time. The observers who noted the progress of the plants were Dr. Masters, Mr. Willis (assistant in Mr. Lawes's laboratory), and Mr. Barron; and the following remarks are based upon the materials thus accumulated. In spite of the pains bestowed on these experiments, there are certain circumstances which, to some extent, impair their value, and which it is necessary to allude to in this place in order that the reader may judge for himself what amount of confidence he can put in them. In the first place, the soil was of itself too rich—the plants in the boxes without manure, when examined by Dr. Gilbert, having been found to have taken up large quantities of certain important constituents of manure from the soil itself, whilst others had taken up more than was supplied in the manure. The plants were sown much too thickly, and the thinning was delayed too long. The seed was not in all cases good; thus, while 'rogues' came up in nearly all the boxes, in one or two cases they predominated. The boxes that should have contained *Poa pratensis* were full of *P. annua*, while those which should have been devoted to *P. trivialis* had also a large proportion of *P. annua*.

"In spite of these drawbacks it is hoped that the record of these experiments will not be without some value, if only as furnishing suggestions. Though the conditions were in some respects faulty, yet all the plants were treated alike, and the comparative observations, as before stated, were carefully and laboriously made by independent observers, and their records correlated and digested, so far as regards the chemical points, by Dr. Gilbert, and, as to the botanical and physiological questions involved, by Dr. Masters. It is hoped, therefore, that the results now related may, in spite of their occasional discrepancies, serve as points of comparison in future trials."

The observations may be divided into four groups:—1. Those relating to germination. 2. Those made at intervals on the growth and development of the plants in the seventy-two boxes from May 1 to July 1, 1869, when the herbage was cut. 3. Those made on October 13, 1869, at the close of the season, when the herbage was again cut. 4. The result of the examination of the roots when dug up, in April 1870, in order to prepare for the continuance of the experiments in the current year.

These observations are treated in two ways. The five manures are the same in both; but in the first instance their effects on the same species of plant are separately considered, while in the second case the comparative influence of each of the manures on all the twelve species of plants taken together is noted. In order to avoid too frequent repetition of names the following numerals and letters are employed in the subsequent remarks and Tables. The plants experimented on are indicated by Roman numerals, i, ii, iii, iv, &c., as before mentioned. The six boxes are herein alluded to under ordinary Arabic numerals: 1, unmanured; 2, manured with mineral manures; 3, with ammonia salts, &c. The letters *a*, *b*, *c*, *d*, *e*, *f* used in the Tables are intended to denote degrees of vigour, *a* being the lowest, *f* the highest. These may be also denoted thus:—*a*, minimum; *b*, low; *c*, *d*, medium; *e*, high; *f*, maximum. In estimating degrees of vigour the general condition of the plants was considered; thus, though actual measurements were made in all cases, yet the highest position was not always necessarily assigned to those boxes in which any particular leaf, stalk, or root measured the greatest number of inches &c., but to those which the observer, from an estimate of all the evidence before him at the time of observation considered to contain, on the whole, the best-developed plants. It must be remarked that the individual plants in each box differed materially in vigour, those in the centre and at the sides being usually the least vigorous. The plan followed was to take what appeared to be a fair average sample of the contents of the whole box, and one representing the general condition of the majority of the plants, avoiding either extreme. As these observations were carefully checked and repeated in all cases of doubt, it is hoped that they afford a tolerably close approximation to the truth.

Germination.

As before stated, the seeds were all sown on April 1; and seedlings were observed in all six boxes of each plant on the following dates:—

i. *Dactylis*, April 16; ii. *Anthoxanthum*, April 16; iii. *Lolium perenne*, April 14; iv*. *Poa pratensis* (*annua*?), April 16; v. *Poa trivialis* (*annua*?), April 12; vi. *Bromus mollis*, April 12; vii. *Trifolium pratense*, April 10; viii. *Lotus corniculatus*, April 12; ix. *Trifolium repens*, April 8; x. *Plantago lanceolata*, April 12; xi. *Achillea Millefolium*, April 12; xii. *Carum Carui*, April 26.

During the period from April 1 to 26 rather more than an inch of rain is recorded to have fallen at Chiswick, 0·54 (or about half) of which fell on the 23rd, when all but the *Carum* had already shown above ground. The amount of rain, then, received by the plants during germination was trifling. The temperature of the soil in the boxes was unfortunately not noted; but in the garden adjacent the soil at one foot in depth was noted at an average of 44°·1 F. from April 1–7, of 50°·7 from April 8–14, of 51°·3 from April 15–21, of 53°·1 from April 22–28. It may fairly be assumed that the seeds, which were buried only an inch or two below the surface, were exposed to a proportionately higher earth-temperature than that just mentioned.

Speaking in general terms, it may be stated that the leguminous plants were the first to germinate; these were followed by the Plantain and the Milfoil, and subsequently by the grasses, beginning with *Bromus mollis* and *Poa trivialis* (*annua*?); but the latest of one set germinated at about the same time as the earliest of the next, and so on. Latest of all, and after a considerable interval, was the Caraway.

The seedlings of each of the twelve species made their appearance about the same time, irrespectively of the nature of the manure.

One month after the sowing of the seeds, viz. on May 3, the seedlings in all the six boxes of each set were observed to be in the same stage of development, though there were differences in the degree of vigour &c. in the various boxes, and individual differences in each box, as will hereafter be stated.

Hence, as might have been anticipated, no perceptible influence was exerted by the manures until after the appearance of

* As already stated, there was considerably more *Poa annua* than *P. pratensis* or *trivialis* in boxes iv and v. It will also be observed that there was a difference of four days in the appearance of the seedlings above ground in the six boxes iv. and v. respectively. As the large admixture of *Poa annua* was not detected for some time, it is not certain to which species the dates above cited really belong.

the seedlings above ground. This arises from the well-known fact that the seedling, or embryo plant, derives most of its nutriment in the early stages of germination from the nutrient matters contained in the seed or in the tissues of the embryo itself.

These experiments, then, so far as they go, do not afford any evidence of the possession by the manures employed of the power reputed to be exerted by some substances, *e. g.* oxalic acid, of hastening germination.

Notes on the Temperature and Rainfall from May to the end of June 1869.

The state of the weather during the summer of 1869 was in in some respects remarkable, and must have had its effect upon vegetation; hence it has been thought desirable to insert a few notes relating to this subject. Daily observations were taken in the Chiswick garden at a short distance from the experimental, boxes; and on the records of those observations as published weekly in the 'Gardeners' Chronicle' the following remarks are based. It must be observed that great accuracy was not aimed at, a near approximation to the actual state of things being all that was considered necessary for the purposes of this communication. In the Table appended are recorded the average mean temperature, the sum of the daily means, and the amount of the rainfall during the intervals that elapsed between the several days on which observations on the progress of the plants were made.

From the Table it will be seen that the temperature fell steadily from the beginning of May to the beginning of June, when it made a sudden rise, and continued to increase till the end of the month. The observations on temperature and rainfall were not continued after the herbage was cut for the first time.

The rainfall was comparatively high in the early part of May, but gradually declined till the end of the month, when it suddenly increased at the same period that the temperature was observed to be at its lowest. At the end of May, therefore, there was a combination of heavy rain and comparatively low temperature. In the following week the conditions were reversed; no rain was recorded, but a high temperature prevailed. In the middle of June rain again fell, and also in the last ten days, but only to a slight amount. The *apparent* relations of these fluctuations to the progress and development of the several plants are alluded to in the following notes on the growth of the plants; but in some cases the fluctuations in growth may have been simply contemporaneous with the meteorological changes, and not really dependent on them; but where they follow atmospheric changes it is a fair inference to conclude that they were the effect of those causes.

Summary of Observations on the Progress of the Plants from May 3 *to July* 1 *inclusive.*

During this period observations were taken at intervals of from seven to ten days. These observations had reference to the condition of the plants in each of the seventy-two boxes, as regards health, vigour, degree of branching, tendency to produce flowers, &c. Comparative observations were also made between the plants in all six boxes of each set. The accompanying Tables show the comparative condition of all the plants at the dates mentioned. The general condition is indicated by the letters *a, b, c, d, e, f*—*a* denoting the lowest degree of general vigour, *f* the highest, as previously explained. The state of the plants in October is alluded to separately. It is shown in the Tables, in the last column.

i. *Dactylis glomerata.*

Box 1 (unmanured). The plants presented uniformly the minimum degree (*a*) of vigour. The plants were generally healthy, with broad leaves of a bright-green colour. The average height of the plant at the end of June was 12 inches, and there was no appearance of flower.

Box 2 (mineral manures). Vigour uniformly low (*b*) throughout; plants healthy, light green, slightly more luxuriant than in box 1, but with no appearance of flower. Average height at the end of June 14 inches.

Box 3 (ammonia-salts). The plants manifested a high degree (*e*) of vigour at first, but declined considerably (to *c*) during the middle and end of May. During June the vigour again increased, and at the end of June attained the maximum degree (*f*). The plants were healthy, with broad leaves of a bluish-green colour. The height at the end of June would have averaged 20 inches; but the stems and leaves were at this time "laid" by drought. No tendency to flower was observed.

Box 4 (nitrate of soda). Maximum (*f*) at first, but declined to medium in the middle of May; improved in June, but declined again towards the end of that month. The plants were healthy, measured 14–16 inches on July 1, had blue-green leaves, and manifested no tendency to flower.

Box 5 (ammonia and mineral). Plants most advanced at starting; remained so to the end of May, when they declined throughout June, and only partially recovered at the end of the experiment, when their colour was of a blue-green, lighter than in 3 or 4. No flowers were produced. The average height was 14 inches.

Box 6 (nitrate of soda and mineral). Plants vigorous at starting, remained so to the end of May; declined in vigour during June, partially recovered towards the end of the month, and sank again at the extreme end. Blue-green colour. No flowers, but in general development more forward than any. Average height 15 inches.

On the whole, the plants in box 4 showed a slightly greater degree of vigour throughout the experiment; and their fluctuations were less extreme than those manifested in the other boxes.

In reference to rainfall and temperature, it may be stated that the plants in boxes 1 and 2 showed no corresponding fluctuations. The plants in boxes 3 and 4 corresponded in their fluctuations pretty closely, at first with the rainfall, latterly with the temperature. The plants in box 5 showed the effect of low rainfall towards the end of the experiment, but exhibited no perceptible relation to fluctuations of temperature. The plants in box 6 showed a slight corresponding fluctuation with that of the rainfall, but not perceptibly with that of the temperature.

ii. *Anthoxanthum odoratum.*

Box 1. The plants showed a slightly increased development over those in No. 2 at an early part of the experiment, and maintained this position throughout. Average height in July 3 inches. Tillering occurred early in all six boxes.

Box 2. Uniform throughout the experiment. Very few plants, and those poor, with no tendency to form stem. Average height in July 2 inches. Colour bright green.

Box 3. The development of the plants rose suddenly towards the end of May, was checked at the extreme end of May, increased again in the middle of June, and continued to do so until July, when the plants averaged 4 inches in height.

Box 4. The plants developed slightly at the end of May and beginning of June, after which the course of their development was checked and never recovered itself. A greater amount of tillering was observable in this and in No. 6 than in the other boxes. Average height in July 3 inches.

Box 5. The plants maintained a relatively high degree of vigour throughout the experiment, but experienced a slight decline towards the end of June, when their average height was 4 inches.

Box 6. The plants maintained uniformly the highest degree of vigour throughout the experiment, and in July were the most luxuriant, bright green, and averaged 5 inches in height.

The plants in all six boxes came up badly, and to the last were patchy and irregular. No tendency to flower was observed in any of the boxes. The plants in Nos. 1 and 2 at the end of the experiment were of a lighter colour than the rest.

In regard to temperature and rainfall, no perceptible relation was observed in the plants in boxes 1 or 2; but in box 3 an advance corresponding to the increase of temperature towards the end of the experiment was observed.

In box 4 a slight advance in proportion to the increased rainfall at the end of May was remarked; in box 5 a slight decrease in proportion to the decline of rainfall at the end of the experiment was noted; while in box 6 no perceptible relation between the growth of the plants and either temperature or rainfall was remarked.

iii. *Lolium perenne.*

Box 1. No difference was observable in the plants in this box throughout the experiment. They presented uniformly the lowest degree of development. Average height at the end of June 6 inches.

Box 2. Uniform throughout the experiment; rather more healthy than 1 at the end of June. The plants in 1 and 2 showed the effect of drought less than the other four; the colour of their leaves was not of so deep a green.

Box 3. The plants exhibited a medium degree of vigour throughout May; their growth was checked during June; and the herbage was laid and shrivelled at the end of the experiment.

Box 4. Medium vigour throughout May; slight increase at the end of the month and early part of June, after which the plants became shrivelled with drought.

Box 5. High degree of vigour throughout the experiment, until checked by drought. At the end of May a slight increase in vigour was observable, which continued to the end of the experiment.

Box 6. High degree of vigour throughout May; slight check at the end of the month; shrivelled with heat at the end of June.

Towards the end of June the plants became so matted and suffered so much from drought, that comparative observations could not be made. In the earlier part of the time no relation to temperature and rainfall was observable in the plants in boxes 1 and 2. In 3 the plants showed a slight relation to diminished rainfall in the early part of June. In the plants in box 4 a slight relation to increased temperature in the middle of June was observable. In 5 a slight relation to increased rainfall at the end of May was observed; while in box 6 the plants showed no perceptible relation to temperature or rainfall.

iv. *Poa pratensis* (*annua*).

Box 1. Uniform throughout the experiment. On June 30 the plants were healthy, but feebly developed, with a few flowers. Height, on June 30, 7 inches.

Box 2. Plants more vigorous than in 1, but uniform throughout the experiment. On June 30 a tendency to flower was noted. Average height 8 inches.

Box 3. In this box the plants had generally broader leaves than in the rest, and exhibited the medium degree of vigour. A slight rise was seen at the end of May, which was maintained throughout June, at the end of which month a slight decline occurred. Average height at that time 9 inches.

Box 4. Medium degree of vigour. Slight arrest at the end of May, which continued through June; slight rise at the end of the month, when the average height of the plants was 9 inches.

Box 5. High degree of vigour throughout the experiment, slight arrest towards the end. Average height 7 inches on June 30.

Box 6. Uniform maximum degree of vigour throughout, longer stems and leaves, but no flowers. Average height, June 30, 10 inches.

In 1 and 2 no relation to temperature or rainfall was observed; in 3 a slight correspondence with increased rainfall and temperature at the end of May and beginning of June was remarked; in 4 a slight decline, corresponding to that of the temperature and rainfall towards the end of May. In no. 5 no perceptible relation to temperature or rainfall, unless quite at the end of June, when a slight decline, corresponding with that of the rain, was noticed. In box 6 no perceptible relation was observed.

No plant of *Poa pratensis* was observed, the contents of the boxes consisting principally of *Poa annua* and *P. trivialis*.

v. *Poa trivialis* (*annua*).

Box 1. Minimum degree of vigour uniformly throughout the experiment, plants healthy, but backward. Height, June 30, 4 inches.

Box 2. Slightly more vigorous than 1, uniform throughout the experiment. Average height 5 inches at the end of June.

Box 3. Maximum degree of vigour till the end of June, when it was checked. Leaves broad, bluish green. Average height, June 30, 7 inches.

Box 4. Uniform medium degree of vigour throughout. Average height, June 30, 7 inches.

Box 5. Uniform high degree of vigour throughout. Average height, at the end of June, 7 inches.

Box 6. High degree of vigour; slightly increased towards the end of the experiment. Average height, at the end of June, 8 inches.

The boxes contained a very large admixture of *Poa annua*; and though a great deal of it was pulled up, it is probable that many of the observations really refer to it, and not to *P. trivialis*. No flower was observed on the latter.

In boxes 1 and 2 no relation to temperature and rainfall was observed, nor in box 3, except at the end of June, when there was a slight arrest corresponding to the diminished amount of rain. In boxes 4 and 5 no relation at all was noticed, and in box 6 no relation till the end of June, when a slight advance, proportionate to or contemporaneous with that in the temperature, occurred.

vi. *Bromus mollis*.

Most forward of all the twelve.

Box 1. Minimum degree of vigour uniformly throughout the experiment; yellowish green at the end of June, when the average height was 8 inches.

Box 2. Slight advance over no. 1, uniform throughout; yellowish green at the end of June. Average height 9 inches.

Box 3. Advance upon 2; plants bluish-green, showed the effects of drought early, foliage nearly dead at the end of June.

Box 4. Uniform maximum degree of vigour throughout, plants showed effects of drought early. Bluish-green colour.

Box 5. High degree of vigour. Checked at end of May, progressed at the beginning of June, after which the plants showed the effects of drought. Deep green colour.

Box 6. Maximum degree of vigour. Arrest in the middle of May, progress in the early part of June, after which the plants were affected by drought. Deep green.

In the early part of May there was no perceptible relation to temperature or rainfall in the condition of the plants in boxes 1, 2, 3, 4. In box 5 a slight increase in vigour was observed after increased rain at the end of May. In box 6 there was slight arrest, in proportion to the diminished rain, in the middle of May. Afterwards the plants suffered so much from drought that no trustworthy comparative observations could be made.

vii. *Trifolium pratense.*

Box 1. Uniform minimum degree of development, healthy throughout, no tendency to flower. Height, at the end of June, 11 inches.

Box 2. Medium; rose in the middle of May to a high degree of vigour. Maintained that position until the end of the experiment. Leaves remarkably vigorous. This and box ix. (*T. repens*) were almost the only instances where the plants in no. 2 (min. manures) showed so high a degree of vigour. A slight tendency to flower was also manifest. Average height, June 30, 11½ inches.

Box 3. Low degree of vigour; slight rise at the end of May, succeeded by a sudden arrest in June.

Box 4. Medium vigour, checked throughout May, slight rise in June.

Box 5. Uniform maximum degree of development. Leaves larger and less downy than in the others.

Box 6. High degree, slight check in the middle of May. All the plants, except those in box 1, showed the effects of drought; latterly the difference between the plants in the six boxes was hardly perceptible.

In the case of the plants in boxes 1 and 2 no perceptible relation to temperature was noticeable; in box 3 a slight increase, in proportion to increased rain, at the end of May was remarked; in box 4 a slight decrease at the same time; in box 5 no perceptible relation between them was observed; in box 6 a slight arrest, in proportion to decreased rain and temperature, in the early part of May was noticed.

viii. *Lotus corniculatus.*

Box 1. Uniform minimum throughout. Average height 1–10 inches; showing flower.

Box 2. Low degree. Slight check in the end of June, showing flower. $9\frac{1}{2}$ inches.

Box 3. Uniform medium. Flowered early. Average height, July 1, $9\frac{1}{2}$ inches.

Box 4. Uniform medium. Flowered early.

Box 5. Maximum degree; rise at the end of May. On July 1, just flowering. Height $10\frac{1}{2}$ inches.

Box 6. High degree of vigour. Check at the end of May. On July 1, a few flowers were observed.

Latterly but little difference was observable between these plants. But little relation of growth to temperature and rainfall was perceptible.

In no. 2 no relation, except at the end of June, when a slight arrest proportionate to diminished rainfall was observed; in no. 5 a slight increase was remarked at the end of May, in proportion to the increased rainfall; and in the other boxes no perceptible relation was remarked.

ix. *Trifolium repens.*

Box 1. Uniform minimum, healthy. Average height, July 1, 6 inches.

Box 2. High. Foliage most vigorous, but became unhealthy, and died off towards the end of June.

Box 3. Uniformly low; but at the end of June the plants were in better condition than in 2.

Box 4. Uniform medium.

Box 5. Uniform maximum. Foliage vigorous. Plants flagged at the end of June. Average height $5\frac{1}{2}$ inches.

Box 6. Uniformly high.

The plants in all six boxes showed the effects of drought, and latterly were all about of the same average height; but little tendency to flower was noticed, and little or no relation to rainfall or temperature was observable.

x. *Plantago lanceolata.*

Box 1. Uniform minimum, healthy. Average height, on July 1, 10 inches.

Box 2. Medium, slight check in June ; the earliest to flower, and with the most abundant blooms, but flowers small.

Box 3. Medium. Rise at the end of May, arrest in the begin ning of June. Less floriferous than 1, but broader in the leaf.

Box 4. Low in May. Sudden rise in the early part of June maintained subsequently. Stouter stalks than in 3.

Box 5. High degree of vigour, which increased in the early part of June, and subsequently slightly declined. Stoutest flower-stalks of all.

Box 6. Maximum throughout May; check at the end of the month, and throughout June.

All the plants showed the effects of drought, except 1 and 2; latterly but little difference could be detected between them. In no. 1 no relation between the growth of the plant and the fluctuations in temperature or rainfall was observed. In 2 a slight arrest in the middle of June, corresponding to the diminished rainfall, was noticed. In 3 a rise at the end oi May, in proportion to the increased rainfall, and a check at the beginning of June, in proportion to the diminished rainfall, were observed. In box 4 there was a rise at the beginning of June, corresponding to the rise in the rainfall, and a gradually increasing rise throughout June, corresponding to the rise in temperature. In box 5 there was a slight decline in vigour towards the end of June, in proportion to the diminished rain, and in box 6 a decline towards the end of May, corresponding to the decline in the rainfall.

xi. *Achillea Millefolium.*

Box 1. Minimum, progress slight in the end of June, followed by a check, plants healthy. Average height, July 1, 10 inches.

Box 2. Uniformly low in vigour.

Box 3. Uniform medium.

Box 4. Began low, rose in the middle of May to medium. Ultimately less healthy than 3.

Box 5. High; rose to maximum at the end of May. Average height, July 1, 9 inches.

Box 6. Maximum in May; slight arrest at the end of the month.

The plants in boxes 1 and 2 were yellow-green, those in 4, 5 and 6 bluish green. All, except those in 1 and 2, flagged, those in 5 the most so (from drought). Those stalks which became exposed to the light assumed a purple colour.

In the plants in box 1 a slight rise took place at the end of June corresponding to the increased rainfall. In boxes 2, 3, 4, 5 no perceptible relation was observable. In box 6 a slight check, corresponding to deficient rain, towards the end of May was noticed.

xii. *Carum Carui.*

Box 1. Uniform minimum. Not fully developed on July 1. Average height 6 inches. Bright green.

Box 2. Uniformly low degree of vigour. Average height in July 7 inches.

Box 3. Medium degree of vigour. Slight rise in June; fall towards the end of the month. Average height 7½ inches.

Box 4. Medium. Slight fall in June; rise at the end of the month. Average height, July 1, 6½ inches.

Box 5. Uniformly high, leaves longer than in the others. Average height 9 inches.

Box 6. Uniform maximum. Average height 9 inches. Rather better crop than 5.

All the plants were healthy, but little developed, and with no trace of flower.

In the plants in 1 and 2 no relation to temperature and rainfall was noticed. In 3 a slight increase in vigour in the middle of June, in proportion to the increased rain and heat, was observable, in 4 a slight increase, in proportion to the increased rain and heat, in the middle of June. In boxes 5 and 6 no relation could be traced.

Notes on the Comparative Effects of the Several Manures on the Various Species of Plants.

In the preceding notes the relative condition of the plants of the same species in the six boxes, one unmanured, five manured, has been briefly recorded. It is quite as instructive to compare the effects of each kind of manure on the twelve plants of different species.

Box 1. *Unmanured.*

In almost all cases the unmanured plants in box 1 presented, with little or no fluctuation, the minimum de ree of vigour throughout the experiment. Of ii. (*Anthoxanthum*), however, the general condition of the plants in the unmanured box was better than in box 2 (min. manures). The most remarkable exception occurred in the case of the *Lotus* and the Milfoil, the second growth of which, in the unmanured boxes, in October was superior to that of all the rest.

Box 2. Mineral Manure.

The plants of i. (*Dactylis*), ii. (*Anthoxanthum*), iii. (*Lolium*), v. (*Poa trivialis*), and vi. (*Bromus*), were uniformly low (*a*, *b*). In *Poa pratensis* (*annua*) the vigour was low at first, but exhibited a sudden rise in July, so that in October the plants had attained nearly to the maximum degree.

In *Trifolium pratense* the vigour was high throughout; in *Lotus*, low; in *Trifolium repens*, high throughout. Of x. (*Plantago*) the plants declined in vigour. In xi. (*Achillea*) the vigour is noted low till June; but in October the plants had attained a high degree of luxuriance; and in xii. (*Carum*) a uniformly low degree was observed. The general result here seems to be, that the herbage of the grasses was not materially benefited by the mineral manures; the two trefoils, on the other hand, luxuriated in them. There are, however, certain discrepancies, as in the case of *Poa annua* and *Lotus corniculatus*, the one high, the other low—conditions the reverse of those observed in their near allies respectively.

Box 3. Ammonia-salts.

The twelve plants treated with these manures exhibited remarkable fluctuations in the case of each box, and also great variation when the plants in one box were compared with those in the others. Of i. (*Dactylis*) the plants showed a high degree of vigour at first (*e*), and then declined to medium (*c*), where they remained till the end of May, when they rose to their former level; and at the end of July they had attained the maximum (*f*), in which condition they remained till October.

In ii. (*Anthoxanthum*) considerable fluctuations were observed. Beginning low (*a*), the plants attained a medium degree of vigour (*d*) in the middle of May, experienced a decline in the end of May, rose again in June to high (*e*), while in October they were noted at *c*.

In iii. (*Lolium*) much less fluctuation was noticed; the plants throughout maintained a medium degree of vigour (*c*, *d*), declining rather towards the end of the experiment.

Of iv. (*Poa pratensis* (*annua*)) the plants were also of medium vigour generally, but at the close of the experiment manifested a rise to maximum (*f*). The observations on this box are imperfect, as at first the presence of *Poa annua* was not noticed.

Of v. (*Poa trivialis, annua*?) the plants manifested generally a high range, sinking in July, but recovered at the close of the experiment.

In vi. (*Bromus*) little or no fluctuation was observed throughout.

To vii. (*Trifolium pratense*) the ammonia-salts seem to have been of but slight advantage, as the vigour was uniformly low.

In viii. (*Lotus*) the medium degree (*d*) was attained, without appreciable fluctuation.

In ix. (*Trifolium repens*) the vigour was uniformly low.

In x. (*Plantago*) considerable fluctuation was manifest, at first medium (*d*), rising to *e*, and subsequently declining to *c*.

Of xi. (*Achillea*) the plants treated with ammonia-salts were uniformly of a good degree of vigour (*d*).

In xii. (*Carum*) frequent fluctuations were observable, though the range was not great.

In the case of the ammonia-salts, it would seem that the results are too discordant to enable any safe conclusions to be drawn from them. So far as these experiments go, however, it would appear that the ammonia-salts are varied in their influence on the grasses. In the case of the Clovers the changes are less sudden and varied, and it might be inferred that ammonia-salts were of little use to them. The Plantain and Carum showed much fluctuation, the Milfoil little or none.

Box 4. Nitrate of Soda.

The plants of i. (*Dactylis*), treated with this substance, exhibited great variation. Beginning high (*f*), the plants sunk to *d* throughout May, rose again in June to *f*, and afterwards experienced a slight decline.

In ii. (*Anthoxanthum*) the changes were great; at first medium, the plants showed a slight rise at the end of May, then a fall, and a much greater rise in October.

In iii. (*Lolium*) a medium degree was attained throughout the summer; but in October it is noted that the plants had attained to *f*.

In iv. (*Poa annua*) a medium was attained, with a slight rise in July.

In v. (*P. trivialis*) a uniformly medium (*c*) degree of vigour was observed throughout.

In vi. (*Bromus*) the vigour was uniformly at a maximum (*f*).

Of vii. (*Trifolium pratense*) the plants showed considerable fluctuations. Beginning high (*d*), they gradually fell to *b* at the end of May, and rose slightly in June.

Of viii. (*Lotus*) the plants showed a uniform medium degree of vigour.

Of ix. (*Trif. repens*) the plants showed a uniform medium degree of vigour.

In x. (*Plantago*) the fluctuations were remarkable. The plants throughout May were low. In June they began to rise, attained to the maximum at the end of the month, and sunk to medium (*d*) in October.

In xi. (*Achillea*) a sudden rise from low to medium was observed; the position was maintained throughout June; but in October it was noted that the plants had attained nearly to the maximum.

In xii. (*Carum*) a medium degree of vigour was observed, with slight fluctuations.

The evidence afforded by these experiments, so far as it goes, would seem to show that nitrate of soda is useful to Grasses, less so to Clovers, of advantage to *Plantago* and *Achillea*, but of little use to *Carum*.

Box 5. Mineral and Ammonia.

In the case of i. (*Dactylis*) the plants at first showed a maximum (*f*), declined to medium (*d, c*) during June, but manifested a slight increase in July and October.

In ii. (*Anthoxanthum*) the vigour was uniformly high, with a slight decline in July.

Of iii. (*Lolium*) the plants were uniformly high, but after the cutting in July they seem to have declined.

Of iv. (*Poa annua*) the plants were uniformly high till after the cutting, when they declined.

Of v. (*Poa trivialis*) the plants were uniformly high throughout.

In vi. (*Bromus*) fluctuation was noted; but throughout a high average was maintained.

In vii. (*Trifolium pratense*) a maximum (*f*) was noted till the cutting, after which the plants declined, till in October they descended to *b*.

In viii. (*Lotus*) a high degree with but slight fluctuation was noted throughout.

In ix. (*Trifolium repens*) a uniformly maximum degree was noted.

In x. (*Plantago*) the general vigour was high, with but slight fluctuation.

In xi. (*Achillea*) a high degree (*e*, *f*) was maintained till after the cutting, when in October the degree was low (*b*).

In xii. (*Carum*) the degree of vigour was uniformly high (*e*).

In general terms the mineral and ammonia-salts combined seem to have exerted a favourable influence on the grasses up to the time of cutting, but the plants declined in vigour afterwards. In the white clovers the degree was uniformly high; but in the *T. pratense* there was a decline in October; in the plantain, vigour high throughout; in *Achillea*, high till the time of cutting, the second growth low; in *Carum*, both before and after cutting, high.

Box 6. *Mineral and Nitrate.*

i. (*Dactylis*). Much fluctuation; beginning high, subsequently declining.

ii. (*Anthoxanthum*). Maximum throughout till the cutting, subsequently declining.

iii. (*Lolium perenne*). High throughout, without much fluctuation.

iv. (*Poa*). Maximum throughout up to the time of cutting, subsequently declining.

v. (*Poa trivialis*). Medium at first, rising to maximum in July.

vi. (*Bromus*). High throughout with but little fluctuation.

vii. (*Trifolium pratense*). Medium throughout to the time of cutting, subsequently attaining a maximum.

viii. (*Lotus corniculatus*). High throughout to the time of cutting, after which the plants declined to the minimum.

ix. (*Trifolium repens*). Medium throughout.

x. (*Plantago*). High at first, declining to medium, rising slightly after the cutting.

xi. (*Achillea*). High at first, declining to minimum after the cutting.

xii. (*Carum*). Maximum without fluctuation throughout.

The effect of mineral manures and nitrate combined, so far as can be gleaned from these experiments, was generally good in the case of the grasses; but much fluctuation was manifest in the case of the *Dactylis*, and a tendency to arrest in the second growth in some of the grasses. In *Trifolium pratense* the vigour was medium till after the cutting, when it rose to maximum. In *Lotus* the degree of vigour was high till the cutting, when it declined to minimum, the plants in the unmanured box at the same time rising to maximum. In *Trifolium repens* the growth was good throughout and without much fluctuation. In *Plantago* the growth, at first high, was subsequently checked. In *Achillea* the same phenomena were observed as in the case of *Lotus*—high at first, declining to minimum after the cutting, at the same time that the plants in the unmanured box rose to a maximum. In *Carum* the growth was maximum to the last.

It would thus appear that the mineral and nitrate was, on the whole, of most service to those plants with fleshy tap-roots (*Lotus*, Trefoils, *Carum*), or to those with a somewhat woody stock, like *Achillea*, but of less service to the fibrous-rooted plants, as grasses. The very marked change from maximum to minimum in the case of *Lotus* and *Achillea* would seem to imply that the season's growth was in a measure complete at the time of cutting, while in the unmanured boxes, on the other hand, growth went on more vigorously afterwards. It must be remarked that the flowering was more profuse in box 6, in the cases mentioned, than it was in box 1.

Notes on the Condition of the Plants on October 13*th.*

After the herbage was cut in the beginning of July, the observations were not carried on systematically till the time when the herbage was again cut in the middle of October.

As the growth for the season, so far as the top is concerned, may be considered to have been completed at that time, it seems desirable to append a statement of the condition of the plants on that day. The general result is shown in a diagrammatic form in the Tables.

i. *Dactylis.*

Box 1 (Unmanured). The plants were at this time rather unhealthy—the leaves broad, but slightly injured by frost. The average height was $7\frac{1}{2}$ inches, and there was but little tendency to flower. The plants in this box were, on the whole, rather better than in box 2.

Box 2 (Mineral manures). The plants were of a yellowish colour, slightly injured by frost, the leaves narrower than No. 1, and the plants averaging about 6 inches, with little or no tendency to produce flowers. The plants in this box were the least developed of any.

Box 3 (Ammonia-salts). Healthy well-developed plants of a bluish-green colour, 11 inches in height, with little tendency to flower. The best plants of any.

Box 4 (Nitrate of soda). Plants healthy, slightly injured by frost, of a bluish-green colour, 10 inches high, with a slight tendency to flower.

Box 5 (Mineral and ammonia). Plants well developed, but sickly and injured by frost, of a yellowish-green colour, 10½ inches high, with little or no tendency to flower.

Box 6 (Mineral and nitrate). Plants fairly healthy and well developed, injured by frost, bluish green, 8½ inches high.

On comparing the state of the plants in the six boxes of *Dactylis* in October with their condition in July, relatively little differences were observable.

ii. *Anthoxanthum.*

Box 1. Plants healthy; leaves broad, pale green, slightly injured by frost. Average height 6 inches. No tendency to flower.

Box 2. Plants healthy; leaves broad, darker than in No. 1, slightly injured by frost; average height 7 inches.

Box 3. Plants healthy, dark green, in better condition than in the preceding; height 7 inches.

Box 4. Plants healthy, vigorous; leaves broad, yellowish, much injured by frost; height 9 inches. A slight tendency to flower.

Box 5. Plants healthy, strong, frost-bitten; height 9 inches. No tendency to flower.

Box 6. Plants healthy; but leaves not so broad as in the three preceding; height 8½ inches. No flowers.

The most noteworthy circumstances in comparing the state of the plants in October and in July were the opposite conditions shown in boxes 3 and 4 and in 5 and 6 respectively: thus in 3 (ammonia salts) the plant had relatively declined after July, while in 4 (nitrate of soda) an equally great rise in October was noted as compared with the state in July. In 5 (ammonia and mineral) there was a slight rise in October, as there was also in 2 (mineral); and in 6 (ammonia and nitrate) there was a fall corresponding to that of the plants in 3 (ammonia).

iii. *Lolium.*

Box 1. Healthy, slightly touched by frost, 8½ inches high. No tendency to flower.

Box 2. Healthy, vigorous plants, but now exhausted and waning, 11 inches high. Slight tendency to flower.

Box 3. In better condition than 2. More flowers showing.

Box 4. Plants having been very strong, now waning 15 inches high. No flowers.

Box 5. Plants dying off, 14 inches high. No flowers.

Box 6. In rather better condition than 5, 14 inches high. Two flower-stems.

The plants in these boxes seem to have been generally healthy, but to have passed their prime at the date of observation. As compared with the observations at the end of June, the most noteworthy circumstance is the great rise in 4 (nitrate of soda) and the corresponding fall in 5 (ammonia and mineral). It will be remembered that the plants in June were so thick, and suffered so from drought, that no proper observations could be made on them at that time.

iv. *Poa pratensis* (*annua*).

Plants all healthy; those in 3 (ammonia-salts) were the best and rather more forward than the rest; 5 inches high. No tendency to flower in any.

As compared with the condition in July, the plants in 2 (mineral) and in 3 (ammonia) exhibited a great rise. In 4 (nitrate of soda), 5 (ammonia and mineral), and 6 (ammonia and nitrate) an apparent decrease.

v. *Poa trivialis* (*annua*).

Plants all healthy, almost all emitting stolons; those in 3 (ammonia) and 5 (ammonia and mineral) the best developed; 7 inches. No tendency to flower in any. All relatively in the same general condition as in July, except the plants in 3 (ammonia), which exhibit a considerable rise.

vi. *Bromus.*

These plants, it will be remembered, in July suffered from the overcrowding and drought; and they do not seem to have recovered afterwards. In October the plants in 4 (nitrate of soda) and in 6 (nitrate and ammonia) were noted as the best; those in 5 (ammonia and mineral) seemed to have declined since July.

vii. *Trifolium pratense.*

Plants all healthy and in seed ; those in box 6 were the strongest, those in box 2 (mineral) next. The most noteworthy point was the opposite character of the plants in 5 and 6. Thus in box 5 (ammonia and mineral) the plants had relatively declined very much since July, while in box 6 a corresponding relative improvement had taken place. No corresponding fluctuations were observable in 2 and 3 or in 3 and 4.

viii. *Lotus.*

All healthy and vigorous, so much overgrown that accurate comparative observations were difficult. All were in seed.

The contrast between the condition of the plants in the unmanured box 1 in October and in July was striking ; in July it was registered at a minimum, but in October it was at *f* (maximum). Box 6 also presented a great difference ; in July the plants were registered at *e*, but had fallen to *a* in October.

ix. *Trifolium repens.*

Plants healthy ; those in the unmanured box the least vigorous. Those in box 5 (ammonia and mineral) were the best-developed ; but little tendency to flower in any of the plants ; and in box 2 none at all. The contrast to the condition in July was remarkable : thus in the plants in 2 (mineral) a great decline was observable, in those in 3 (ammonia) a slight rise, in those in 4 (nitrate of soda) a greater rise.

x. *Plantago.*

Plants healthy in all cases ; all in flower or seed. Plants in boxes 5 and 6 the most vigorous ; those in box 2 the least so, both as regards leaf and flower. As compared with the condition in July, but little difference is worthy of being noted, except in the case of box 4 (nitrate of soda), the plants in which box seem to have relatively deteriorated. In the plants in 5 and 6 there was a slight increase of vigour as compared with the state in July.

xi. *Achillea.*

Plants all healthy and vigorous, all with strong flower-heads. The plants in box 1 were in all ways the best, those in box 2 the next in degree, the rest nearly alike.

The contrast with the condition in July is very remarkable: thus in the unmanured box the plants rose from the minimum to the maximum degree of vigour; in box 2 (mineral) a similar rise was manifest. In box 3 no change was observable. In box 4 a great rise was seen. In box 5 (ammonia and mineral) the plants manifested a great decline, as also in box 6 (ammonia and nitrate).

It will be seen that there was no correspondence between the condition of the plants in the mixed boxes (5 and 6) and that of the plants in boxes 2 and 3 and 2 and 4, as might have been expected.

xii. *Carum.*

Plants all healthy, vigorous, with no tendency to flower (biennial); boxes 1 and 2 were the least-developed; the remainder all about alike. As compared with the condition in July, but little difference was observable, except in the opposite condition of the plants in 3 and 4 respectively—a rise in 3, and a corresponding decline in 4. Further comments on the state of the plants in October will be found in the following section.

Observations on the State of the Roots of the several Plants in April 1870.

The plants were allowed to remain in the several boxes throughout the winter, till the 1st of April, 1870, when the boxes were emptied of their contents, fresh manure incorporated with the old soil, and a definite number of plants replanted in the boxes at regular distances apart. The removal of the soil from the boxes allowed an inspection of the roots to be made; and the following is a summary of the main appearances then observed.

i. *Dactylis glomerata.*

Box 1 (unmanured). Roots fibrous, fibres descending vertically, 18 inches long, slender, with numerous evenly distributed fibrillæ.

Box 2 (mineral manure). Fibres 18–20 inches long, more densely branched and matted than in any of the others.

Box 3 (ammonia-salts). Roots 14 inches long; fibres thicker than in 1; ultimate fibrils not so numerous as in 2.

Box 4 (nitrate of soda). Superior in general development to 3, inferior to 2; fibres 16–18 inches long, not so thick as in 3: fibrils less densely matted.

Box 5 (mineral and ammonia). Roots 14–15 inches long, more vigorous than in 3 and 4; main fibres more wiry than in any, except 6.

Box 6 (mineral and nitrate). Roots 18 inches long; main fibres more wiry and stouter than in any of the rest; fibrils more numerous than in 5.

Box 2, therefore, had the finest and most densely matted roots.

It is further interesting to compare the condition of the plant in October with that of the root in the following April. The plant, it may be assumed, did not grow much after October. How much the roots may have extended during the period from October to April, we have, unfortunately, no means of determining. The comparison is indicated in the annexed Tables. In the case of the *Dactylis*, the most salient features were the great development (*f*) of the root in box 2 as contrasted with the low state (*a*) of the plant in October. Here we have, if this observation can be relied on, a striking antagonism between root and "top." In most of the other boxes comparatively little difference existed between top and root; but in box 5 an antagonism similar to that in 2, but less in degree, was observable.

The condition of the roots in April and that of the plants in October may be thus illustrated.

Boxes	1	2	3	4	5	6
Root (April 1870) ..	*a*	*f*	*e*	*d*	*b*	*c*
Plant (Oct. 1869) ..	*b*	*a*	*f*	*d*	*e*	*c*

ii. *Anthoxanthum.*

Box 1. Plant tufted. Roots fibrous; fibres 7–8 inches long, slender, weak, much branched; fibrils horizontal.

Box 2. Roots of the same character as in 1, but superior in vigour and degree of branching.

Box 3. Superior to 2.

Box 4. The best-developed of all.

Box 5. Superior to 2, inferior to 3 and 4.

Box 6. About equal to 5.

But little comment is needed in this case, as the roots presented but little differences *inter se.*

The roots in the nitrate-of-soda box (4) were the best-developed. If the condition of the plant in October be compared with that of the root in April, it will be seen that the correspondence was in all cases close, and presented little trace of the antagonism so marked in the case of *Dactylis*. The main difference was in the case of box 3 (ammonia) which seems to have been more favourable to the root than to the plant.

Boxes	1	2	3	4	5	6
Root (April) ..	*a*	*b*	*e*	*f*	*d*	*c*
Plant (Oct.) ..	*a*	*b*	*c*	*f*	*e*	*d*

iii. *Lolium perenne.*

Box 1. Plant cæspitose. Root fibrous; fibres 16–18 in. long, much branched and matted; fibrils densely covered with fine root-hairs.

Box 2. Less vigorous than 1; fibres 12 inches long.

Box 3. Much more vigorous than 1 or 2, 14 inches long and upwards, rooting into the drainage, more densely fibrous and with more numerous root-hairs.

Box 4. Less vigorous than in 3, 4, and 5 more than in 1 or 2; the fibres ran down to the drainage, but were less matted than in 3.

Boxes 5 and 6 about alike; but in 5 the roots were more matted, and held the soil together more firmly than in the rest.

The abundance of root-hairs was very characteristic in the ammonia-box. It is worthy of note that in this box (3) the roots were the most highly developed, while the plant in October was only moderately developed. In box 4 (nitrate of soda) precisely the opposite conditions were observed; here the root-development was moderate, while the plant was comparatively very luxuriant. In the other boxes the differences between root and top were not so observable.

The condition of the root in April and of the plant in October may be thus expressed:

Boxes	1	2	3	4	5	6
Root	*b*	*a*	*f*	*c*	*d*	*e*
Plant	*a*	*b*	*c*	*f*	*d*	*e*

iv. *Poa annua**.

Box 1. Plant tufted. Root-fibres numerous, slender, 10–12

* The observations on this plant are not fully to be relied on.

inches long; fibrils horizontal, very numerous, short, and densely matted.

Box 2. Fibres 12–14 inches long, denser than in 1.

Box 3. Fibres 14 inches long.

Box 4. Fibres 10 inches long, less branched than in 3.

Box 5. Fibres 8–9 inches long.

Box 6. Fibres 7 inches long, the least developed of any. Probably by accident.

The actual state of the roots calls for little remark; comparatively the differences may be thus expressed:—

Boxes	1	2	3	4	5	6
Root	*d*	*e*	*f*	*c*	*b*	*a*
Plant	*a*	*e*	*f*	*c*	*b*	*d*

v. *Poa trivialis**.

Box 1. Plant tufted, sending off runners or offshoots. Root of very numerous very fine fibres, 6–7 inches long; fibrils numerous, flexuous, densely matted, and provided with scanty root-hairs.

Box 2. Root-fibres 8 inches long, denser than in 1.

Box 3. Fibres 4–5 inches long, superior to 1, inferior to 2, but denser than in 1.

Box 4. More "stocky" than in 1, 2, and 3. Root-fibres 4 inches long, inferior to 3.

Box 5. More "stocky" than 4. Roots about 6 inches long.

Box 6. Moderately "stocky". Roots about 6 inches long.

The most remarkable points that were brought into view by a comparison of the root-development with that of the herbage, &c., were afforded in the case of the plants in box 2 (min. man.), where the roots in April were comparatively highly developed, while the plant in October was comparatively little developed. This exactly corresponds to the phenomena in *Dactylis* and *Bromus*. In box 5 (min. and ammonia) the reverse condition was observed, comparatively low development of the root and high development of the plant. In the other boxes comparatively little difference was observable.

The differences between root and stem may be thus made apparent:—

* The observations on this plant are not fully to be relied on.

Boxes	1	2	3	4	5	6
Root........	*a*	*f*	*e*	*b*	*c*	*d*
Plant	*a*	*b*	*f*	*c*	*e*	*d*

vi. *Bromus mollis.*

Box 1. Plant cæspitose. Fibres numerous, vertical, wiry, 8–10 inches long, not much branched, but thickly covered with root-hairs.

Box 2. Same general characters as 1, but fibres denser, longer, 12–14 inches long; root-hairs more numerous, root-development altogether superior.

Box 3. Root-development scarcely, if at all, superior to 1.

Box 4. But little better than 3; fibres rather longer, 10–12 inches long; root-hairs slightly more abundant.

Box 5. Better than 4. Main fibres 8 inches long, but stouter than in 4.

Box 6. Main fibres 8–10 inches long, nearly the same as 3; densely covered with root-hairs; 3 and 6 nearly alike.

When compared with the condition of the plant in October, some remarkable differences were observable. Thus, in box 2 (mineral manures), the roots were highly developed, while the plant was but slightly so. In box 4 (nitrate of soda) the reverse conditions were noticeable, viz. low root-condition, high plant-development. In 6 (min. and nitrate) the appearances were similar to those in 4, but less pronounced.

The condition of the root and plant respectively may be thus indicated:—

Boxes	1	2	3	4	5	6
Root	*a*	*f*	*b*	*c*	*e*	*d*
Plant	*a*	*b*	*c*	*f*	*d*	*e*

vii. *Trifolium pratense.*

Box. 1. Plant tufted (uniform). Root tap-shaped, woody, 10–12 inches long, $\frac{1}{8}$ inch in diameter; fibres numerous (especially towards the upper and central portions of the root), wavy, directed obliquely downwards.

Box 2. Variable. Plant more "stocky" than in no. 1, *i. e.* stock more branched, and the branches of a firmer texture. Tap-root a foot long, reaching to the drainage, and not further. Stouter than in no. 1.

In this box two roots are specially worthy of notice from their relatively enormous proportions; one was nearly 20 inches long, nearly $\frac{1}{2}$ inch in diameter at the upper portion, and almost destitute of fibres, except at the upper end. At the extremity it divided into a leash of stout fibres, which must have gone between the spaces at the bottom of the box into the subjacent soil. The other root had evidently originally been of similar character and dimensions; but by some accident it had been broken off in the middle. The consequence was the formation of a vast number of fibres, averaging 8–9 inches in length.

Box 3. Tap-root a foot long, somewhat exceeding the normal roots of 2; fibres more numerous and longer, 2 inches long.

Box 4. On the whole less developed than 3. In one case there was a slender tap-root 16–18 inches in length.

Box 5. Roots less developed than in 4 or 3, 10–12 inches long.

Box 6. Roots about a foot long, more developed than in 5, but on the whole inferior to 2 and 3. One root very large.

The comparison of the root in April with the plant in October brings out some curious antagonisms thus in 3 (ammonia-salts): the root attained a maximum degree of vigour, while the plant was lower in the scale; in box 5 (ammonia and mineral) precisely the reverse took place—root low, plant highly developed. The conditions in 5 were repeated, but less markedly, in 6.

The comparison is shown in the following formula:—

Boxes	1	2	3	4	5	6
Root	*a*	*e*	*f*	*c*	*b*	*d*
Plant	*a*	*e*	*b*	*c*	*d*	*f*

viii. *Lotus corniculatus.*

Box 1. Plant tufted. Root tap-shaped, fleshy, 16–18 inches long, $\frac{1}{4}$ inch in diameter at the upper part, slightly branched; main branches slender, horizontal, 2 inches long, with numerous nodules, the lower ones descending, and without nodules.

Box 2. Roots 16 inches long; fibrils, especially the upper ones, much more numerous, and ascending, 2–3 inches long.

Box 3. Root 18 inches long, thicker and more succulent than in box 2, more fibrous; fibres much longer (5–6 inches), and more generally distributed, upper ones horizontal or ascending.

Box 4. Root 16 inches long, fleshy; fibres numerous, upper ones ascending, lower obliquely descending; knobs numerous and large.

Box 5. Inferior to 3 and 4, though longer, 18 inches long; upper fibres ascending, lower descending; knobs not so numerous or so large as in 4.

Box 6. Superior to 5, inferior to 4. Root 14 inches long; upper fibres thick, ascending; root-knobs large.

Considerable differences were observable between the condition of the roots in April and that of the plants in the preceding October. Thus, in the unmanured box 1, while the root was at a minimum (*a*), the plant was noted as having attained the maximum of development (*f*). In box 2, root and plant alike were poorly developed. In box 3 the root was not so fully developed as the plant; in box 4 (nitrate of soda) considerable difference existed, as the root had attained the maximum degree of development, while the plant had attained only a moderate degree. In 5 (min. and ammonia) the root was not so vigorous as the plant, while, on the other hand, in 6 the root was very much better than the plant, the latter being noted at a minimum.

In a few instances the root had made its way through the bottom of the box into the soil beneath. It was curious to observe that, when this took place, the tap-root broke up into a number of branches, and these again into leashes of smaller fibres.

The condition of the plant and that of root are shown in the following Table:—

Boxes	1	2	3	4	5	6
Root	*a*	*b*	*c*	*f*	*d*	*e*
Plant	*f*	*b*	*d*	*c*	*e*	*a*

ix. *Trifolium repens.*

Box 1. Plant cæspitose, giving off numerous runners. Tap-root 12–13 inches long, very gradually tapering, but little branched; branches descending obliquely, and with but few fibrils.

Box 2. Tap-root 8–9 inches long.

Box 3 showed considerable differences among the plants; the measurements of two characteristic plants are given. In one the runners were 2 inches long, the tap-root 12–14 inches in length, the fibres 3–4 inches long. In a second specimen the runners were 9 inches in length, the tap-root woody, a foot in length.

Box 4. Runners 2 inches long. Tap-root 8–9 inches long.

Box 5. Runners numerous. Tap-roots 8–9 inches in length; fibres more numerous than in the others.

Box 6. Tap-root a foot long.

The plants in these boxes showed a greater range of individual variation as to the number and length of the runners (prostrate branches) and roots than in most others. The state of the root in April and of the plant in October presented comparatively slight divergences, and may be thus indicated:—

Boxes	1	2	3	4	5	6
Root	*b*	*a*	*d*	*c*	*f*	*e*
Plant	*a*	*b*	*c*	*e*	*f*	*d*

x. *Plantago lanceolata.*

Box 1. Plants cæspitose, uniform. Leaves tufted. Stock very short. Main root tap-shaped, woody, 10–11 inches long. Secondary fibrils numerous, descending, branched, 4–5 inches long, especially abundant towards the upper portion, concealing the central root.

Box 2. Plants uniform. Similar to 1, and but little, if at all, more vigorous.

Box 3. Plants uniform. More vigorous than 2. Roots 14–16 inches long; fibrils very numerous, 4–5 inches long.

Box 4. Plants uniform. Rather less vigorous than 3. Roots 16 inches long.

Box 5. The most vigorous of all, both as to the condition of the main root and the number of fibrils. The former averaged 15–16 inches in length.

Box 6. Rather inferior to 4. Main root 14–16 inches long; fibrils less numerous than in 4 and 5.

The plants and roots in April, in boxes 3, 4, and 6 were nearly equal; and but little difference could be seen between them. The same equality of proportion is manifest when the condition of the plant in October is compared with that of the root in April, as in the following diagram:—

Boxes	1	2	3	4	5	6
Root	*a*	*b*	*c*	*d*	*f*	*c*
Plant	*b*	*a*	*c*	*d*	*f*	*e*

xi. *Achillea Millefolium.*

Box 1. In this box the plants were much matted together; and the individuals therefore varied in size and vigour; moreover, in some instances, the offshoots or stolons had given rise to new plants, which had become independent by the decay of the offshoot. The main stem was terminated by a flower-stalk, which died down after flowering, so that the growth of the stem is "determinate." The formation of lateral shoots is therefore imperative if the plant is to persist a second season. These lateral shoots are of two kinds: the one, which may be called stock-branches, are mere subdivisions of the stock or rhizome; the others are long slender runners, each terminated by a new crown, which ultimately is detached from the main stock by the decay of the runners, and forms an independent plant. In most cases the primary root remained in the form of a woody flexuous tap-root, 6–8 inches long, giving off here and there a few short fibrils; but in some instances the primary embryonic root speedily decayed, so that the roots with which the adult plant was furnished were wholly adventitious and proceeded from the short woody stock.

Box 2. More vigorous than no. 1. Runners not so numerous, shorter, but much firmer and more woody than in no. 1. Main or primary roots almost all present, cylindrical, as thick as a crow-quill, flexuous, descending vertically, 12–14 inches long; adventitious roots 6–7 inches long.

Box 3. More vigorous than 2 both in regard to runners and roots (the runners especially). Stocks slightly branched. Main root 16–18 inches long; adventitious roots 8 inches long; runner, in one case, 18 inches long.

Box 4. More vigorous than 1, 2, and 3, both in regard to roots and runners; the latter, however, are softer than in 3. Stock-branches numerous. Main roots 14–16 inches long; adventitious roots 7–8 inches long.

Box 5. The most vigorous of all. Branches of stock thick, woody, with numerous adventitious roots. Runners numerous, soft, 10–12 inches long, with a few short fibrils. Main root 14–16 inches long, thicker and more woody than in all the rest; adventitious roots 1 inch long.

Box 6. Inferior to 5 and 4, superior to the rest. Stock-branches shorter and not so stout as in 4. Runners 12–14 inches long, soft in texture. Main root 16–18 inches long; adventitious roots 4 inches.

The noticeable points in *Achillea* were the *proportionally* large number of runners in no. 1, combined with the absence of stock-branches, and the frequent disappearance of the primary root. In box 2 the stock-branches were somewhat more numerous, but there was a great paucity of runners; the main roots were proportionally well developed. In 3, runners were numerous and long, stock-branches scanty, main roots large.

Owing to the variety of structures to be taken into account, a general comparison of roots and plant is more than ordinarily difficult to be obtained. The following is an approximate estimate of the condition of the plants in October, and the roots proper in April. The most noteworthy circumstance is the antagonism between the roots and the plants in 1, 2, and 3, the plant in the unmanured box exceeding those in the manured boxes:—

Boxes	1	2	3	4	5	6
Root	*a*	*b*	*c*	*f*	*e*	*d*
Plant	*f*	*e*	*d*	*e*	*b*	*a*

xii. *Carum Carui.*

Box 1. Roots pretty uniform. Root tap-shaped, vertical, 12–14 inches long, ½ inch in diameter, at the upper end tapering off very gradually towards the apex, yellowish-brown, marked above with circular ring-like prominences, and throughout its whole length by small scattered elevations, from which the branches proceed smooth below; branches 1–2 inches long, given off obliquely downwards at tolerably regular intervals of ½ to 1 inch above, less numerous and more widely distant from each other below. The pseudo-nodes are arranged in four vertical lines, so that the fifth is over the first. The fibrils are few in number, proceeding from similar raised pseudo-nodes as the larger branches, sometimes in company with them, at other times distinct, the upper ones ascending, the lower ones obliquely descending.

Box 2. Roots varying greatly in size, some penetrating the bottom of the box; the largest 18 inches long and ¾ inch in diameter at the thickest portion; average roots scarcely, if at all, larger than in no. 1. The fibrils more numerous than in no. 1.

Box 3. Variable, but less so than in no. 2; length 14–16 inches, ¼–½ inch in diameter at the widest part. Some of the main branches arising from the root 2–3 inches below the surface are directed nearly *vertically upwards.* Fibrils less numerous than in 2.

Box 4. Somewhat variable in size, but on the whole the finest and best-developed of all (*i. e.* assuming size and succulence to be the desiderata as in root-crops); length 18–20 inches, diameter of thickest portion $\frac{3}{4}$ inch and upwards. Main branches very few *; fibrils also few.

Box 5. Very variable. On the whole superior to 1, 2, and 3; average length 16–17 inches, $\frac{1}{2}$ inch in diameter. Main branches few or none; fibrils short, scanty.

Box 6. Very variable, about the same as 5; average length 16–17 inches, diameter $\frac{1}{2}$–$\frac{3}{4}$ inch. The larger specimens had a few large branches, some of which were directed vertically upwards.

The root-development of *Carum* is interesting as showing the great degree of individual variation in plants grown under the same conditions, and which, from their habit of growth, did not interfere the one with the other. Each plant had fair play, as much so as if it had been grown in a separate pot; and yet there were considerable differences in root-development. The ascending direction of some of the main fibres is also a noteworthy feature.

Considerable differences between the development of root and top were observable, especially in boxes 3 (ammonia), 4 (nitrate of soda), and 6 (mineral and nitrate), the nitrate seeming to favour root-development. This is shown in the following scheme:—

Boxes	1	2	3	4	5	6
Root	*a*	*c*	*b*	*f*	*e*	*d*
Plant	*a*	*b*	*d*	*c*	*e*	*f*

On the Relative Effect of the various Manures on the Root-development of the Twelve Plants, and on the Contrasts observable between the Growth of the Root and that of the Herbage.

In former sections the condition of the herbage and of the roots of the same species under various manures have been sepa-

* Except in one case, where the main root showed a lacerated wound 4 inches long and $\frac{1}{4}$–$\frac{1}{2}$ inch deep; in this case there had been a production of new branches.

rately considered. It will now be useful to compare the effects of each kind of manure on all the twelve plants, both in regard to their root and their herbage.

1. *Unmanured.*

In almost all cases the roots in the unmanured box 1. were the least developed; the exceptions were in the case of iv. (*Poa annua*) and ix. (*Trifolium repens*). The difference was slight in the latter case, while in the former, for reasons before cited, the record is not trustworthy. The condition of the plant in October and that of the root in April have been alluded to already; nevertheless it is desirable to recall the great development of leaf as contrasted with that of the root in viii. (*Lotus*), and xi. (*Achillea*).

2. *Mineral Manures.*

When the twelve plants treated with mineral manures were compared with each other as to their root-development, the differences were seen to be very remarkable. In i. (*Dactylis*) root-development was at a maximum (*f*); in ii. (*Anthoxanthum*) and iii. (*Lolium*) it was low; in iv. (*Poa annua*), v. (*P. trivialis*), and vi. (*Bromus*) high; in vii. (*Trifolium pratense*) still high; but in viii. (*Lotus*) and ix. (*T. repens*) it was low, as also in x. (*Plantago*), xi. (*Achillea*), and in xii. (*Carum*). There are some very curious discrepancies here between the various grasses and between the various clovers—though the general result seems to be that, so far as the root-development is concerned, the mineral manures favour the more fibrous-rooted plants, and are of little or no use to the more fleshy tap-rooted species.

The different effect on plant and root was also striking. Thus in *Dactylis* the top did not thrive in mineral manures; and the same held true of *Anthoxanthum, Lolium perenne, Poa trivialis*, and *Bromus*. In *Achillea*, again, a contrast was observable; the mineral manures favoured the plant, but did comparatively little for the root.

3. *Ammonia salts.*

Very considerable variations were observable in the root-development of the twelve plants treated with ammonia salts. In i. (*Dactylis*) and ii. (*Anthoxanthum*) the root-development was good, while that of the plant was inferior. In iii. (*Lolium*) root-development was at a maximum, the plant only medium. In iv.

(*Poa annua*) root medium, plant maximum. In v. (*Poa trivialis*) root and plant both high. In vi. (*Bromus*) root and plant both low. In vii. (*Trifolium pratense*) a great contrast was observable; the ammonia seemed to have favoured the roots, but to have been productive of but little benefit to the herbage. In viii. (*Lotus*) root and herbage were both about medium; and the same may be said in general terms as to ix. (*T. repens*), x. (*Plantago*), xi. (*Achillea*), and xii. (*Carum*).

4. *Nitrate of Soda.*

Here also the differences were considerable. In i. (*Dactylis*) both root and plant were well developed, in ii. (*Anthoxanthum*) still better. In iii. (*Lolium*) a contrast was observable; the root was only medium, while the plant was very good. In iv. (*Poa annua*) the roots were good. In v. (*Poa trivialis*) both root and plant were indifferent. In vi. (*Bromus*) the root was medium (*c*), the plant superior (*f*). In vii. (*Trifolium pratense*) both root and plant were low. In viii. (*Lotus*) a contrast was exhibited; the root was highly developed (*f*), while the plant was medium. In ix. (*T. repens*) an inverse condition occurred. In x. (*Plantago*) root and herbage were alike moderately developed. In xi. (*Achillea*) root and herbage both highly developed. In xii. (*Carum*) root highly developed, top moderately so.

On the whole, it would seem that nitrate of soda favours root-development rather than that of the herbage; thus in *Lotus* and *Carum* the thick fleshy roots were apparently specially benefited by the nitrate, while the herbage was not proportionally favoured. In *Bromus*, on the other hand, where the herbage was good, the roots were low. *Anthoxanthum* at first sight seems to be an exception, as root and herbage are alike marked as benefited by the nitrate; but it must be remembered that the herbage of this grass was very badly developed in all the boxes (bad was the best). In two of the very free-growing grasses, however, the *Lolium* and the *Bromus*, it was the plant and not the root that was characteristically developed by the nitrate.

5. *Mineral and Ammonia.*

The differences in the twelve plants were considerable.

In i. (*Dactylis*) root-development was not benefited, but the herbage was. In ii. (*Anthoxanthum*) both herbage and root were benefited, but neither were good. In iii. (*Lolium*) a medium condition of root and herbage was noted. In iv. the results were untrustworthy. In v. (*Poa trivialis*) the roots were moderately, the herbage well developed. In vi. (*Bromus*) herbage and roots alike well developed. In vii. (*T. pratense*) neither root nor herbage was benefited. In viii. (*Lotus*) root and herbage were both moderately well developed. In ix. (*T. repens*) and x. (*Plantago*) both root and plant were much and equally benefited. In xi. (*Achillea*) the root was apparently much advantaged; but the foliage did not derive corresponding gain. In xii. (*Carum*) root and leaf both derived benefit from the manure.

6. *Mineral and Nitrate.*

Remarkable fluctuations were observable in the plants treated with this mixture.

In i. (*Dactylis*) root and plant alike exhibited a moderate degree of vigour. In ii. (*Anthoxanthum*) and iii. (*Lolium*) a similar remark holds good. In iv. the record is untrustworthy. In v. (*Poa trivialis*) the root was less well developed than the herbage, which was at the maximum. In vi. (*Bromus*) the root was moderately well developed, while the herbage was at a maximum. The same remark is true of vii. (*T. pratense*): but in viii. (*Lotus*) there was a great difference; the root was well developed, the foliage comparatively badly. In ix. (*T. repens*) root and herbage were alike well developed, as also in x. (*Plantago*). In xi. (*Achillea*) a contrast was observable; the roots were favoured, the herb was poorly developed. In xii. (*Carum*) the roots were moderately developed, the herb was at the maximum. On the whole, it would rather seem that the mineral and nitrate favoured the herbage rather than the root, and this alike in the fibrous-rooted and succulent-rooted species.

Conclusion.

In the preceding sections inferences and general conclusions from the facts observed have been given when there seemed occasion to do so. It remains now to advert to one of the main objects of the experiment, the investigation of the causes in virtue of which certain plants dominate over others placed under like circumstances. And with reference to this point, after an examination of the plants during growth, and subsequently after removal from the boxes, the conclusion is forced upon the writer that it is to the natural "habit" of the plant that we must look for the explanation of this phenomenon. Every plant has its own mode or habit of growth; and the application of various manures does not alter the natural habit in kind, but only in degree. It is easy to see why *Dactylis* or *Achillea* should gain a victory over many competitors less favourably circumstanced by nature. The *Dactylis*, with its general vigour, its bold tufts of foliage, its spreading shoots, its dense masses of roots, the *Achillea*, with its tufted habit, branching crown, profusion of runners, and ample root-development, must have the advantage over such grasses, say, as *Anthoxanthum*.

But while the natural advantages possessed by some plants over others are obvious to all, it is equally manifest from these and similar experiments that it is possible, by the addition of certain manures, to increase the root-development or that of runners &c. as the case may be, as has been shown in the preceding remarks. No doubt when each plant is grown separately under fairer conditions, not crowded by its neighbours, these results will be even more manifest.

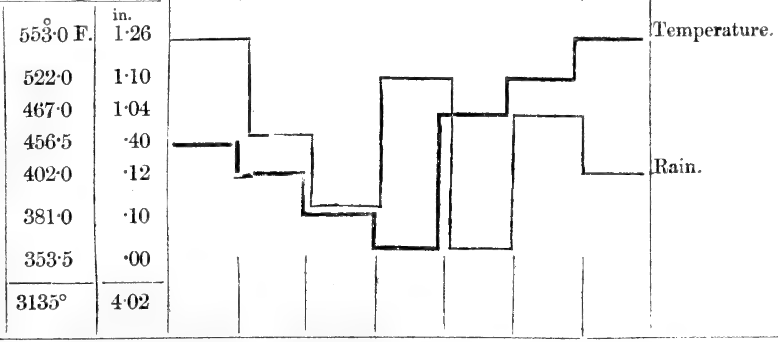
At any rate it is clear that the natural habit of the plant is of primary importance. For practical purposes, we must select those plants or those varieties whose "habit" is suitable for our purpose, whatever that may be; and having secured the right plant, we have it in our power to encourage those peculiarities of its conformation on which its value as an economic plant depends.

The following Table shows *approximately* the climatal conditions to which the plants were subjected from the beginning of May till the end of June; the thicker line indicates the temperature, the thinner one the rainfall. The diagrams show the fluctuations in the growth of the plants during the same period. In the last column is indicated the condition of the plant in October. These points are fully explained in the foregoing notes.

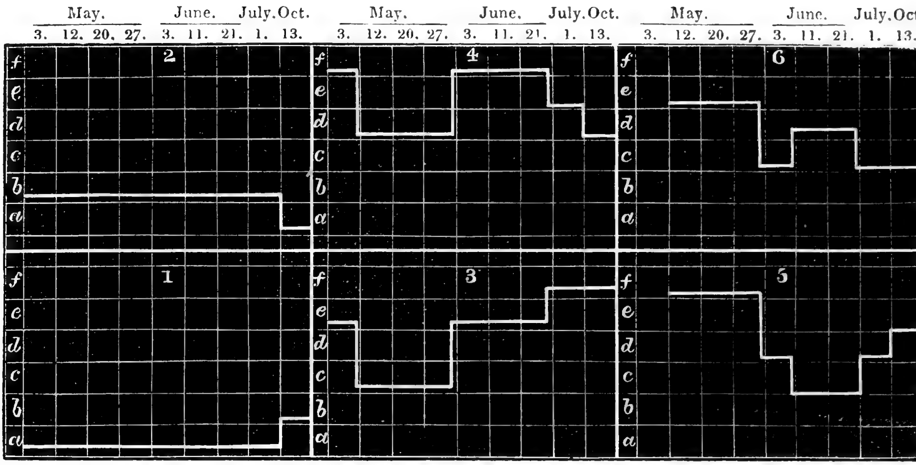
Similar diagrams were prepared showing the comparative effects of the several manures on the various species of plants, and also showing the condition of the roots in April 1870 and the contrast between the development of the roots and that of the herbage. These diagrams were unfortunately mislaid and were not found till too late for use on this occasion. It is hoped, however, that the details relating to these subjects contained in the foregoing pages will sufficiently convey the required information.

TABLE I.

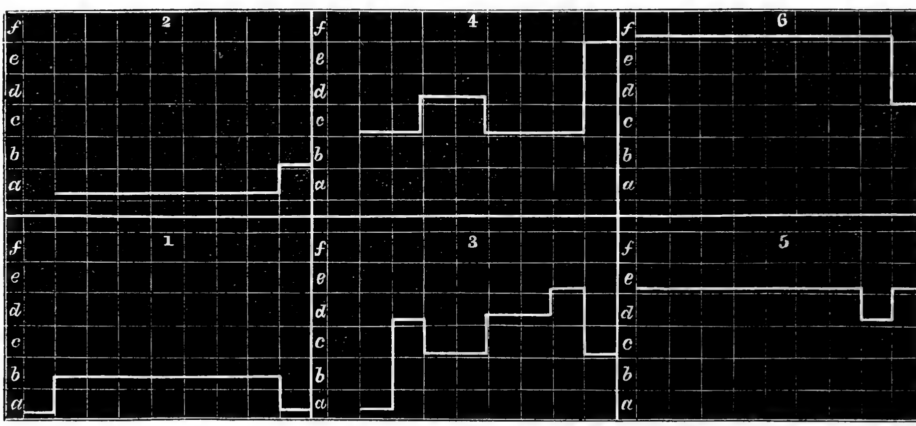
	May				June			Sums of aggregate temperature and rainfall.
	3–11.	12–19.	20–26.	27–2.	3–10.	11–20.	21–30.	
Aggregate mean temperature	456°·5	402·0	381·0	353·5	467·0	522·0	553·0	................3135°·0 F.
Average mean temperature	50°·7	50·2	54·4	50·5	58·3	52·2	55·5	
Total Rainfall................................	1·26	·40	·10	1·10	·00	1·04	·12	.... 4·02 ins.



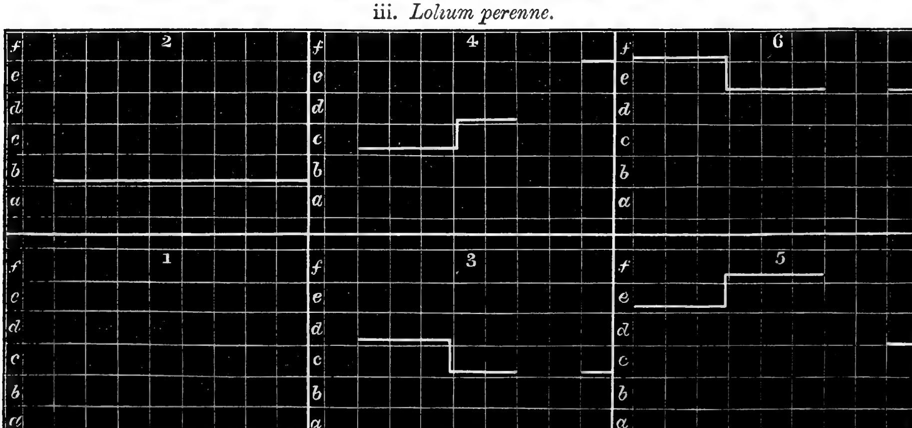
i. *Dactylis glomerata.*



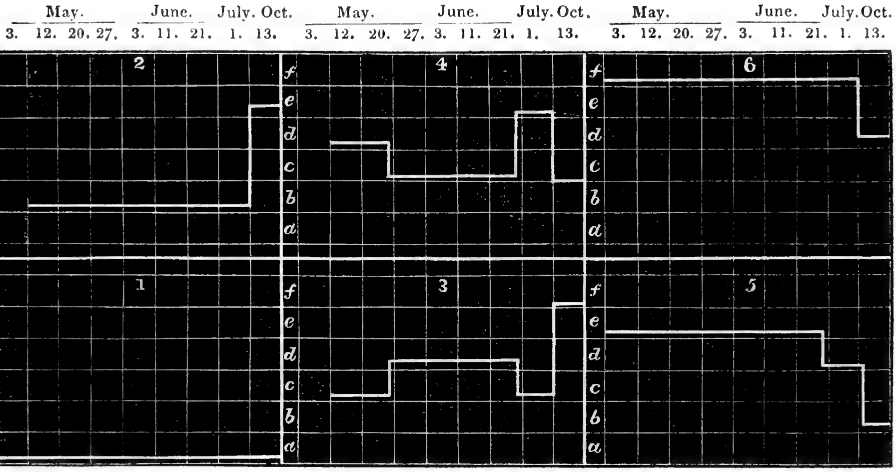
ii. *Anthoxanthum odoratum.*



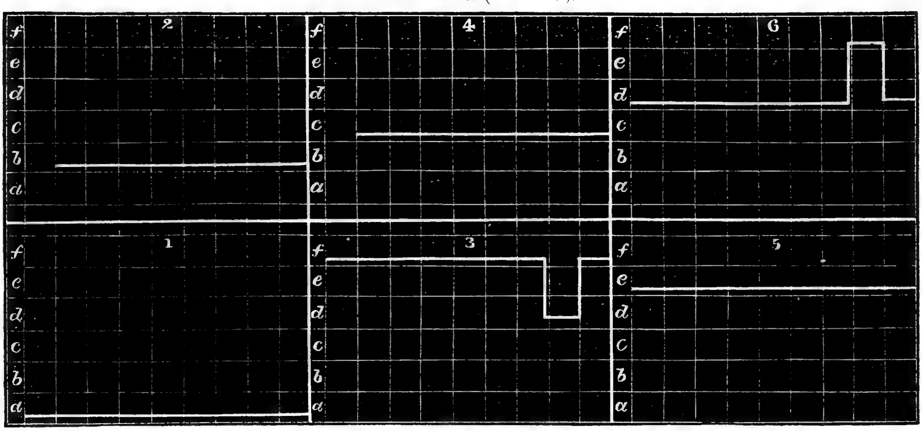
iii. *Lolium perenne.*



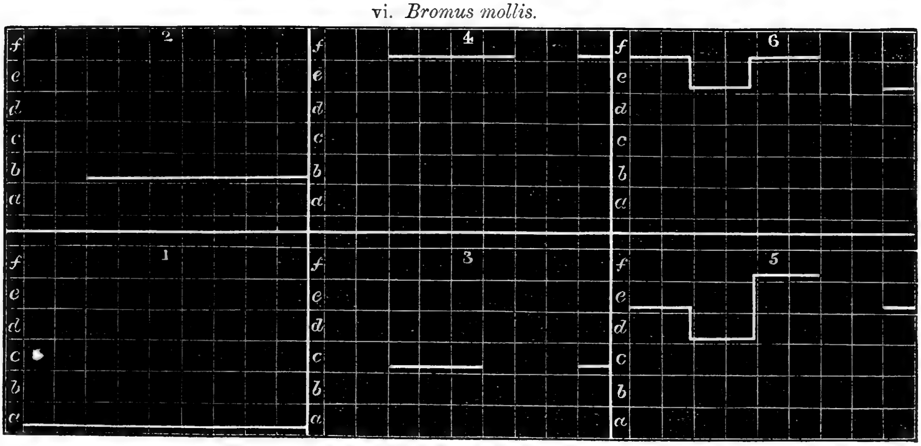
iv. *Poa pratensis* (*annua*?).



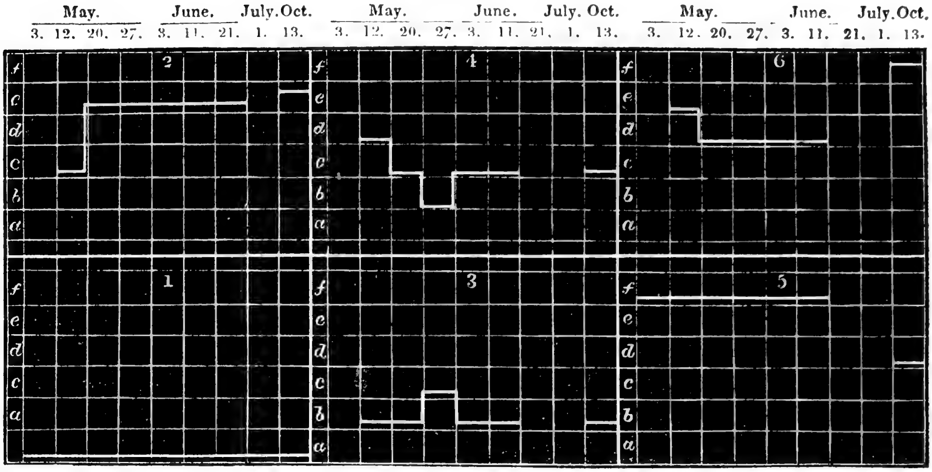
v. *Poa trivialis* (*annua*?).



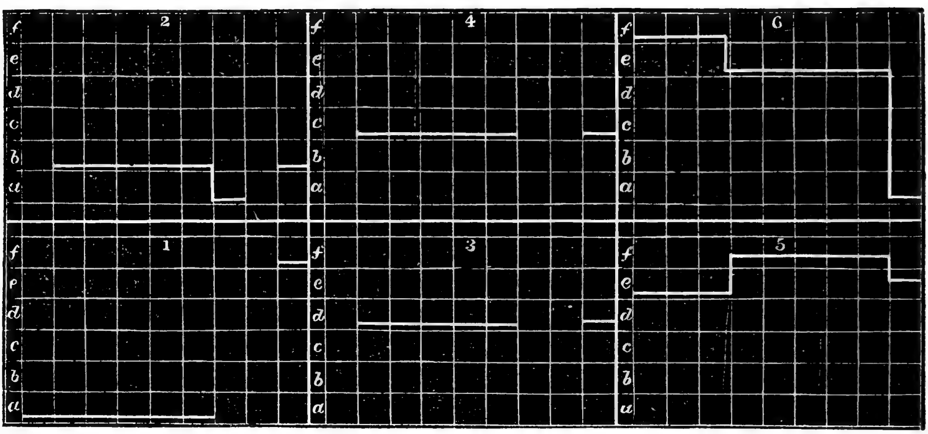
vi. *Bromus mollis.*



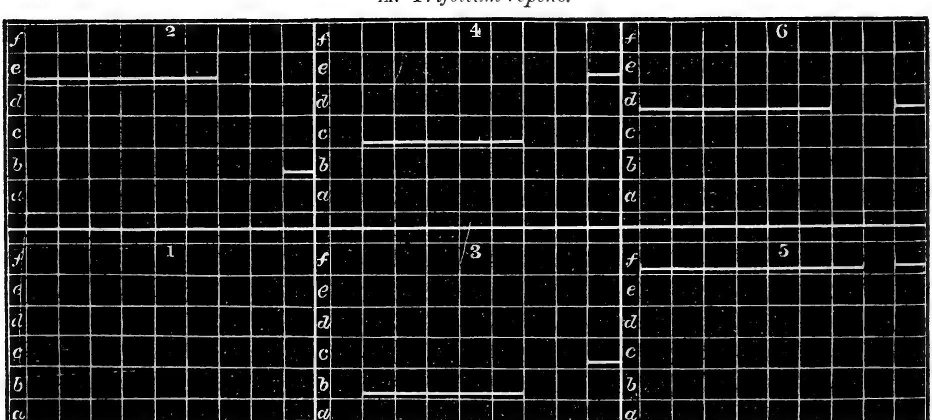
vii. *Trifolium pratense.*



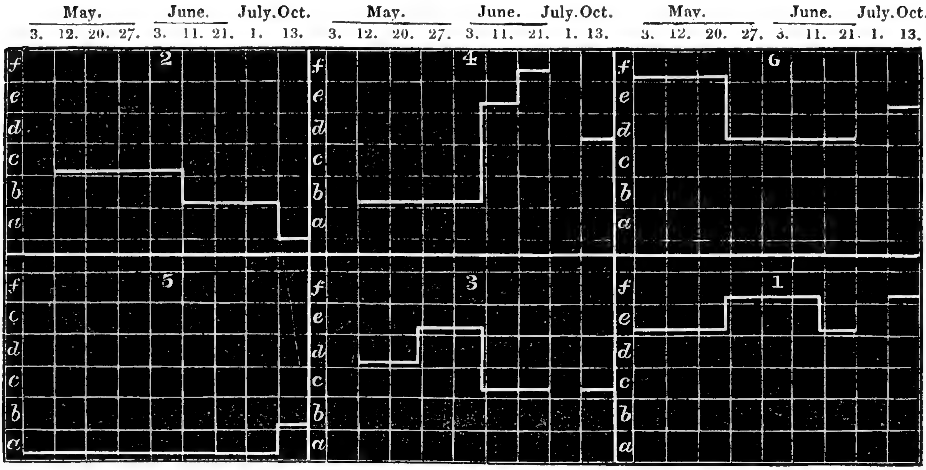
viii. *Lotus corniculatus.*



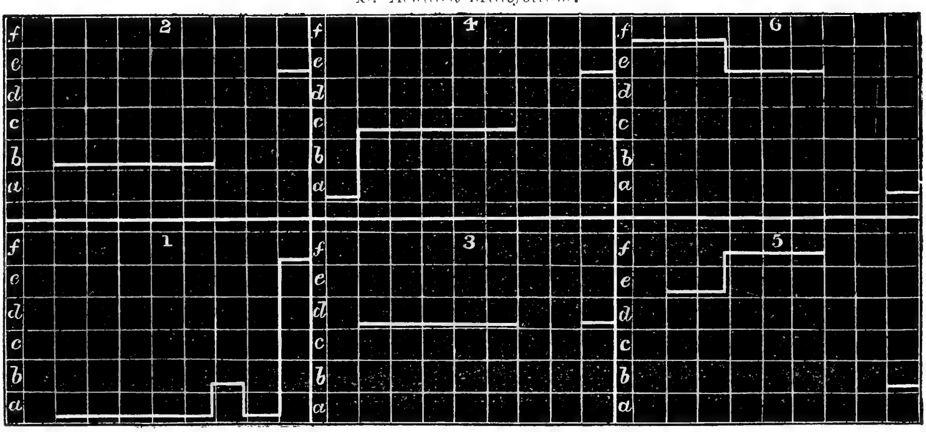
ix. *Trifolium repens.*



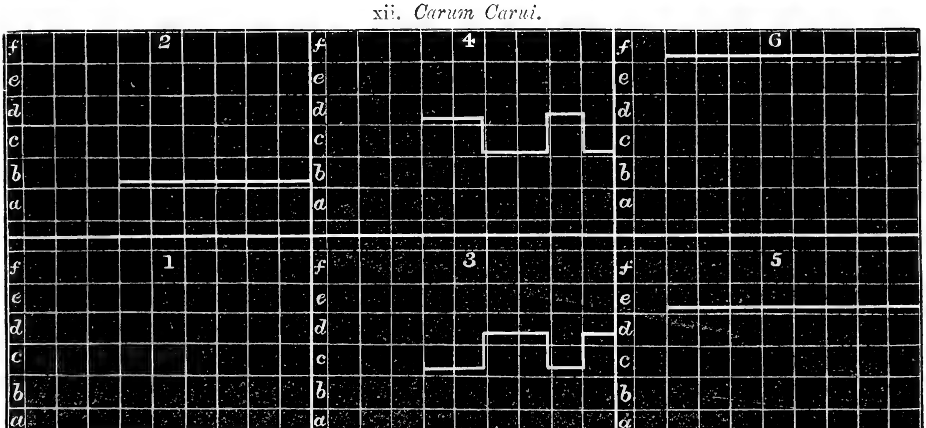
x. *Plantago lanceolata.*



xi. *Achillea Millefolium.*



xii. *Carum Carui.*



Report on the Quantity of Vegetable Matter produced.
By Dr. J. H. Gilbert, F.R.S., F.C.S.

As has been already explained, there were several circumstances, and notably the richness of the soil, the too thick sowing of the seed, and the consequent crowding of the plants, which prevent the results of this first year's experiments from being so conclusive as might be wished on the many points of interest connected with tendency and character of development which they were calculated to raise. It is perhaps the more desirable to follow up the preceding report of the observations on the character of development of the various species under the influence of the different manures, by records of the actual quantity of matter produced in each case.

It was thought sufficient for the purpose to determine simply the total amount of substance cut, and dried at 212° F., and the total amount of mineral matter represented by the ash left on burning a proportional part. The analytical work has been performed, with Mr. Lawes's permission, in the Rothamsted Laboratory. The results are given, in summary in Tables I., II. and III., which follow, and in full detail in Table IV.

Table I.—Weight of plant produced (two cuttings) dried a 212° F.

Description of plant. Order.	Description of plant. Genus and Species.	1. Unmanured.	2. Mixed mineral manure.	3. Ammonia-salts.	4. Nitrate of soda.	5. Mixed mineral manure and ammonia-salts.	6. Mixed mineral manure and nitrate of soda.
		oz.	oz.	oz.	oz.	oz.	oz.
Graminaceæ	i. Dactylis glomerata......	5·99	6·53	9·94	9·60	9·40	9·18
	ii. Anthoxanthum odoratum	4·36	3·46	4·59	5·44	5·04	5·80
	iii. Lolium perenne..........	9·76	13·34	13·54	15·06	15·55	14·85
	iv. Poa annua	6·25	6·96	8·54	7·62	6·98	7·56
	v. Poa trivialis	3·93	4·09	5·38	4·34	5·64	4·98
	vi. Bromus mollis	8·04	8·70	10·03	10·97	10·50	10·36
	Means	6·39	7·18	8·67	8·84	8·85	8·79
Leguminosæ	vii. Trifolium pratense......	9·45	11·39	12·14	12·27	10·32	12·35
	viii. Lotus corniculatus.....	20·90	18·66	24·16	21·13	23·71	22·47
	ix. Trifolium repens	7·34	9·62	9·47	9·57	10·54	9·22
	Means	12·56	13·22	15·26	14·32	14·86	14·68
Plantaginaceæ	x. Plantago lanceolata ...	26·48	20·06	27·28	27·76	29·83	29·15
Compositæ......	xi. Achillea Millefolium ...	22·99	21·97	22·73	21·12	21·33	20·32
Umbelliferæ ...	xii. Carum Carui	1·59	2·01	2·87	2·95	3·53	4·19
	Means	17·02	14·68	17·63	17·28	18·23	17·84
	General means	10·59	10·57	12·56	12·32	12·70	12·54

TABLE II.—Quantity of Mineral Matter (ash); two cuttings.

Description of plant: Order.	Description of plant: Genus and species.	1. Unmanured.	2. Mixed mineral manure.	3. Ammonia-salts.	4. Nitrate of soda.	5. Mixed mineral manure and ammonia-salts.	6. Mixed mineral manure and nitrate of soda.
		oz	oz.	oz.	oz.	oz.	oz.
Graminaceæ	i. Dactylis glomerata	0·702	0·848	1·214	1·072	1·272	1·156
	ii. Anthoxanthum odoratum	0·616	0·544	0·578	0·658	0·710	0·824
	iii. Lolium perenne	1·230	1·832	1·898	2·216	2·358	2·266
	iv. Poa annua	0·736	0·896	1·236	1·014	1·014	1·020
	v. Poa trivialis	0·500	0·510	0·726	0·582	0·754	0·660
	vi. Bromus mollis	1·000	1·104	0·238	1·426	1·428	1·506
	Means	0·797	0·956	1·148	1·161	1·256	1·239
Leguminosæ	vii. Trifolium pratense	1·176	1·564	1·608	1·614	1·496	1·750
	viii. Lotus corniculatus	2·066	2·122	2·440	2·044	2·670	2·592
	ix. Trifolium repens	0·942	1·474	1·364	1·286	1·620	1·412
	Means	1·395	1·720	1·804	1·648	1·929	1·918
Plantaginaceæ	x. Plantago lanceolata	3·470	2·688	4·026	3·994	4·434	4·200
Compositæ	xi. Achillea Millefolium	3·278	3·464	3·806	3·274	3·690	3·390
Umbelliferæ	xii. Carum Carui	0·376	0·480	0·622	0·740	0·896	1·064
	Means	2·375	2·211	2·818	2·669	3·007	2·885
	General means	1·341	1·461	1·730	1·660	1·862	1·820

TABLE III.—Percentage of Mineral Matter in Substance dried at 212° F.

Graminaceæ	i. Dactylis glomerata	11·73	12·92	12·26	11·26	13·65	12·63
	ii. Anthoxanthum odoratum	13·67	15·64	12·65	12·59	13·97	14·05
	iii. Lolium perenne	12·90	14·47	14·83	15·34	15·98	15·97
	iv. Poa annua	12·14	13·18	14·92	15·06	15·07	14·86
	v. Poa trivialis	12·70	12·49	13·39	13·58	13·38	13·44
	vi. Bromus mollis	14·83	14·68	15·48	15·63	13·90	15·71
	Means	13·00	13·90	13·92	13·91	14·33	14·44
Leguminosæ	vii. Trifolium pratense	12·43	13·65	13·24	13·12	14·23	14·13
	viii. Lotus corniculatus	10·38	12·02	10·56	10·15	11·80	11·92
	ix. Trifolium repens	13·02	15·10	14·36	13·33	15·23	15·12
	Means	11·94	13·59	12·72	12·20	13·75	13·72
Plantaginaceæ.	x. Plantago lanceolata	11·91	12·52	13·65	13·45	13·77	13·27
Compositæ	xi. Achillea Millefolium	14·08	15·89	16·53	15·33	17·30	16·64
Umbelliferæ	xii. Carum Carui	23·61	24·15	21·92	24·38	25·91	26·26
	Means	16·53	17·52	17·37	17·72	18·99	18·72
	General means	13·62	14·73	14·48	14·44	15·35	15·33

The main points of interest, however, are conveniently brought to light, in the graphic form, in the diagrams Nos. 1 to 18 inclusive.

In each of the first series of diagrams, Nos. 1 to 6 respectively, is shown the results of one only of the six manurial conditions, but on each of the twelve plants. The continuous line represents the amount of *dry substance* produced (above ground); and each horizontal division, numbered from the base line upwards, represents one ounce of such dry produce. Thus the diagrams 1 to 6 show, graphically, the actual and relative amounts of dry substance produced, which are recorded numerically in the six columns of Table I. (p. 64). It need hardly be explained that the amount of *dry substance* is a true measure of the amount of growth attained above ground, in each case, at the time of cutting. To aid the conception of the results, it may be added that each ounce of produce on the experimental area of 4 square feet corresponds to rather more than 6 cwt. per acre; or, to put it in another way, 16 ounces, or 1 lb., corresponds to 97¼ cwts., or nearly 5 tons of dry produce per acre.

A glance at the six diagrams, side by side, shows that under no condition of manuring did any one of the six *grasses* quite attain to 16 ounces of produce, whilst generally they yielded less than half, and sometimes only about a quarter as much, though in several cases the *Lolium* gave nearly as much. Of the Leguminosæ, neither the *Trifolium pratense* nor the *Trifolium repens* ever reached 16 ounces; whilst the *Lotus corniculatus* did so under each of the six different conditions of manuring; and in several cases attained to nearly once and a half that amount. Of plants of other orders, the *Plantago* in every case exceeded the amount of growth of the *Lotus*; and in every case but one it exceeded that of any other plant among the twelve; in fact, in several cases the produce of *Plantago* corresponded to more than 8, and in one to more than 9, tons of dry vegetable matter per acre. The *Achillea*, too, in two instances exceeds, in another equals, and in the remainder falls little short of, the produce of the *Lotus*. The *Carum* (biennial), on the other hand, gave under each condition of manuring the smallest amount of produce above ground in this first year's growth, though the amount of matter in its fleshy root, stored up for future use, probably exceeded that of any other description of plant.

Studied in detail, the facts here but briefly summarized afford striking illustrations of the varying powers of accumulation and assimilation of plants of different families, of different genera of the same family, and even of different species of the same genus,

Table IV.—Plants grown at Chiswick by different Manures. First Season, 1869; Actual Determinations of Dry Matter at 212° F. and of Mineral Matter (Ash). [*To face p.* 66.]

Descriptions of plant.	Cuttings	1. Unmanured. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.	2. Mixed mineral manure. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.	3. Ammonia-salts. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
i. Dactylis glomerata	1	3·12	0·780	0·716	0·083	4·21	1·053	0·953	0·125	6·21	1·553	1·411	0·166
			0·780	0·713	0·085		1·053	0·948	0·127		1·553	1·405	0·169
	2	3·72	0·930	0·781	0·093	3·24	0·810	0·670	0·080	5·24	1·310	1·089	0·135
			0·930	0·783	0·090		0·810	0·695	0·092		1·310	1·067	0·137
	Total	6·84	3·420	2·993	0·351	7·45	3·726	3·266	0·424	11·45	5·726	4·972	0·607
ii. Anthoxanthum odoratum	1	1·52	0·380	0·326	0·037	0·55	0·138	0·120	0·018	1·56	0·390	0·363	0·046
			0·380	0·336	0·046[a]		0·138	0·119	0·019		0·390	0·355	0·046
	2	3·65	0·913	0·752	0·120	3·53	0·883	0·758	0·105	3·73	0·933	0·789	0·115[a]
			0·913	0·768	0·105		0·883	0·733	0·130[a]		0·933	0·789	0·082
	Total	5·17	2·586	2·182	0·308	4·08	2·042	1·730	0·272	5·29	2·646	2·296	0·289
iii. Lolium perenne	1	7·24	1·810	1·557	0·183	10·41	2·603	2·241	0·280	11·10	2·775	2·343	0·312[a]
			1·810	1·558	0·185		2·603	2·237	0·272		2·775	2·354	0·287
	2	4·16	1·040	0·880	0·117	5·38	1·345	1·097	0·177	4·97	1·243	1·046	0·170
			1·040	0·885	0·130		1·345	1·095	0·187		1·243	1·026	0·180
	Total	11·40	5·700	4·880	0·615	15·79	7·896	6·670	0·916	16·07	8·036	6·769	0·949
iv. Poa annua	1	4·65	1·163	1·061	0·121	6·04	1·510	1·242	0·165[a]	7·76	1·940	1·586	0·198
			1·163	1·061	0·115		1·510	1·243	0·145		1·940	1·584	0·245[a]
	2	2·44	0·610	0·498	0·065	2·43	0·608	0·499	0·065	2·79	0·698	0·545	0·082
			0·610	0·505	0·067		0·608	0·495	0·073[a]		0·698	0·557	0.092[a]
	Total	7·09	3·546	3·125	0·368	8·47	4·236	3·479	0·448	10·55	5·276	4·272	0·618
v. Poa trivialis	1	1·85	0·463	0·426	0·055	1·77	0·443	0·418	0·055	2·75	0·688	[a]0·636	0·085[a]
			0·463	0·432	0·055		0·443	0·415	0·050		0·688	0·599	0·068
	2	2·70	0·675	0·575	0·089[a]	2·93	0·733	0·601	0·080	3·69	0·923	0·725	0·105
			0·675	0·534	0·060		0·733	0·611	0·070		0·923	0·731	0·105
	Total	4·55	2·276	1·967	0·250	4·70	2·352	2·045	0·255	6·44	3·222	2·691	0·363
vi. Bromus mollis	1	8·41	2·103	1·710	0·215[a]	9·46	2·365	1·942	0·246	11·50	2·875	2·277	0·274
			2·103	1·750	0·183		2·365	1·931	0·224		2·875	2·320	0·265
	2	1·39	0·348	0·280	0·045	1·15	0·288	0·237	0·040	1·03	0·258	0·210	0·040
			0·348	0·282	0·057		0·288	0·239	0·042		0·258	0·206	0·040
	Total	9·80	4·902	4·022	0·500	10·61	5·306	4·349	0·552	12·53	6·266	5·013	0·619
vii. Trifolium pratense	1	6·69	1·673	1·393	0·191	7·82	1·955	1·592	0·240	7·86	1·965	1·589	0·203
			1·673	1·383	0·157		1·955	1·580	0·215		1·965	1·603	0·221
	2	4·70	1·175	0·968	0·125	6·10	1·525	1·256	0·157	7·04	1·760	1·434	0·180
			1·175	0·981	0·115		1·525	1·267	0·170		1·760	1·446	0·200[a]
	Total	11·39	5·696	4·725	0·588	13·92	6·960	5·695	0·782	14·90	7·450	6·072	0·804
viii. Lotus corniculatus	1	7·70	1·925	1·615	0·188	7·61	1·903	1·584	0·228	10·30	2·575	2·168	0·267
			1·925	1·619	0·190		1·903	1·605	0·220		2·575	2·171	0·262
	2	17·30	4·325	3·596	0·328	14·68	3·670	3·085	0·305	18·64	4·660	3·863	0·321
			4·325	3·620	0·327		3·670	3·057	0·308		4·660	3·878	0·370
	Total	25·00	12·500	10·450	1·033	22·29	11·146	9·331	1·061	28·94	14·470	12·080	1·220
ix. Trifolium repens	1	6·70	1·675	1·395	0·181	8·68	2·170	1·810	0·272	7·81	1·953	1·653	0·225
			1·675	1·391	0·170		2·170	1·802	0·290		1·953	1·634	0·235
	2	2·20	0·550	0·458	0·060	3·00	0·750	0·614	0·090	3·50	0·875	0·726	0·105
			0·550	0·436	0·060		0·750	0·582	0·085		0·875	0·721	0·108
	Total	8·90	4·450	3·680	0·471	11·68	5·840	4·808	0·737	11·31	5·656	4·734	0·673
x. Plantago lanceolata	1	12·86	3·215	2·616	0·320	11·99	2·998	2·408	0·320	14·71	3·678	2·915	0·452
			3·215	2·602	0·318		2·998	2·419	0·310		3·678	2·924	0·460
	2	[b]15·26	3·815	3·152	0·475	[b]9·40	2·350	1·926	0·290	[b]14·03	3·508	2·844	0·430
			3·815	3·185	0·480		2·350	1·961	0·302		3·508	2·852	0·470
		[c]4·00	1·000	0·847	0·072	[c]3·15	0·788	0·658	0·065	[c]5·04	1·260	1·042	0·090
			1·000	0·840	0·070		0·788	0·657	0·057		1·260	1·065	0·111
	Total	32·12	16·060	13·242	1·735	24·54	12·272	10·029	1·344	33·78	16·892	13·642	2·013
xi. Achillea millefolium	1	8·58	2·145	1·753	0·239	8·40	2·100	1·718	0·280	11·38	2·845	2·302	0·360
			2·145	1·766	0·240		2·100	1·720	0·277		2·845	2·315	0·351
	2	19·61	4·903	3·990	0·580	17·94	4·485	3·770	0·580	16·25	4·063	3·372	0·602
			4·903	3·985	0·580		4·485	3·776	0·595		4·063	3·376	0·590
	Total	28·19	14·096	11·494	1·639	26·34	13·170	10·984	1·732	27·63	13·816	11·365	1·903
xii. Carum carui	1	[d]0·96	0·240	0·190	0·031	[d]1·29	0·323	0·268	0·050	1·83	0·458	0·373	0·057
			0·240	0·201	0·033		0·323	0·265	0·050		0·458	0·375	0·060
	2	0·97	0·243	0·185	0·062	1·09	0·273	0·241	0·070	1·64	0·410	0·330	0·097
			0·243	0·220	0·062		0·273	0·233	0·070		0·410	0·359	0·097
	Total	1·93	0·966	0·796	0·188	2·38	1·192	1·007	0·240	3·47	1·736	1·437	0·311

Descriptions of plant.	Cuttings	4. Nitrate of soda. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.	5. Mixed mineral manure and ammonia-salts. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.	6. Mixed mineral manure and nitrate of soda. Produce, air-dried.	½ for drying and burning.	Dry matter.	Ash.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
i. Dactylis glomerata	1	6·13	1·533	1·387	0·148	6·34	1·585	1·435	0·191	6·24	1·560	1·392	0·176
			1·533	1·375	0·146		1·585	1·432	0·185		1·560	1·411	0·173
	2	4·86	1·215	1·018	0·121	4·43	1·108	0·903	0·130	4·17	1·043	0·879	0·111
			1·215	1·019	0·121		1·108	0·931	0·130		1·043	0·910	0·118
	Total	10·99	5·496	4·799	0·536	10·77	5·386	4·701	0·636	10·41	5·206	4·592	0·578
ii. Anthoxanthum odoratum	1	0·91	0·228	0·216	0·028	1·10	0·275	0·224	0·030	2·17	0·543	0·456	0·062
			0·228	0·206	0·028		0·275	0·232	0·033		0·543	0·456	0·062
	2	5·60	1·400	1·148	0·173[a]	4·94	1·235	1·021	0·140	4·87	1·218	1·005	0·138
			1·400	1·148	0·100		1·235	1·044	0·152		1·218	0·983	0·150
	Total	6·51	3·256	2·718	0·329	6·04	3·020	2·521	0·355	7·04	3·522	2·900	0·412
iii. Lolium perenne	1	10·98	2·745	2·345	0·306	11·98	2·995	2·554	0·346	11·24	2·810	2·420	0·325
			2·745	2·343	0·295		2·995	2·577	0·346		2·810	2·407	0·331
	2	6·77	1·693	1·417	0·235	6·52	1·630	1·370	0·227	6·26	1·565	1·298	0·222
			1·693	1·423	0·272[a]		1·630	1·276	0·260[a]		1·565	1·301	0·255
	Total	17·75	8·876	7·528	1·108	18·50	9·250	7·777	1·179	17·50	8·750	7·426	1·133
iv. Poa annua	1	7·81	1·953	1·578	0·186	7·04	1·760	1·434	0·223[a]	7·96	1·990	1·632	0·192
			1·953	1·591	0·208[a]		1·760	1·422	0·183		1·990	1·622	0·230[a]
	2	1·58	0·395	0·326	0·053	1·56	0·390	0·313	0·051	1·30	0·325	0·254	0·043
			0·395	0·314	0·060		0·390	0·321	0·050		0·325	0·272	0·045
	Total	9·39	4·696	3·809	0·507	8·60	4·300	3·490	0·507	9·26	4·630	3·780	0·510
v. Poa trivialis	1	2·78	0·695	0·640	0·086[a]	3·06	0·765	0·695	0·102	3·24	0·810	0·744	0·092
			0·695	0·636	0·075[a]		0·765	0·704	0·093		0·810	0·745	0·093
	2	2·28	0·570	0·442	0·064	3·61	0·903	0·712	0·095	2·61	0·653	0·495	0·070
			0·570	0·432	0·066		0·903	0·708	0·087		0·653	0·508	0·075
	Total	5·06	2·530	2·170	0·291	6·67	3·336	2·819	0·377	5·85	2·926	2·492	0·330
vi. Bromus mollis	1	12·18	3·045	2·440	0·295	11·33	2·833	2·351	0·310	11·51	2·878	2·352	0·340
			3·045	2·463	0·308		2·833	2·311	0·320		2·878	2·359	0·333
	2	1·45	0·363	0·287	0·060	1·46	0·365	0·298	0·042	1·20	0·300	0·234	0·040
			0·363	0·294	0·050		0·365	0·290	0·042[e]		0·300	0·233	0·040
	Total	13·63	6·816	5·484	0·713	12·79	6·396	5·250	0·714	12·71	6·356	5·178	0·753
vii. Trifolium pratense	1	8·59	2·148	1·845	0·222	8·62	2·155	1·741	0·245	8·11	2·028	1·658	0·245
			2·148	1·759	0·260		2·155	1·774	0·281		2·028	1·647	0·240
	2	6·19	1·548	1·265	0·160	4·12	1·030	0·839	0·110	7·07	1·768	1·432	0·190
			1·548	1·266	0·165		1·030	0·806	0·112		1·768	1·438	0·200
	Total	14·78	7·392	6·135	0·807	12·74	6·370	5·160	0·748	15·18	7·592	6·175	0·875
viii. Lotus corniculatus	1	9·02	2·255	1·931	0·237	10·96	2·740	2·320	0·325	10·72	2·680	2·255	0·335
			2·255	1·896	0·217		2·740	2·311	0·335		2·680	2·255	0·291
	2	16·45	4·113	3·368	0·290	17·17	4·293	3·629	0·345	16·22	4·055	3·365	0·318
			4·113	3·369	0·278		4·293	3·593	0·330		4·055	3·362	0·352
	Total	25·47	12·736	10·564	1·022	28·13	14·066	11·853	1·335	26·94	13·470	11·237	1·296
ix. Trifolium repens	1	7·90	1·975	1·672	0·225	8·65	2·163	1·835	0·290	7·74	1·935	1·680	0·261
			1·975	1·636	0·225		2·163	1·816	0·280		1·935	1·631	0·255
	2	3·70	0·925	0·719	0·092	3·99	0·998	1·818	0·120	3·24	0·810	0·640	0·095
			0·925	0·759	0·101		0·998	0·799	0·120		0·810	0·657	0·095
	Total	11·60	5·800	4·786	0·643	12·64	6·322	5·268	0·810	10·98	5·490	4·608	0·706
x. Plantago lanceolata	1	14·66	3·665	2·920	0·440	15·14	3·785	3·003	0·501	14·37	3·593	2·873	0·410
			3·665	2·920	0·450		3·785	2·989	0·530		3·593	2·823	0·420
	2	[b]13·63	3·408	2·718	0·430	[b]14·96	3·740	3·053	0·470	[b]15·70	3·925	3·177	0·515
			3·408	2·716	0·440		3·740	3·073	0·472		3·925	3·178	0·535
		[c]6·22	1·555	1·307	0·120	[c]6·72	1·680	1·401	0·122	[c]6·06	1·515	1·254	0·115
			1·555	1·298	0·117		1·680	1·394	0·122		1·515	1·268	0·105
	Total	34·51	17·256	13·879	1·997	36·82	18·410	14.913	2·217	36·13	18·066	14·573	2·100
xi. Achillea millefolium	1	10·98	2·745	2·196	0·315	11·65	2·913	2·388	0·425[a]	11·88	2·970	2·411	0·385
			2·745	2·200	0·315		2·913	2·358	0·395		2·970	2·406	0·370
	2	14·98	3·745	3·095	0·485	14·39	3·598	2·954	0·555	13·05	3·263	2·675	0·470
			3·745	3·071	0.522[a]		3·598	2·966	0·470		3·263	2·667	0·470
	Total	25·96	12·980	10·562	1·637	26·04	13·022	10·666	1·845	24·93	12·466	10·159	1·695
xii. Carum carui	1	1·60	0·400	0·330	0·055	2·29	0·573	0·476	0·092	2·85	0·713	0·587	0·110
			0·400	0·339	0·055		0·573	0·472	0·091		0·713	0·583	0·112
	2	1·91	0·478	0·404	0·125	1·89	0·473	0·407	0·135	2·17	0·543	0·455	0·150
			0·478	0·401	0·135		0·473	0·408	0·130		0·543	0·469	0·160
	Total	3·51	1·756	1·474	0·370	4·18	2·092	1·763	0·448	5·02	2·512	2·094	0·532

[a] In all cases adherent soil was removed as much as possible before drying and burning, but in these instances the ashes were seen to be more or less contaminated with it. [b] Leaf. [c] Stem and seed. [d] These two samples were accidentally partially mixed, and, though separated as far as possible, may not have been so completely. [e] Ash spilt and quantity assumed to be the same as in experiment I.

under the same external conditions of supply in soil and atmosphere—indicating, doubtless, not only very varying ranges of root-collection, but also quantitatively varying functional characters both of the feeders and the elaborating organs.

A collective view of diagrams 1 to 6 shows, as a rule, but few marked differences in the relation of the amounts of growth of the various descriptions of plants compared one with another, under the six very varying conditions of soil-supply of constituents; and, indeed, diagram 1, and column 1 in Table I., representing the growth without manure of any kind, shows in many cases but little or no less growth than that attained with some of the manures—a fact sufficiently illustrative of the too high condition of the unmanured soil for the purposes of such experiments. But the effect of the different manures on each description of plant will be better studied by reference to diagrams 7–18.

The twelve diagrams, 7–18, show, for each of the twelve descriptions of plants respectively, the comparative effects of the six different conditions of manuring. The continuous line, as in diagrams 1–6, represents the amount of *dry produce* in ounces; but the dotted line represents the proportion of *mineral matter* (ash) *in the dry substance*, each horizontal division indicating 1 per cent. of mineral matter in the dry substance.

We will refer first to the effects of the different manures on each description of plant:—

Diagram 7. *Dactylis glomerata.*—It will be observed that this very free-growing grass increases but little under the influence of purely mineral manures, but augments by about one half under the influence of each of the other manures, all of which supply a large and equal amount of nitrogen, but in different states of combination or of association with other constituents. And here it may be well to observe that, preeminently so far as the *grasses* are concerned, the recognized characteristic effect of mineral manures is to favour elaboration or maturation rather than luxuriance; whilst the characteristic effect of nitrogenous manures is to give luxuriance rather than maturing-tendency. The fact, therefore, of any increase by mineral manures alone is some indication of the overrichness of the unmanured soil in available nitrogen; and that, at the time of cutting, there was not more produce where the ammonia-salts or the nitrate was employed in admixture with mineral manures (the conditions of both luxuriance and maturation being thus supplied) than where they were used alone, is probably accounted for by the facts that where they were used alone there was, owing to the richness of the soil, a sufficiency of mineral matter within the increased root-range for as full an amount of produce over the area as the limitation of season would admit of; whilst, where both the nitrogenous and the mineral manures were employed, the limitation of season again prevented any increased effect from the increased supplies by manure.

The dotted line, showing the percentage of mineral matter in the dry substance, throws some light on these points. It should here be premised that, other things being equal, a low percentage of mineral matter in dry substance is generally indicative of relatively high condition of maturation, and a high percentage of mineral matter of backward or low condition of maturation. We find, accordingly, a considerably higher percentage of mineral matter in the produce grown by ammonia-salts and mineral manure than in that by ammonia-salts alone, and, again, considerably higher in that by nitrate of soda and mineral manure than in that by nitrate of soda alone, indicating that the produce by ammonia-salts or nitrate of soda alone was relatively more matured, or, in other words, had less potential growth before it, than that where the minerals were also used. Having directed attention to these points in detail in this case, we may be more brief in reference to the other grasses.

Diagram 8. *Anthoxanthum odoratum.*—The continuous line shows meagre growth under each of the six different conditions of manuring. In all the boxes of this species the plant was very irregular; and hence little satisfactory conclusion can be drawn in regard either to the comparative amounts of produce, or the condition of its maturation as indicated by the dotted line. The root-range also being comparatively limited, the differences in the amounts of produce are also limited, though with this limited range (and consequent less influence from the richness of the bulk of the soil) the effects of the manures, with the exception of the purely mineral, are upon the whole normal in direction,—there being a slight increase with the ammonia-salts, and more with ammonia and mineral manures together—also more increase with the more rapidly available nitrate, and more still when it is used in combination with the mineral manure. The high percentage of mineral matter indicated in the produce by mineral manure alone, is partly due to adherent soil, of which, in all cases, there is some on the lower leaves, the whole of which cannot be removed, and which would the more increase the percentage of incombustible matter the smaller the amount of produce; and in this case it was very small.

Diagram 9. *Lolium perenne.*—Under all six conditions of manuring, this grass grew more luxuriantly, and eventually produced a larger amount of vegetable matter, than any other. Even without manure, its produce was considerably more than that of either *Anthoxanthum odoratum*, *Poa annua*, or *Poa trivialis*, and nearly as much as that of *Dactylis glomerata*, and *Bromus mollis* with it. With mineral manure it gave considerable increase, probably due to more active root-development, and hence gathering up available nitrogen from a more extended range of soil. The nitrogenous manures gave still more increase, probably limited, however, by season and want of room, as the plants with these manures especially were as crowded and luxuriant as the space would admit of. That the most luxuriant plants were, at the time of cutting, not the most matured, and might, therefore, with extension of season have given more growth, is probable from the fact that, as a rule, the higher the amount of produce, the higher also is the percentage of mineral matter in the dry substance.

Diagram 10. *Poa annua.*—As in these boxes there was not only an uneven plant, but a mixture of *Poa trivialis* and *Poa annua*, little need be said about the final result of growth. With uneven plant there is no consistent increase of vegetable matter with the more liberal nitrogenous and mineral manuring; but the high, both actual and relative, percentage of mineral matter in the dry substance, when the nitrogenous manures were used, indicates a tendency rather to luxuriance than maturation in the majority of such plants as grew.

Diagram 11. *Poa trivialis.*—The plants in these boxes were also uneven, and they contained, besides, much *Poa annua*. The amount of growth was, under all conditions of manuring, less than in the case of any other grass, excepting in some instances the *Anthoxanthum*.

Diagram 12. *Bromus mollis.*—As in the cases of the *Dactylis* and *Lolium* especially, so also in that of the *Bromus*, the characteristic effects of the different manures were masked or prevented by crowding and over-luxuriance. Accordingly the nitrogenous manures do not afford much increase; but, with the exception of No. 5, with ammonia-salts and mineral manure together, there is comparatively high percentage of mineral matter in the substance produced, showing immaturity, and consequently capability of further accumulation had the season permitted.

We now come to plants of the Natural Order *Leguminosæ*; and, by way of introduction to the results, it may be well to state that a given weight of the dry substance of such of the species, at any rate, as are cultivated in agriculture, contains, as a rule, two or more times as much nitrogen as an equal weight of any of the *grasses* experimented upon, supposing the specimens compared to be in somewhat equal condition of maturation. Notwithstanding this, whilst nitrogenous manures, whether in the form of ammonia-salts or nitrates, as a rule produce very marked effects on the luxuriance of growth of the *grasses*, on the clovers and allied plants ammonia-salts, if not injurious, have not, as a rule, any beneficial effect; and the nitrate has much less than on the grasses. On the other hand, the common experience is, that mineral manures, and especially those rich in potass, much more characteristically benefit Leguminous than they do Graminaceous plants.

Diagram 13. *Trifolium pratense.* The plants in all six boxes were luxuriant and more or less crowded. Still the mineral manures gave notable increase; and, excepting in the case of No. 5 (minerals and ammonia, from which it would seem the plants suffered), the nitrogenous manures gave a further increment of increase, and the nitrate somewhat more than the ammonia-salts. In fact, the effects of nitrogenous manures were, upon the whole, greater than common experience has shown with plants of the family to which this belongs, when they are grown on soilsless rich in the mineral constituents required. The variation in the proportion of mineral matter is not great; but the percentage is higher under all the manured conditions than under the unmanured; and from the greatly increased development of underground feeders under the manured conditions, we have additional reason for supposing that the late-sown, crowded, and luxuriant plants had not attained to the maximum growth at the time of the final cutting of the season.

Diagram 14. *Lotus corniculatus.*—This plant gave much more produce under corresponding manuring-conditions than either of the other leguminous species—much more than any of the grasses,—and, in fact, was only exceeded uniformly by the *Plantago lanceolata*, and in two cases by the *Achillea Millefolium*. The very high amount of produce without any manure at all, corresponding to about 6½ tons of dry substance per acre, clearly indicates the richness of the soil; and owing to this fact, and to the doubtless unequal stage of growth of the plants under the different conditions at the time of cutting, abnormal results as to the final amount of total produce are only what might have been expected. We have, at the time of cutting, even a less amount of total produce by mineral manures than without any manure; but at the same time a proportionally high percentage of mineral matter, indicating less maturity. With each of the nitrogenous manures, on the other hand, there is increase, but, contrary to common experience with plants of this family, more in both cases in which ammonia-salts were employed than in either where the nitrate was used. There was, throughout, a low percentage of mineral matter in the dry substance; and although strict comparison on the point cannot be made between plants of different species, it may be mentioned that it was not only lower than in the case of either of the other Leguminosæ, but under each of the six conditions lower than in the case of any other species of the twelve. Consistently with this, the *Lotus* (being well podded and seeded) was more matured than any other description of plant.

Diagram 15. *Trifolium repens.*—This plant did not, under any condition, yield as much produce as the *Trifolium pratense*; and only in one instance did it give half as much as the *Lotus*. Each of the manures gave some increase; the purely mineral manures nearly as much, however, as either of the nitrogenous ones. The percentage of mineral matter in the dry substance was throughout rather high, indicating relatively immature conditions; and it was the more so under the manured than under the unmanured conditions.

It will be observed that the above results with Leguminosæ are, in some respects, not consistent with what might have been expected from the remarks made in introducing the consideration of them. It is true that, in two out of the three cases, the mineral manures did give notable increase. The nitrogenous manures, on the other hand, though they did not give very great increase, might, so far as these results are concerned, be judged to be nearly as appropriate for these plants as for the grasses; whilst the ammonia-salts would seem to be at least as appropriate as the nitrate. As already explained, the richness of the unmanured soil—of which, from the great root-development, it was obvious that the plants had full possession, and from which they were enabled to obtain nearly all that was essential for the fullest growth which the limitation of area and season admitted of—must be taken as accounting for the absence of more definite and consistent results from the different manures.

Diagram 16. *Plantago lanceolata.*—As already intimated, of all the twelve species, the *Plantago* gave the most growth above ground. Even without manure the dry substance produced was equivalent to about 8 tons per acre, representing an assimilation of more than 3 tons of carbon! There was even less produce by mineral manures than without manure. The nitrogenous manures, however, gave increase, and more when combined with mineral manures, though, from the very large produce over the limited area without manure, there was not room for much increase under any circumstances. The percentage of mineral matter in the dry substance was throughout comparatively low; and, consistently, whilst many of the plants were unripe, many were freely seeding. The amount of constituents removed from the soil by these plants must have been very great; but to this point we shall recur.

Diagram 17. *Achillea Millefolium.*—This plant, although it proved inferior in assimilative capacity to the *Plantago*, so far, at any rate, as growth above ground is concerned, probably formed more matter below the surface than the *Plantago*; and it was second to it, among the twelve species, in amount of above-ground growth without manure. With its complete possession of the ground, and the soil so rich, it gave, however, no increase whatever above ground under any of the manured conditions. The percentage of mineral matter, however, was higher under every manured condition; and hence it may be gathered that at the time of the final cutting the manures had chiefly encouraged increased root-development, and that, if the season had been prolonged, this increased resource would have borne result in increased growth above as well as under the surface.

Diagram 18. *Carum Carui.*—Of all the twelve species, this *biennial* gave by far the smallest amount of produce above ground, but in its fleshy roots (a storehouse for future development) probably more under-ground growth than any other. Many of the parsnip-like roots, indeed, were from ½ to ¾ inch or more in diameter at the top, tapering down a foot, or 15 inches, or more. Although, too, the actual amount of growth above ground was so small, there was a pretty regular gradation of increase under the influence of the different manures, from **No. 2**, with mineral manures alone, up to No. 6, with mineral manures and nitrate of soda; and, again, although the actual amount was not great, the *proportion* of the manured to the unmanured produce was, as a rule, higher than with any other plant. The percentage of mineral matter also was throughout extraordinarily high, indicating the early stage of progress of the plants at the time of the completion of the first year's growth. All conditions, therefore, tended to show that, far from having attained the full growth which the soil-conditions supplied were adapted for, the plants had, at the time they were cut, much potential work before them, and in degree much in proportion to the provision of the constituents available for assimilation.

To the above few comments on the amount of growth attained by the different species, under the different conditions of manuring, it may be interesting to add a few observations as to the relation of the amounts of constituents removed to the bulk of soil, and to the supply by manure.

Table II. shows that the *grasses* removed from 0·5 to 1·23 oz., or an average of about 0·8 oz., of mineral matter from the unmanured soil; whilst under the same conditions the Leguminosæ removed from under 1 to over 2 oz.; the *Achillea* 3¼, and the *Plantago* nearly 3½ ozs. Some idea of the richness of the soil in available mineral matter which these amounts indicate will be acquired when it is stated that 1 oz. of mineral matter removed from one of the boxes by one of the grasses, would correspond to as much per acre as would be contained in about 5 tons of meadow hay, 1 oz. in one of the clovers to as much per acre as would be removed in about 4 tons of clover hay, and 3 to 3½ ozs., as in the cases of the *Achillea* and *Plantago*, to a ton or more of mineral matter per acre.

Of *phosphoric acid*, the *grasses* would, on the average, thus remove from the unmanured soil about one-seventh as much as was supplied where the heavy mineral manure was employed; and of *potass* from one-fourth to one-third as much as the mineral manure supplied. Of *phosphoric acid*, the *clovers* would remove considerably more than, and of *potass* about as much as, the average of the grasses. Of both constituents the *Lotus* would remove more still, and the *Achillea* and *Plantago* probably very much more. With nitrogenous, but without mineral manure, the amounts removed were, as a rule, with all the plants much greater than—in fact, in some cases once and a half as much as without manure.

With regard to *mineral constituents*, therefore, it may be concluded that the unmanured soils were so far drawn upon by the first year's growth, as to widen considerably the difference between the unmanured and manured conditions; and hence the series of soils would be better fitted for the purposes of further experiment.

With regard to the *nitrogen*, although no determinations of it in the produce have been made, it may safely be estimated that, from the unmanured soils, some of the grasses removed more than half as much, the clovers about as much, and the *Lotus* more than twice as much, as was contained in the very heavy dressings where nitrogenous manures were employed; whilst the *Plantago* and the *Achillea* probably gathered up still more.

The quantity of nitrogen in the produce was doubtless generally increased where it was supplied, but pretty certainly in no case in amount equal to the supply.

In regard to richness in available *nitrogen*, therefore, as well as mineral matter, the unmanured soils must have been, relatively to the others, much reduced, and hence the whole set rendered better fitted for further experiment. Calculations and considerations of the kind here indicated led, in fact, to the decision to retain the same soils for the second (the current) year's experiments.

If the results of the first season's experiments do not, as hardly could be expected that they would, afford very satisfactory evidence in regard to the many points of interest which experiments of the kind are calculated to elucidate, at any rate much experience has been gained as to the conduct of future trials; and the discussion of the results themselves cannot fail to indicate how much we may hope to learn when the unfavourable conditions have been avoided, favourable ones carefully secured, and the results attentively studied. The relatively varying dependence of different plants on soil and atmospheric conditions respectively, the effects of varying conditions as to soil-supply, the tendency to luxuriance on the one hand or to maturation on the other, or the widely varying special characters of development, according to the external conditions provided, are points which, when thoroughly investigated and generally understood, must serve to place the cultivation of plants for various purposes—whether for the supply of wood, of fibre, of food, of drug or colour in some special organ, of fruits, or of flowers—on the sure basis of scientific principle, rather than leave it dependent on the still uncertain, though often wonderfully successful, guidance of empiricism. May not such knowledge too, give much insight into the varying functions of plants which have been held to be allied to, or separated from, each other, as the case may be, for reasons quite independent of the sources of their accumulation, or the special tendency of their assimilative actions?

Diagram 1.—*Unmanured.*

Graminaceæ. Leguminosæ. Other Orders.

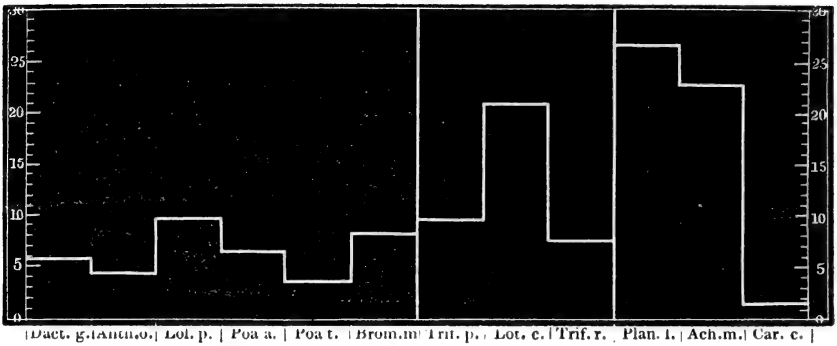


Diagram 2.—*Mixed Mineral Manure.*

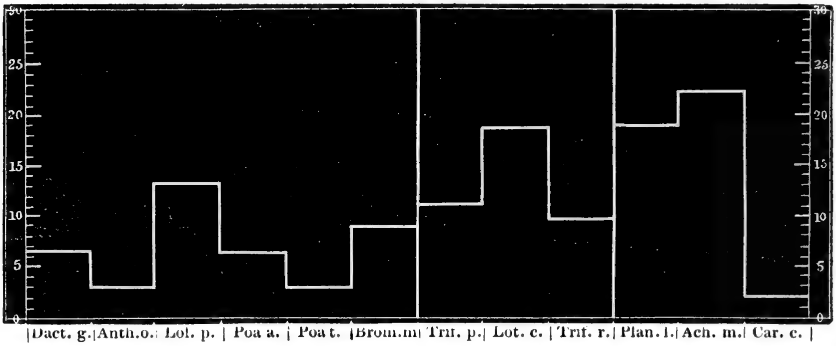


Diagram 3.—*Ammonia-salts.*

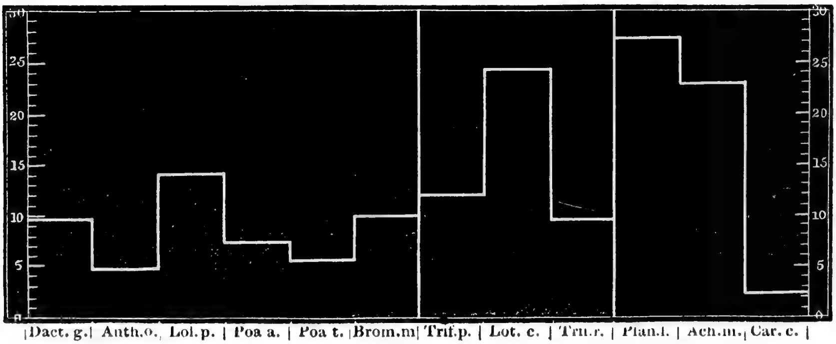


Diagram 4.—*Nitrate of Soda.*

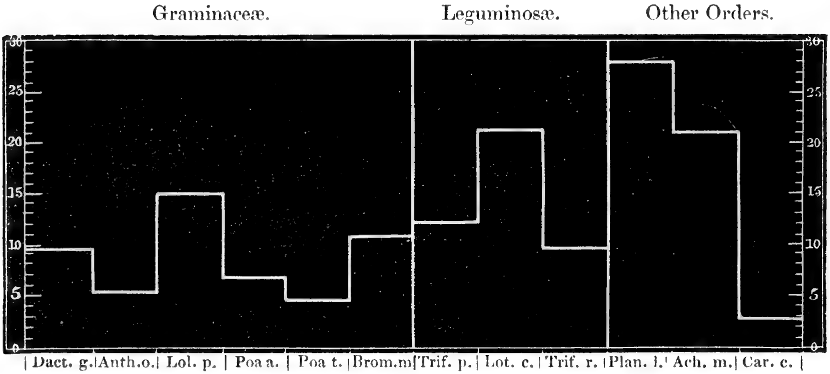


Diagram 5.—*Mixed Mineral Manure and Ammonia-salts.*

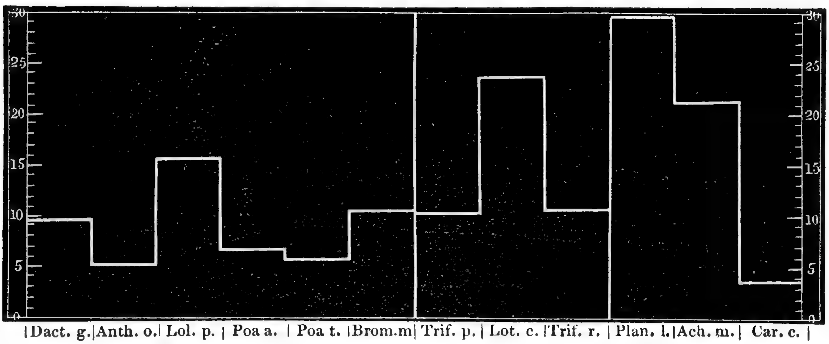


Diagram 6.—*Mixed Mineral Manure and Nitrate of Soda.*

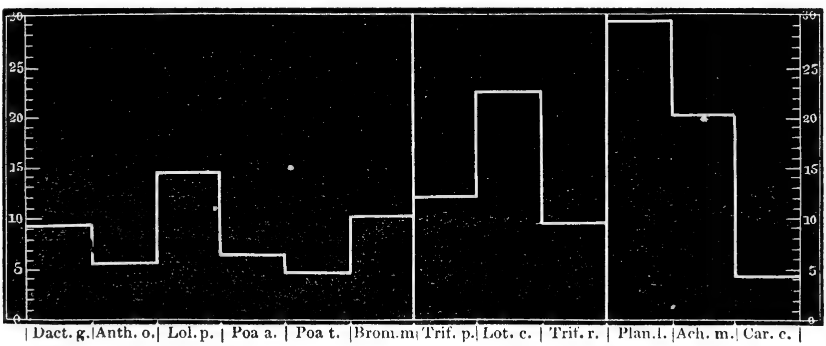


Diagram 7.—i. *Dactylis glomerata.*

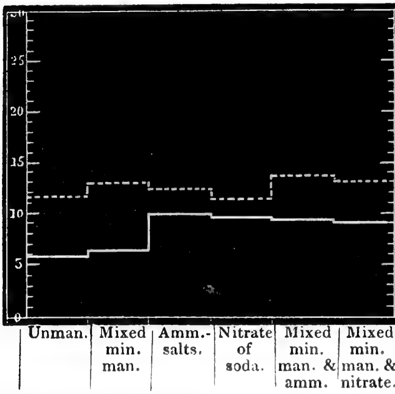


Diagram 10.—iv. *Poa annua.*

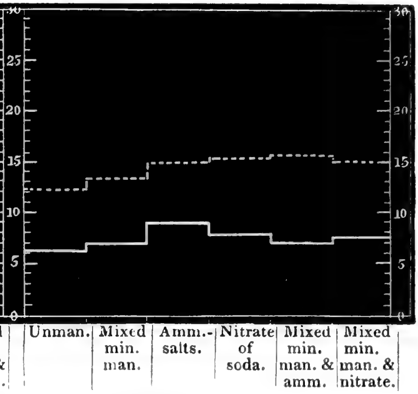


Diagram 8.—ii. *Anthoxanthum odoratum.*

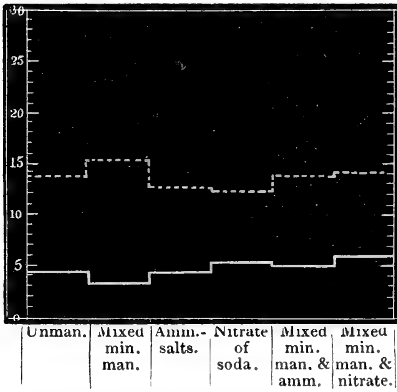


Diagram 11.—v. *Poa trivialis.*

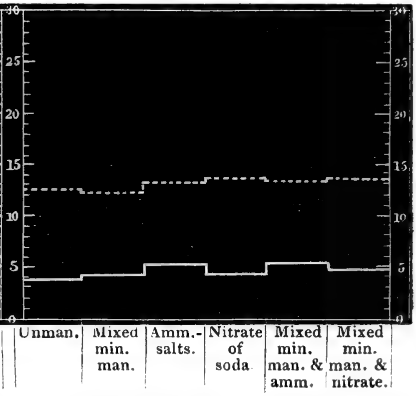


Diagram 9.—iii. *Lolium perenne.*

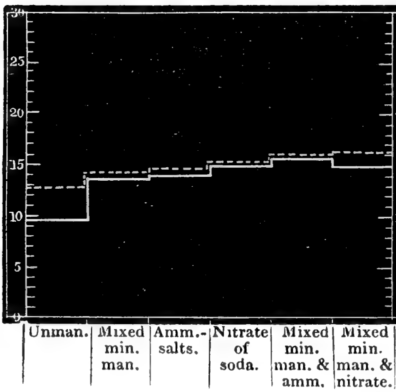


Diagram 12.—vi. *Bromus mollis.*

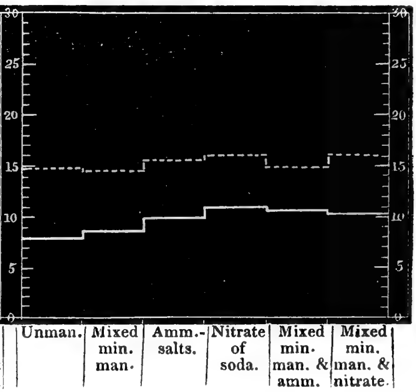


Diagram 13.—vii. *Trifolium pratense.*

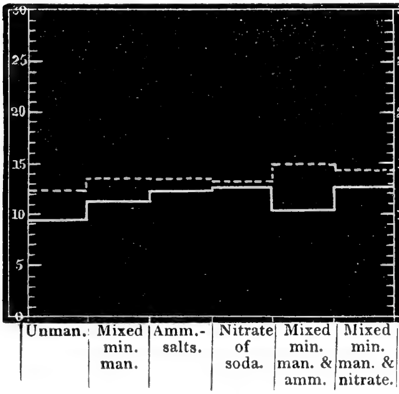


Diagram 14.—viii. *Lotus corniculatus.*

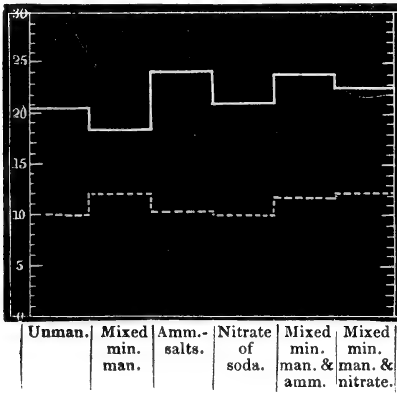


Diagram 15.—ix. *Trifolium repens.*

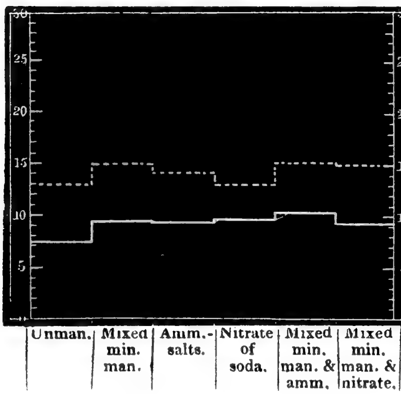


Diagram 16.—x. *Plantago lanceolata.*

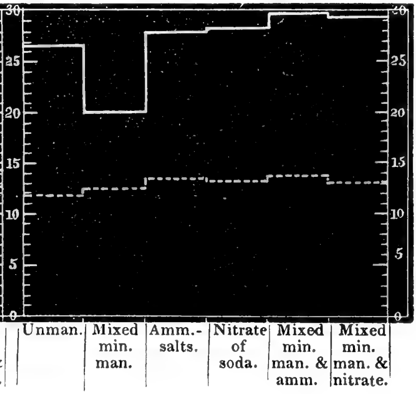


Diagram 17.—xi. *Achillea Millefolium.*

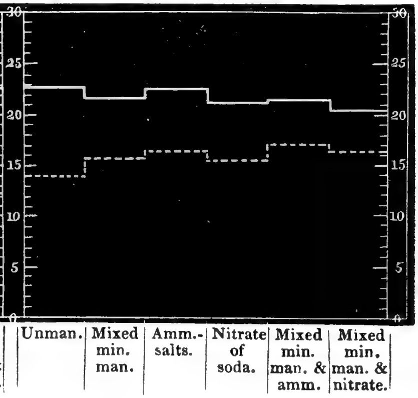
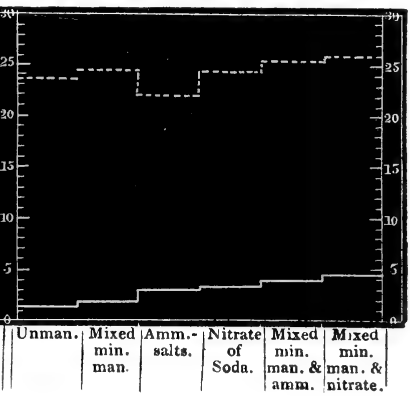


Diagram 18.—xii. *Carum Carui.*



VII. Statement of the various Plans tried during the years 1867, 1868, and 1869, to extirpate the "Vine-pest" (*Phylloxera vastatrix*) from the Vines at Powerscourt, county of Wicklow, Ireland, with full details of the plan successfully adopted to eradicate it. By Malcolm Dunn.

Early in July, in the year 1867, the "Vine-pest" (*Phylloxera vastatrix*) made its first appearance at Powerscourt on the leaves and young wood of the vines in two late vineries. It being new to me, I was at first very much puzzled what to make of it; but one thing I saw clearly, at the rate it was increasing, that it certainly would soon destroy the vines if it was not effectually checked; so that I at once began to try to get rid of it by some of the usual methods of exterminating plant-insects, such as syringing heavily where we could get at them without damaging the fruit then on the vines, fumigating with tobacco and capsicums, dusting with snuff, sulphur, hellebore, Cayenne pepper, &c.; but I found all of little use, owing to the habit the insect has of hiding itself in the soft tissue of the young wood and in swellings of the leaves, where none of the remedies mentioned could reach it; therefore finding that the "pest" still increased rapidly if left alone for a few days, I determined to try to keep it down as well as I could, by cutting off the worst infected young wood and leaves and burning them, until the vines would be at rest during the winter, when I could get the opportunity of giving them a thorough cleaning.

In the meanwhile, seeing a notice in the public papers of the breaking out of a new Vine-disease in the South of France, and also hearing that a similar disease to that at Powerscourt had made its appearance in some of the London nurseries, I began to suspect that our vines had got the disease that was making such ravages in the French vineyards; and as I knew nothing of its history, or any cure for it, I forwarded specimens of infected leaves to the Editor of the 'Gardener's Chronicle,' asking for any information he could give about it, and got a reply in 'Notices to Correspondents' saying "the disease is quite new to us," and asking for the history of it and more specimens, which I duly sent. Next week I got a reply saying "thanks for the vine-leaves. The disease is undescribed. We are preparing an article on it," signed "W."—Professor Westwood, of Oxford, I supposed.

Just at that time (September and October 1867) the Rev. M. J.

Berkeley, the eminent cryptogamist, visited Powerscourt, and investigated the appearance and habits of the insect on the spot, and came to the conclusion that it was closely allied, if not identical with, the insect then devastating the vineyards in France.

Having learned so much, I feared the vines were almost beyond recovery; more especially so when, on turning up a part of the border to examine the condition of the roots, I found them attacked by the insect in myriads, burrowing into the young rootlets in the same way as they did in the young wood, and completely destroying them. The roots being in such a bad state, I tried every thing I could think of at the time to try to stop the ravages of the insect; such as watering with strong farmyard manure-water, Guano-water, lime-water, ammoniacal liquor, diluted turpentine, &c.; but nothing that I tried had the desired effect of killing the insects thoroughly, except when used strong enough to kill the roots too, which I did not wish to do; therefore I kept on trying all I could to keep them from increasing until the vines would be at rest, when I could with safety give both roots and stems a thorough cleaning.

Being late vines, the grapes were not all cut until about Christmas, when I immediately set about cleaning them by removing all the leaves still left, closely pruning the young wood, stripping the stem clean of all loose bark, and then thoroughly washing them with a stiff brush and pure water. Having thus cleaned the tops, I began at the roots by lifting them carefully out of the soil and cutting away all the badly infected parts, going patiently over those left and cutting clean off all spots of canker showing where the insects were or had been, then washing them in the same manner as I had done the stems, going over them two or three times to make sure they were thoroughly clean, then dusting them over with an equal mixture of dry soot and newly-slacked lime, replanting them in some fresh soil, and filling up the remainder of the border with the old soil, mixing a little soot and lime amongst it while filling it in, and taking care to pick out every morsel of old root or stick that could be seen. I then washed the house thoroughly in every part, and painted it with spirits of turpentine, to destroy any insects that might be missed in the washing, painted the vines with the usual mixture of clay, soot, sulphur, soft-soap, aud tobacco, adding two ounces of turpentine and one ounce of *Nux vomica* to every gallon of the mixture, and then tied them in their places, leaving them alone until they broke into growth in April, which they did in a most satisfactory manner and made strong growth during the summer, never showing the least sign of an insect during the whole season on either root or stem.

One vinery I treated as above described; but finding the roots of the vine in the other to be in a much healthier state and not nearly so badly infected with insects, I did not think it necessary to lift them and subject them to such severe treatment, hoping that I might find out some liquid mixture that I might apply to the soil and that would destroy the insects without killing the roots, or having to be at the trouble of lifting and cleaning them. The vine-house and all above the ground I thoroughly cleaned in the same manner as the first house, and applied different liquid mixtures to the soil and roots whenever I had an opportunity and thought they would bear it, in hopes of being able by that means to exterminate the insects. All went on well until the beginning of June, about seven weeks after they started into growth, when the insects began to appear on the young wood and leaves as well as on some pot-vines trained against the back wall; and on examining the roots I found them literally swarming with insects. The roots of the pot-vines being equally bad, I at once turned them out to the rubbish-heap and burned them remorselessly, leaving six to experiment on with the different solutions during the summer. I increased the strength of the liquid mixtures until the vines began to flag and show signs that they could bear no more and live; but still the insects lived and increased, if anything, on the roots, except in one place where I had watered with salt and water, at ten ounces of salt to the gallon of water, which I increased to twelve ounces to the gallon, and found it effective in keeping the insects from increasing without hurt to the vine-roots.

Having killed some of the pot-vines by using too strong solutions, I did not feel justified in experimenting further, but determined to try and keep the insects in check as much as possible until they were again at rest, and then thoroughly clean both tops and roots in the same manner as I had done those in the other house in the previous winter, and which had gone on most satisfactorily ever since and kept perfectly clean of insects. So as soon as the crop was cut and the vines at rest (in December 1868), I treated them in every particular the same as I had done those in the other vinery and with equally good results. They started into growth early in April and grew most luxuriantly during the summer and ripened their wood and crop thoroughly during the autumn, so that I gained several prizes with the grapes cut from them, including a first for Muscats at the Royal Horticultural Society of Ireland's show.

After extirpating the pest out of the late vineries I was sorry to see it make its appearance in two early vineries in May 1869, where I have no doubt it had been introduced with some pot-vines brought from the late vineries in 1868 before I was aware of their being infected. I had now no doubt that I could prevent their increasing to any serious extent, and that I certainly could get rid of them during the winter, when the vines were at rest; but being still anxious to find out if there was a possibility of getting rid of the pest without disturbing the roots, I watered one of the vine-borders with a solution of water, salt, nitre, and spirits of turpentine (12 oz. salt, 2 oz. nitre, 2 oz. turpentine to one gallon of water) twice a week for ten weeks, and, on examining the roots, I found it effectually prevented the insects increasing, and killed all with which it came in contact; but still I could not feel sure of its thoroughly eradicating them from all the holes and crannies of the roots and borders; so during the following winter I had the vines thoroughly cleaned and treated the same way in every respect as I had done those in the late vineries, and with equally good results, as they grew most luxuriantly during the summer of 1870, ripening their wood well and maturing perfectly a light crop of first-rate grapes, with which I gained several first-class prizes at the Dublin Autumn Show. All the vines started well and healthily in the present year, and have gone on satisfactorily; and there has not been an insect (*Phylloxera vastatrix*) seen about Powerscourt since I exterminated the last of them in December 1869. When I left Powerscourt in June last the vines were in robust health and bearing fine crops of excellent grapes; and I have no doubt they will continue to do so with ordinary fair management for years.

From the foregoing it will be seen that the only effectual plan of getting rid of the "pest" without destroying the vines is, when the vines are at rest, pruning the young wood close in and clearing the stems of all loose bark and excrescences that would harbour insects, lifting and cutting away all infected roots, dressing those left in the same manner as the stems by removing everything likely to harbour insects (carefully carrying away and burning all prunings and rubbish taken from the vines), then washing and scrubbing every part of the vines with clear soft water and a stiff brush (I found a "spoke" brush handiest) until *you are sure* that they are *thoroughly clean*, then dusting the roots over with an equal mixture of dry soot and newly-slacked lime, replanting them in some nice clean fresh soil, giving no water to the roots until the buds have fairly started into growth. I painted the stems with the following mixture: viz. 4 ozs. sulphur, 2 ozs. soft soap, 2 ozs. tobacco (boiled, strained, and the juice used), 2 ozs. turpentine, 1 oz. *Nux vomica*, with sufficient cow-dung and clay to make a gallon of water into the consistency of thick paint. After the ingredients are mixed, they require to be slowly boiled and well stirred for twenty minutes; and as soon as the mixture is cold, it is fit for use. All the vines require afterwards is to be left alone until they begin to grow naturally, when the usual treatment in regard to watering, syringing, regulating their growth, &c. will succeed; but they ought to bear only a few bunches, according to their strength, the first season after being subjected to such severe treatment. If the above plan is strictly carried out, I have not the least doubt but that any vines, either indoors or out, can be effectually and permanently cleared of the "pest," so that proper precautions are taken against its being introduced again from an infected quarter.

If the *Phylloxera vastatrix* makes its appearance on the vines during summer, as is usually the case, the best and safest plan to keep it in check until the vines are at rest, when the treatment I have described can be applied, is to pick off the leaves and young wood as they become infested, burning all that is picked off, and watering the soil the roots are in with a solution of one gallon of water, 12 ozs. salt, 2 ozs. nitre, and 2 ozs. spirits of turpentine, applying it in quantity sufficient to thoroughly saturate the soil as deep as the roots go. By doing so, their increase to any serious extent will be prevented; but owing to the habit of the insect burrowing into the young wood and roots and depositing its eggs therein (where they are securely protected from any solution that can be applied through the soil, except it is strong enough to kill the vines as well), it is useless to think of eradicating them thoroughly and saving the vines unless the roots are lifted and cleaned in the manner I have described, or by some other cleaning process equally sure and carefully performed.

I am certain the process I recommend will be equally as efficient in exterminating the "pest" or disease in the French vineyards if properly applied and strictly carried out; and if the vines have a fair amount of vitality left when operated on, they will thrive well afterwards and bear good crops for an indefinite number of years.

VIII. Notes on "Clover-sickness."
By J. H. Gilbert, Ph.D., F.R.S., F.C.S.

Having been informed by Mr. Berkeley that it was his intention to make some observations on the subject of "Clover-sickness" at the Meeting of the Scientific Committee to day, and having been requested by him to state briefly the results of the attempts made at Rothamsted to grow clover more frequently on the same land than custom recognizes as practicable, I have, in conjunction with Mr. Lawes, drawn up a summary statement of the plan and results of the experiments, partly in the form of a short abstract of previously published accounts, but bringing the record up to the present date.

Among the causes which have been assigned for clover-sickness may be mentioned:—

Exhaustion of the soil.

The growth of parasitic plants which strike their roots into the clover and exhaust its juices.

Destruction by insects.

The injurious influences arising from the matter excreted by the roots of a former crop, or from the decay of the roots themselves.

The growth of the young plant under the shade of a corn-crop.

With regard to the last supposition, which, in a letter in the 'Gardener's Chronicle' of May 13th, Mr. Berkeley seems disposed to adopt, it may be stated that during the period of twenty-three seasons over which our experiments on the subject have now extended, clover has more frequently been sown alone than with a corn-crop, and the failures have been as signal under those as under the usual conditions.

The experiments on the growth of clover with many different descriptions of manure were commenced in 1849, and, with the occasional interposition of a corn-crop or fallow, have been continued up to the present time. The land is divided into three main divisions, each of which comprises a series of six plots.

Series 1.—The plots of this series have received no carbonaceous, and scarcely any nitrogenous manure since the commencement. On the other hand, some of them have received much more of both potass and sulphuric acid, and more phosphoric acid, but all less, and generally considerably less, lime and magnesia than have up to this date been taken off in the crops.

Series 2.—These plots have all received a considerable amount of both carbonaceous and nitrogenous manures, supplying, on the average, about half, but in some cases more than half, as much of both carbon and nitrogen as have been taken off in the crops. Of potass and sulphuric acid, some of the plots have received considerably more, of phosphoric acid rather more or not much less, of lime very much more, but of magnesia in all cases less than were yielded in the crops.

Series 3.—The plots of this series have also received a considerable quantity of both carbon and nitrogen, but all of them less than those of series 2. Some of them have received more, or not much less, potass, magnesia, and phosphoric acid, considerably more sulphuric acid, and very much more lime than were contained in the crops.

These very summary comparative statements relate to the whole period from 1849 up to the present time; and the observations which follow will for the most part have reference to the same period. But it should be observed that many of the plots which now show an excess of removal over supply of certain constituents did not do so at the time of the first failures. It will presently be seen that failure commenced after growing the crop a second time with the interposition of only a single wheat-crop. This was the case notwithstanding that at that time, and even later, on some of the plots more of all constituents (excepting perhaps carbon) had been supplied in manure than taken off in the crops. It was obviously, therefore, not merely a question of supply or exhaustion, using the terms in the same sense as we should do in reference to wheat or barley, for example. One object of the plan of experimenting followed was, therefore, to give time for the proper *soil-digestion*, or distribution of the constituents already directly supplied, or which might otherwise exist within the soil, in case this might be the condition needed.

As with other *leguminous* crops, the general result has been that mineral constituents applied as manures (particularly potass) considerably increased the early crops; whereas ammonia-salts had little or no beneficial effect, and were sometimes injurious. It may be added that even up to the present time the beneficial effects of long previous applications of potass are apparent whenever there is any growth at all.

To go into a little more detail: The crops were throughout very heavy in the first year (1849), especially on the plots of series 1, with mineral, but with no carbonaceous or nitrogenous manure. In the autumn of that year wheat was sown, and in the spring of 1850 Red Clover. In 1851 small cuttings were taken; and in 1852, though the crops were not heavy, there was by no means a failure. Since that time, however, all attempts to grow clover year after year on the same land have failed to give anything like a full crop, or a plant which would stand the usual time on the ground. Small cuttings were obtained in the autumns of 1855 and 1859 from seed sown in the spring of those years, and small cuttings, but rather heavier than in the former cases, in 1865 (June and August) from seed sown in 1864.

On the plots of series 1, seed has been sown ten times during the twenty-three years of the experiment, namely, in 1848, 1850, 1853, 1854, 1855, 1859, 1864, 1868, 1869, and 1870. In seven out of the last eight trials the plant has died off in the winter or spring succeeding the sowing the seed; and at the present time the land is again ploughed up, the plant having entirely died off in the spring, now three years in succession. The plots of series 2 and 3, on the other hand, though previously sown as frequently as those of series 1, were not sown in either 1868 or 1869, but were ploughed and left fallow, and only sown again in 1870; and they carry, at the present time, a rather thin, but fairly healthy crop; whilst, as already said, the plants from the seed sown at the same time on series 1 entirely died away in the spring.

The difference between the conditions of the plots of series 1, resulting at the present time in entire failure, and those of series 2 and 3, affording at least comparative success, may be briefly summarized as follows:—

In the first place, in the cases of the utter failure, seed was sown, and plants came up, in 1868 and 1869, as well as in 1870, that is in three consecutive seasons; whereas in those of the partial success none was sown between 1864 and 1870.

So far as regards manure, the chief distinctions are—that where there is entire failure, neither carbon nor nitrogen has been supplied in manure; but where there is partial success both have been supplied, but neither of them in amount equal to that of their removal in the crops. With regard to mineral constituents, the conditions of series 1, resulting in failure, are—a considerable excess of supply of both potass and sulphuric acid, and a considerably greater excess of both than on either series 2, or series 3; no essential difference as to phosphoric acid; a greater deficiency of magnesia than in either series 2 or series 3; and lastly, a considerable loss of lime, whereas on the plots of series 2 and 3, very much more lime has been supplied in manure than taken off in the crops.

It would appear, therefore, that if the failure on series 1, compared with series 2 and 3, be due to the greater exhaustion of certain constituents, it must be of either carbon, nitrogen, magnesia, or lime. On this point it may be mentioned that the excess of carbon removed in the crops, over that supplied in the manure, has been in no case nearly approaching that which may take place with impunity in the case of either wheat or barley. On the other hand, the average annual removal of nitrogen has been considerably greater on all the plots of series 1, but generally less on those of series 2 and 3, than happens with either wheat or barley grown without nitrogenous manure; it has, however, been considerably less than in experiments on the mixed herbage of grass-land where no nitrogenous manure has been employed.

Again, taking of course the whole period, the exhaustion of magnesia has been generally greater, and that of lime considerably greater, than has occurred in the experiments on the continuous growth of wheat or barley. So far, then, as the result depends on mere amount, rather than on condition or distribution of constituents, it would appear to be connected with a deficiency of nitrogen, of magnesia, or of lime, or of more than one of them.

Having regard to the question of the condition and distribution of the constituents, in 1864 a portion of the land of series 1 was trenched 2 feet deep, one third of the manure being mixed with the layer from 24 to 16 inches, one third from 16 to 8 inches, and the remainder from 8 inches upwards. Superphosphate of lime, and salts of potass, soda and magnesia, the first two in very large quantity, were used; and nitrate of soda, which is a much more favourable form of application of nitrogen for leguminous crops than ammonia-salts, and which distributes more rapidly, was also liberally applied. Owing to the character of the season, the mechanical condition of the land was very unfavourable after this treatment; and, although many years have now elapsed, and the excess of constituents supplied is in some cases considerable, the plant has died off as completely on the plots so treated as elsewhere.

In view of these failures in the field, it is a fact of much interest that in 1854 Red Clover was sown in a garden only a few hundred yards distant from the experimental field, on soil which has been under ordinary garden-cultivation for probably two or three centuries, and it has every year since shown very luxuriant growth; and after resowing four times, namely, in 1860, 1865, 1868, and 1870, during that period, there is at the present time not only no indication of failure, but, on the contrary, very luxuriant growth. It may be added, by way of illustration merely, that if the produce on these small garden plots be calculated to the acre, it would represent a removal in seventeen years, at the rate of more than $1\frac{1}{2}$ ton of lime, nearly $\frac{1}{2}$ ton of magnesia, more than a ton of potass, nearly $\frac{1}{2}$ ton of phosphoric acid, and about $1\frac{1}{2}$ ton of nitrogen per acre, without the supply of any of either during the period of the experiment.

Lastly, in the winter of 1867–68, small portions of the land of series 1 were dug, some to the depth of 9 inches, some to the depth of 18, some to the depth of 27, and some to the depth of 36 inches, and sown to the respective depths with different manurial mixtures; supplying in some cases very large amounts of potass, soda, lime, magnesia, phosphoric acid, sulphuric acid, nitrate of soda, &c. From other similarly sized plots, the soil was removed to the depth of 9, 18, and 27 inches respectively, and replaced by soil from the same depths from the garden border, on a portion of which clover had been grown successfully since 1854, as above referred to. In April 1868, clover was sown over the whole of these small plots, as well as over the rest of the land of series 1 not so treated; but the plant for the most part died off during the winter. The same portions were resown in April 1869, and small quantities of clover were cut in September of that year; but the plant again died off in the winter. In April 1870, clover was again sown, this time in conjunction with barley; but the plant again died off during the past winter and early spring. This result should not, however, at present be taken as absolute proof of failure of the manurial conditions supplied on the various small plots; for not only was the summer of 1870 one of extraordinary drought, but where the manures were applied at the different depths specified, the land may not yet have recovered a favourable mechanical condition, and where the natural soil was replaced by that from the garden border, the plants, being luxuriant compared with any around them, were more a prey to woodpigeons, rabbits, and game. The whole of these small plots are now resown, and those of the garden-soil are entirely enclosed, both around and above, by galvanized wire netting.

The general result of the experiments in the field is—that neither organic matter rich in carbon as well as other constituents, nor ammonia-salts, nor nitrate of soda, nor mineral constituents, nor a complex mixture, supplied as manure, whether at the surface or at a considerable depth, has hitherto availed to restore the clover-yielding capabilities of the land.

On the other hand, it is clear that the garden-soil supplied the conditions under which clover can be grown year after year on the same ground for many years in succession.

The results obtained on the garden-soil seem to show that what is called "clover-sickness" cannot be due to the injurious influence of excreted matters upon the immediately succeeding crop.

That the clover crop frequently fails coincidently with injury from parasitic plants, or insects, cannot be disputed; but it may be doubted whether such injury should be reckoned as the cause, or merely the concomitant and an aggravation of the failing condition.

If, then, it be decided that the cause of failure is not destruction by parasitic plants or insects, nor injury from excreted matters, nor the shade of a corn-crop, and that it is to be looked for in exhaustion of the soil, there will still remain several open questions. Is it exhaustion of certain organic matters rich in carbon, of nitrogenous food, or of mineral constituents? Again, is there an actual exhaustion of the substances in question, or only an unfavourable condition of combination, or, so to speak, of *soil-digestion* of them, for the accumulative and assimilative requirements of leguminous plants? Or, is there only an unfavourable distribution of them within the soil, considered in relation to the extent and character of the root-range of the crops?

These various points cannot be considered in detail within our present limits; but a few brief observations may be made in reference to them by way of explanation and suggestion.

The results obtained on the garden-soil are, of course, consistent with the supposition that there was in the field-soil a want of some of the ultimate elements of the crop. They are also consistent with the assumption that it is not merely requisite that the constituents should be present in the state of combination and of distribution available for other descriptions of crop, but that it is essential for the healthy development of the clover-plant, that the constituents should have undergone a certain digestion, so to speak, within the soil; or that certain constituents should have become more distributed than is necessary for the cereal crops. On either supposition the result may be dependent on the proper supply of carbon, of nitrogen, or of mineral constituents. Thus, in garden-soil, liberally dunged for centuries, there would be a great accumulation of all constituents. A large amount of both carbon and nitrogen compounds would have undergone considerable, if not as complete change as could take place within the soil; and their products, as well as mineral constituents, would be widely distributed.

Although, taking the whole period, carbon has been removed in the crops from all the plots in larger quantities than it has been supplied to them in manure, experience with other descriptions of crop would not lead to the supposition that the failure could be due to a deficiency of that constituent provided it were taken up by the Leguminosæ exclusively as carbonic acid, yielded by the atmosphere, or by the decomposition of organic matter within the soil. If, however, it were the case that some plants, clover, for example, required for healthy development at certain stages of their growth a portion of their carbon to be presented them in other compounds—organic acids more complex than carbonic acid, in combination, it may be, with ammonia, or with fixed bases—we could then easily understand that, under ordinary circumstances. a certain period of time might be requisite for the formation and accumulation of a sufficient amount of the compounds in question. It would also be intelligible that there should be a great accumulation of such compounds in the soil where dung had been liberally used for centuries. A fact of another kind, which is at any rate consistent with the view here assumed, is, that the ashes of the Leguminosæ we cultivate contain a large proportion of carbonate, indicating, possibly, that the fixed bases had been taken up in combination with a combustible organic acid. Again, another fact in accordance with the view is, that although a Leguminous crop assimilates two, three, or more times as much nitrogen over a given area as a Graminaceous one, the direct application of ammonia-salts, so effective with the latter, is more frequently injurious than beneficial to the former within the season of their employment; though, after some time has elapsed, some beneficial effects can be observed, apparently due to the previous supplies. An obviously possible explanation of this is, that organic acid salts of ammonia have have been formed.

On the other hand, nitrate of soda, though not a reliable manure for Leguminous crops, as it and ammonia-salts are for the Graminaceæ, is certainly much more beneficial to them than are ammonia-salts; and, it may be, that it is not until the ammonia has in great part been converted into nitric acid, and the resulting nitrates become widely distributed throughout the pores of the soil and subsoil, that the Leguminous plant attains sufficiently active and vigorous growth, and acquires sufficient possession of the soil, to render it independent of its many enemies—whether in the form of animal or vegetable parasites, or of climatic vicissitudes which slacken its vitality, and render it an easier prey to its animal or vegetable enemies.

On the supposition that the favourable condition of the nitrogen is that of ammonia in combination with an organic acid, we have to conclude that that condition, even if favourable, is at any rate not essential for the Graminaceous crop, or that the distribution of the compounds in question is such as to render them not so readily available for the Graminaceous as for the Leguminous plants. Supposing, however, that the required condition be the oxidation of the ammonia and the wider distribution of the nitrogen in the form of nitrates than would take place so long as it remained as ammonia, that portion of the nitrogen which is supplied in manure for the Graminaceæ, and which, owing either to unfavourable combination, or unfavourable distribution, within the soil, is not recovered in the increase of the immediate crop, becomes gradually oxidated and more widely distributed, and the Leguminous crop, alternating with the Graminaceous one, and gathering from a more extended or different range of soil, in its turn leaves a residue, or allows the accumulation, of assimilable nitrogen within the range of collection of the crops which succeed it. On this view, not only does the growth of the Leguminous crop serve to arrest the loss of nitrogen by drainage as nitric acid, by bringing up again much of that which had passed in that condition into the lower layers of of the soil; but there is obviously provided one important element at least in the explanation of the beneficial effects of alternating Leguminous with Graminaceous crops in rotation.

Again, the nitric acid would, most probably in great part, be in combination with lime, which is the base occurring in large proportion in the ash of our Leguminous crops; and supposing nitrogen were taken up by the plants as nitric acid, chiefly in combination with lime, but partly with potass or other bases, we should, in that fact, have an element in the explanation of the occurrence in the ashes of the Leguminosæ of so much fixed base, and especially of lime, not in combination with a fixed acid; and we should, so far, to a less extent require the aid of the assumption that the bases in question had been taken up from the soil as ready-formed organic acid salts.

The above considerations are of interest not only with reference to the results obtained in the highly manured garden-soil, but also in connexion with the facts of the entire failure in the field at the present time where neither carbonaceous nor nitrogenous manures have been supplied, and lime has been the most exhausted, and of the partial success where carbonaceous and nitrogenous manures have been to a considerable extent supplied, and lime has been added in great excess.

It is obvious that the time that would serve for the formation and distribution of the organic acid salts, or of the nitrates, would also serve for the soil-digestion, and distribution, of mineral constituents.

To conclude, in regard to the conditions of failure and partial success in the field at the present time, it may be remarked that on some portions of the land where there is the complete failure, considerably more of those mineral constituents which most characteristically increase the growth of a healthy clover crop in the land in question, have been supplied than taken off in the crops.

This has not, however, been the case with the nitrogen on any portion of the experimental land; though, as already said, the exhaustion of it has nowhere been so great as in experiments on mixed herbage, including perennial Leguminous species. On the other hand, where there is at the present time a fairly healthy, but only small crop growing, the application of those mineral constituents which most increase a healthy plant has been considerably less, but that of nitrogen has been greater than where there is the total failure. Nevertheless, on the portions where there has been the most liberal supply of those mineral constituents—potass, for example—there is at the present time considerably more growth than where there has been no such supply.

Lastly, in regard to the attempts made to supply the fertilizing matters at a considerable depth below the surface, it is admitted that, for a time at least, the resulting physical condition of the soil and subsoil was not satisfactory; though, even at present, indications are wanting that beneficial effects may eventually follow.

This brief record of many failures may be concluded by a quotation from a paper on the subject published by Mr. Lawes and myself some years ago:—

"When land is not what is called 'clover-sick,' the crop of clover may frequently be increased by top-dressings of manure containing potass and superphosphate of lime; but the high price of salts of potass, and the uncertainty of the action of manures upon the crop, render the application of artificial manures for clover a practice of doubtful economy.

"When the land is what is called 'clover-sick,' none of the ordinary manures, whether 'artificial' or natural, can be relied upon to secure a crop.

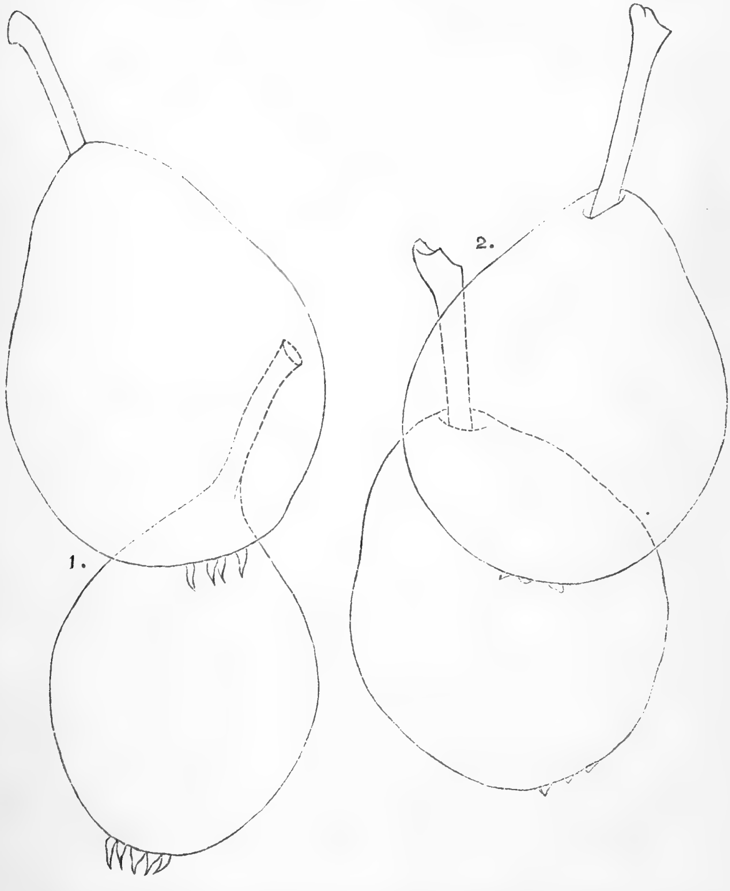
"So far as our present knowledge goes, the only means of insuring a good crop of Red Clover is to allow some years to elapse before repeating the crop upon the same land."

IX. Notes on some Wild Pear-trees growing near Charlwood, Surrey. By W. Wilson Saunders, Esq., F.R.S.

On the high ground west of Charlwood, Surrey, the Common Pear (*Pyrus communis*) occurs, apparently wild, in several localities. The soil is stiff clay, a portion of the great Wealden formation lying between the lower Greensand and the Hastings sands. The trees are to be found chiefly in hedgerows and in the outskirts of woods and thickets, many far removed from any dwelling, and where there is no probability of their having been planted. They occur for the most part singly; and their character is much the same as that of the cultivated pear when allowed to assume its natural habit, reaching from 20 to 30 feet high, with a straight trunk for some 8 to 12 feet, then forming a spreading, somewhat elongated head of branches, of which the lower ones are more or less horizontal, the upper more or less ascending. The leaves have nothing peculiar to separate them from those of the cultivated kinds of pear, being more or less ovate, with the same kind of serratures, and being covered more or less with downy pubescence in the young state. The trees produce a strong reddish-coloured close-grained wood, easy to work, which is used for furniture, turning a good colour by age and the application occasionally of a little oil. The trees are usually abundant flowerers and bearers of fruit, quite enlivening the landscape in the spring by their masses of white blossoms.

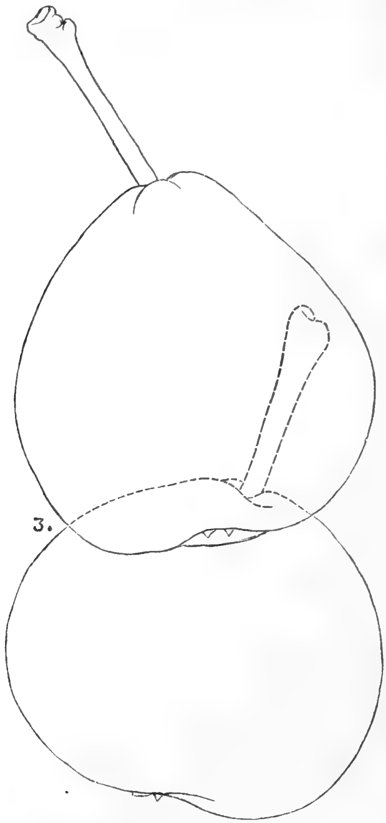
I have had an opportunity of closely examining for several seasons successively many of these wild pear-trees at Greening's Farm, in the clay district alluded to, and I have noted carefully the nature of the fruit produced. The result shows that not one of them can be called palatable when ripe. Some are excellent when properly stewed, and most of them are used in the making of a beverage called cyder, which consists of the juice of apples with that of a small quantity of pears mixed. The pears are in many instances very juicy, with a sweet but overpowering astringent flavour, which few palates can endure. None of them are large in size, as will be seen from the outline figures accompanying these notes; but the size is very variable. In shape they may be classed into two divisions,—the *ovate*, or more or less pear-shaped, the orbicular, or more or less rounded and approaching a sphere in shape. The figures are all drawn from the recent fruit, and give the exact size and form of two pears from each, of five trees widely separated from one another, and selected to give a fair idea of the character of the fruit produced. The short descriptions given with the figures were made from the fresh ripe fruit. Nos. 1 and 2 belong to the first, or ovate division, 3, 4, and 5 to the orbicular division.

No. 1.—Ovate, gradually narrowed towards the stalk, which is long, thin, and nearly cylindrical. Eyes large and little prominent, with the persistent calyx-segments large and well developed. Colour yellow-green, with a little flush of reddish rust-colour on the sunny side. Flesh white; flavour exceedingly astringent. Leaves ovate, inclining to orbicular. From a tree near the Gelding's Wood.



No. 2.—Broadly ovate, contracted towards the stalk, which is long, thick, cylindrical, much thickened at the base, and seated in a shallow depression. Eye moderate, prominent, with the persistent calyx-segments short and stout. Colour dull, uniform yellowish green, with a little inclination to surface-rust. Flesh whitish; flavour sweet, but combined with great astringency. Leaves ovate, with a pointed apex. From a tree in the hedgerow, Eastlands Gate.

No. 3.—Orbicular, or somewhat ovate, rounded at the stalked end, where there is a shallow lobed depression. Stalk, long, thin, and thickening towards the base, which is at times somewhat warty. Eye sunk, with the persistent calyx-segments small and

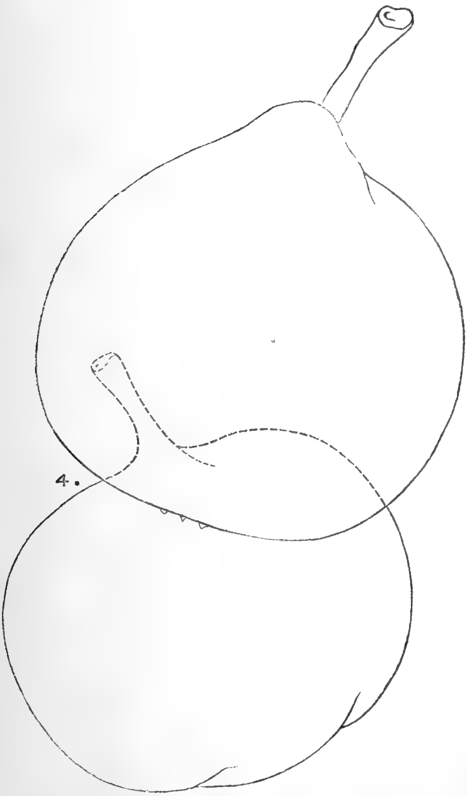


3.

little apparent. Colour yellow-green, covered with numerous minute black-brown freckles. Flesh yellowish white; flavour very astringent. From a tree in the Beggar's Gill Wood.

No. 4.—Orbicular, more or less lobed, with the stalk short, stout, and slightly curved. Eye prominent, small, with the persistent calyx-segments short and little apparent. Colour yellowish green, freckled with blackish points. Flesh yellowish, very juicy; flavour sweet, but very astringent. Odour pleasant and powerful. One specimen weighed 1322 grains. From a tree in the hedgerow on the south side of Hood's Hole field. This tree produces the largest fruit of any wild tree I have examined in the district.

No. 5.—Orbicular, or a little ovate. Stalk situated in a slight depression, very short, cylindrical, slightly curved, and rather stout. Eye small, a little depressed, with the persistent calyx-segments short, blunt, and little apparent. Colour uniform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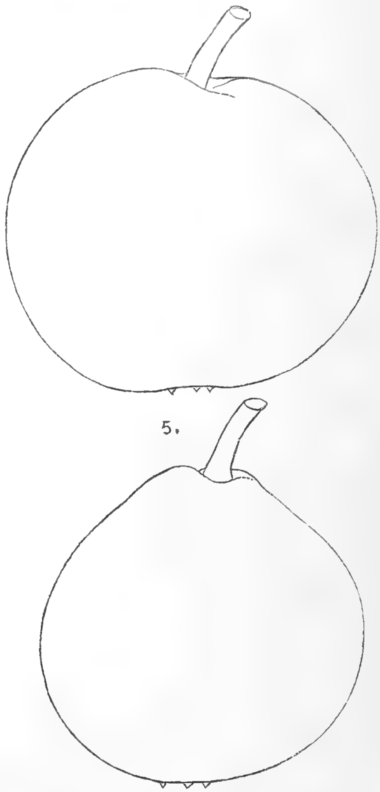
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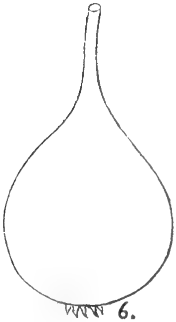
greenish yellow; flesh yellowish white; flavour sweet and not very astringent. In the hedgerow of the paddock at Greenings.

This is a very good pear when stewed, quite equalling in richness some of the cultivated sorts.

The fruit of the wild pear, as figured in the first edition of the 'English Botany,' plate 1784, is given in the accompanying sketch (fig. 7). It is there called *Pyrus communis*. Since the publication of that figure the species has been divided by botanists into two subspecies or varieties:—

Var. 1. *Pyrus pyraster*, Boreau. Var. 2. *Pyrus achnes*, Gent.

The fruit of the latter is figured in the third edition of the 'English Botany,' pl. 488, and copied in the adjoining sketch (fig. 6). The two varieties are distinguished by the shape of the fruit, that of var. 1 being elongate and truly pyriform, that of var. 2 being globular, pyriform, rounded at the base. Both varieties are found in this country apparently wild.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7.

Now looking to the wild pear-trees at Greenings, it would appear that they vary much in the shape and character of their fruit; but still the fruit ranges well under the characters given to that of *Pyrus communis* when divided into its two varieties, which correspond with the two divisions I have used in the descriptions of the fruit which I have given. As to the origin of the pear-tree in the Charlwood district, I have no facts to offer. Many of the trees are very old, being known as full-grown trees to some of the oldest inhabitants from their childhood. There are no old establishments in the neighbourhood where the trees could have sprung from, the district being much covered with wood, and the farms small, with very poor homesteads. The soil seems favourable to the growth of the pear-tree, seeing the healthy appearance of the wild trees and of a considerable number of the cultivated varieties which I grow in my farm-garden at Greenings. There are wild trees springing up in various places in the district, apparently from seed and from suckers from the roots of old trees. The latter method of increase is, however, uncommon.

EXTRACTS FROM PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY

AND

MISCELLANEOUS MATTER.

FLORAL COMMITTEE.

Feb. 16, 1870.

A First-class Certificate was awarded to *Oncidium splendidum*, which formed one of the numerous objects of attraction which Lord Londesborough had sent down, at a great expense, in a van made expressly for the purpose and heated with hot water. Messrs. Veitch sent also a fine group of Orchids, and obtained the prize for *Lycastes*, amongst which was a pure white variety of *L. Skinneri*, which was much admired. *Vanda cærulescens* was the gem of the collection, though probably exhibiting, on a small scale only, an extremely promising species. A Special Certificate was awarded to *Cattleya Trianæ*, var. *Laurenceana*, from the ex-Bishop of Winchester, remarkable for the intense rosy purple of the frontal portion of the richly fringed lip. Messrs. Smith, of Dulwich, obtained the Prize for *Primulas*. A Second-class Certificate was awarded to a hybrid *Libonia*, from the Hon. W. O. Stanley, being a cross between *L. floribunda* and a variety of *L. sericographis*. Mr. Waterer sent a variety of *Cupressus Lawsoniana*, with the habit of the Florence Court Yew, and a bushy variety with slightly pendulous branches, to both of which a First-class Certificate was awarded.

FRUIT COMMITTEE.

Mr. Parsons, gardener to W. I. Blake, Esq., obtained the First Prize for Apples, and Mr. Garland, gardener to Sir T. Dyke Acland, Bart., the Second. The First Prize for three dishes of Apples was taken by Mr. C. Ross, gardener to C. Eyre, Esq., for Scarlet Nonpareil, white Nonpareil, and Stone Pippin, and the Second by Mr. Saul, gardener to Lord Stourton, for Aromatic Russett, Ribston Pippin, and Margil. Mr. Wells, of Holme Lacy, was first for Pears with Bergamotte Esperen, Beurré Rance, and a third variety: Mr. Garland second for the two first and Winter Nelis. One of Messrs. Adams and Grant's sulphur distributors was much approved.

SCIENTIFIC COMMITTEE.

Andrew Murray, Esq., F.R.S., in the Chair.

A piece of Elm, from Mr. Henry, was exhibited, in which part of a large iron rail was deeply imbedded, insomuch that it was not discovered till struck against by the saw.

Mr. Standish sent buds of a vine which had been attacked by some insect. The specimens were accompanied by a live and dead example of some Athous, which were, however, from the known habits of the genus, clearly not the cause of evil.

Mr. Berkeley stated that he had examined the Date-stone brought by Mr. Wilson Saunders to the last Meeting, and found the cellular tissue in the pustules much enlarged, but no certain trace of a fungus.

Mrs. Lloyd Wynne sent specimens of *Bridgesia spicata* in which tufts of hair were produced above the axils of the leaves.

Mr. Woodford again sent, through the Rev. I. Dix, shoots of diseased Peaches, accompanied by a letter, in which he expressed an opinion that the disease did not arise from root-action, but from atmospheric influence, which seemed also to be the feeling of the Committee.

Mr. Glaisher exhibited specimens of instruments which he considered requisite for carrying out the proposed improved observations at Chiswick. Similar instruments will be manufactured expressly for horticultural purposes by Messrs. Negretti and

Zambra, and supplied at a moderate cost, each instrument having been tested by Mr. Glaisher. No instrument will be passed which shall be in error more than $\frac{3}{10}$ of a degree. A very excellent modification of the thermometer for ascertaining the temperature of roots was exhibited, which was highly approved.

Mr. A. Murray showed specimens of an insect from Port Philip which is destructive to oats, being scarcely distinguishable, without close examination, from the oats themselves. He also brought specimens of the Tsetze, or African fly.

GENERAL MEETING.

W. WILSON SAUNDERS, Esq., F.R.S., in the Chair.

In the absence of Mr. Bateman, Mr. Berkeley stated that *Oncidium splendidum*, *Stenia fimbriata*, from Lord Londesborough, and *Vanda cærulescens*, from Messrs. Veitch, were exhibited for the first time. The latter was described by Dr. Lindley thirty years ago, but had only recently been introduced into this country. *Goodyera Dawsoniana* was then pointed out, as, though extremely beautiful in foliage, it does not require the same close treatment as many of the allied Orchids. A *Primula sinensis* with white and rose-coloured flowers in the same truss was then pointed out, attention being drawn to the fact that the side of the plant which bore the white flowers had leaves with pale petioles.

Mr. Berkeley then made some observations on the insect which is at the present time so destructive to Vines, calling especial attention of cultivators to the circumstance that winged individuals, probably males, had been figured by Planchon. The galls containing the insects on the leaves should at once be burned, and gas-water has been recommended as a remedy, but must be used carefully.

Forty Essays were on the table in competition for Mr. Hubbard's prizes.

Mr. A. Murray made some observations on *Cupressus Lawsoniana* as more hardy than *C. macrocarpa*, which had perished in the neighbourhood of London.

Mr. Berkeley stated, however, that though almost every plant was killed in the valley of the Thames, it did not suffer in Huntingdonshire and Northamptonshire.

Report on Double-flowered Pelargoniums.
By Thomas Moore, F.H.S., Floral Director.

A collection, consisting of forty varieties of these novel and useful plants, was grown at Chiswick during the past year. They were also, with one or two exceptions indicated below, presented to the garden by Mr. William Bull, of Chelsea, and formed one of the features of interest in the garden during the late summer months. Having been received in the spring in the shape of small plants, it was decided to cultivate them in pots under glass, for which purpose these Pelargoniums seem especially useful. They were accordingly grown with much success in moderate-sized pots, and bloomed remarkably well in one of the span-roofed greenhouses, their healthy character reflecting much credit on Mr. Barron and his assistants. The accompanying notes indicate the condition as to habit and inflorescence which these plants assumed, and may be regarded as recording as fair a verdict on their respective merits as could be arrived at from the growth of a single individual of each kind. The certified sorts, indicated by asterisks in the subjoined description-list, were the following:—

First-class Certificates.

Marie Lemoine, Madame Lemoine, Victor Lemoine, Gloire de Nancy.

Second-class Certificates.

Sparkhill Beauty, Impératrice Eugénie, Andrew Henderson, Victor, Wilhelm Pfitzer, Memnon, Le Vésuve, Triomphe de Thumesnil, Triomphe de Lorraine, Signet.

The following is a transcript of notes made at intervals during the following season:—

Albina. Vigorous, with faintly zoned leaves, the trusses small; the flowers of a deep rose-pink, rather darker in colour than those of Madame Lemoine.

Andrew Henderson **. This variety is of moderately vigorous growth, with faintly zoned leaves, and compact trusses of orange-scarlet flowers very freely produced. It is an ornamental variety well worth growing.

Ascendency. Moderately vigorous in growth, with faintly zoned leaves; but too near Gloire de Nancy in the flowers.

Capitaine l'Hermite. A vigorous-growing sort now superseded, with faintly zoned leaves, and loose cerise-scarlet flowers.

Conqueror. A vigorous-growing variety, with green leaves and poor scarlet flowers.

Consul. A vigorous-growing sort, with faintly zonate leaves; the flowers light scarlet, in a loose truss.

Cottington. A dwarf-growing small-leaved bedding variety, with quite the habit and general character of the old Tom Thumb; the flowers scarlet, semidouble, loose, larger than those of Madame Rose Charmeux, and forming large and more showy trusses.

Delight. Dwarf and moderately vigorous in habit, with indistinctly zonate leaves, and fair trusses of large thin flowers; but too closely resembling those of Gloire de Nancy.

EMILE LEMOINE. A variety of moderately vigorous habit, having the leaves marked by an indistinct zone, and the flowers of a cream-colour, ragged, but forming dense trusses. An inferior variety.

EMULATION. A vigorous-habited green-leaved sort, with indifferent scarlet flowers.

FIREBRAND. A coarse-habited green-leaved sort, with carmine-scarlet flowers of inferior quality.

GLOIRE DE NANCY ***. A handsome and moderately vigorous-growing variety, still retaining a high position in the double class. It has green leaves, and good bold trusses of well-formed, full, double, rosy-carmine flowers. This proves to be also a good bedding plant.

IMPÉRATRICE EUGÉNIE **. A variety of remarkably vigorous growth, which, in the case of the Chiswick specimen, scarcely proved itself to be a free bloomer. The leaves are indistinctly zonate, and the rosy-pink flowers are full, and sufficiently good to render the variety deserving of further trial. It is reported to have been good in other collections.

LATONA. A vigorous-growing sort, with green leaves; the flowers of a light scarlet, in small compact trusses.

LE VÉSUVE **. A vigorous-growing variety, of erect habit, with faintly zoned leaves, and fine trusses of large well-formed, full, double flowers, of a light orange-scarlet colour. A very promising sort.

MADAME LEMOINE ***. One of the very best of the varieties in the whole collection. It is dwarfish in habit, with faintly zoned leaves, and large, full, double, bright, rose-pink flowers, freely produced in good showy trusses.

MADAME ROSE-CHARMEUX. A dwarf-growing slender variety, of the habit of the old Tom Thumb, producing numerous small trusses of loose bright scarlet flowers. A bedding variety, in the way of Cottington.

MARIE LEMOINE ***. A variety of first-class excellence. It is of dwarf stocky habit, with flat faintly zoned leaves, and large-sized flowers, forming abundant, bold, and effective trusses. This variety is much like Madame Lemoine in the colour and general aspect of its flowers; but it is of dwarfish habit, distinct in its foliage, and producing better flowers.

MARTIAL DE CHAMFLEUR. A variety of moderately vigorous habit with green leaves, and thin double scarlet flowers; now quite superseded.

MARY ELIZABETH. A dwarf-growing variety, with faintly zonate leaves and rose-pink flowers, paler than, but not equal in merit to, those of Madame Lemoine.

MEMNON **. This is a meritorious variety of moderately vigorous growth, with faintly zoned leaves; the trusses are of fair size and compact, consisting of close well-formed light scarlet flowers. Distinct and promising.

Monsieur E. G. Henderson. A dwarf-habited variety; the leaves with an indistinct zone; the truss good, bearing large flowers; but too near in colour to Gloire de Nancy.

National. Vigorous in growth, with faintly zonate leaves, and good double flowers in close trusses, but in colour too much resembling those of Gloire de Nancy.

Navarino. Of dwarf habit, with indistinctly zonate foliage; the trusses apparently small, and the flowers rosy carmine, rough. A very inferior form of Gloire de Nancy.

Review. A rather vigorous- and straggling-growing sort, with the leaves green, and the flowers of a light scarlet colour, growing in small trusses.

Rosetta. Of vigorous growth, with green leaves, and small trusses of scarlet flowers, which are rather deeper tinted than in other scarlet-flowered varieties; but they are two narrow-petaled and ragged.

Signet **. A rather desirable variety, of moderately vigorous growth, with the leaves densely zonate, the trusses well filled, and the colour a rosy carmine, in the way of Emile Lemoine; but the individual flowers are of better form.

Sparkhill Beauty **. This variety is of moderately vigorous growth, with faintly zoned leaves, and close trusses of bright rose-pink flowers, very much resembling those of Madame Lemoine; superior to that sort as regards smoothness of petal; but, taking other points into consideration, the preference must be given to Madame Lemoine.

Splendour. A coarse-habited tall-growing sort, with green leaves, and scarlet flowers in loose trusses.

Sunshine. Of vigorous growth, with the leaves green, the flowers deep rose-coloured.

Surpasse Gloire de Nancy. A variety of moderately vigorous habit, with green leaves; the flowers too nearly resembling those of Gloire de Nancy, but not equal to that variety either in truss or in the quality of the individual blossoms.

Tom Pouce cerise. A dwarfish-growing variety, with faintly zonate leaves and compact trusses of pale cerise-scarlet flowers.

Tom Pouce Rose. A dwarf-growing variety, with faintly zoned leaves and dense habit; the flowers are of a rosy pink, loose and rough, and by no means equal in quality to those of Marie Lemoine.

Triumph. Coarse-growing, with faintly zonate leaves, and large loose flowers of an orange-scarlet colour, similar in tint to those of Le Vésuve, but of inferior quality.

Triomphe de Lorraine **. A variety of some merit, being of moderate growth with faintly zonate leaves and close trusses of carmine-scarlet flowers, of the same colour as those of Emile Lemoine.

TRIOMPHE DE THUMESNIL **. A vigorous-habited sort of some merit; the leaves are green, not zoned; while the flowers, which are scarlet with a faint tinge of cerise, are large and full.

TROUBADOUR. A tall coarse-growing variety, with indistinct zones and poor trusses of light scarlet flowers.

VICTOR. A coarse-growing sort, with faintly zonate leaves, and orange-scarlet flowers in good-sized trusses, but not equal to Le Vésuve.

VICTOR (G. Smith) **. Dwarf and free-blooming in habit, with the leaves faintly zoned, and the scarlet flowers in compact trusses. The flowers are of the same colour as those of Wilhelm Pfitzer, and closely resemble those of that variety, but the foliage is smaller. A variety well worth growing. Received from Mr. G. Smith.

VICTOR LEMOINE ***. One of the finest of the varieties in the whole collection. The plant is of a rather vigorous habit of growth; the leaves are marked with an indistinct zone, and the flower-trusses are larger. The flowers themselves are somewhat rough, having serrated petals; but they form a fine head, and are of a rich orange-scarlet, brighter than Le Vésuve.

VIVIAN. A variety closely resemblig Gloire de Nancy in every respect, but scarcely equal to it in merit; the leaves are very indistinctly zonate.

WILHELM FFITZER **. One of the useful second-class sorts, of moderately vigorous growth, with indistinctly zonate leaves, and fair-sized trusses of good full flowers of a light scarlet colour. Received from Messrs. Carter and Co.

ZELINDA. Dwarf in habit, with indistinctly zonate leaves. The flowers are small and poor, scarlet, resembling those of Triomphe de Thumesnil, but not so freely produced.

Report on Plants grown for Trial at Chiswick, 1869. By THOMAS MOORE, Floral Director, R.H.S.

ANNUALS.

A considerable collection of annuals was presented by Messrs. Barr and Sugden, with the object that their capacity to endure cold might be tested. The greater portion of them failed to stand through the winter; but those which were able to do so proved to be much finer and more lasting than the same sorts sown in spring. Some of them, indeed, were objects of great beauty. The seeds of these annuals were sown in September 1868, and the following kinds flowered well in the spring of 1869:—

Viscaria oculata coccinea nana—very fine.
,, ,, deep scarlet.
,, ,, pink.
,, ,, alba Dunnettii.
,, cardinalis.
,, picta.
,, hybrida—very fine, various.
,, cœli-rosa.
,, ,, alba.
,, ,, nana.
,, ,, hybrida.
Saponaria calabrica.
Silene pendula.
,, pseudo-Atocion—rather tender.
Clarkia pulchella flore-pleno—very fine double.
Nemophila insignis.
,, maculata.
Nemophila stricta.
,, marginata.
,, discoidalis.
Gilia capitata.
Eutoca Wrangeliana.
Leptosiphon, several varieties.
Campanula pentagona.
Chryseis crocea.
,, alba.
Collinsia bicolor.
,, bartsiæfolia—very dwarf and pretty.
Centaurea cyanus—very fine.
,, albo-cærulea.
Xeranthemum annuum.
Calliopsis tinctoria.
,, cardaminifolia.
Sphenogyne speciosa aurea.

The above are the most important of those which survived the winter, and these all proved to be exceedingly pretty. The Viscarias were especially beautiful, as were the Nemophilas and the Centaurea cyanus. A few plants of the double-flowered Clarkia were also remarkably fine.

Pelargoniums.

The Chiswick collection of Pelargoniums comprised in 1869 about 850 varieties, and a very considerable display was made by these during the summer and early autumn months. Of the novelties, as usual, many were received too late and in too weakly a condition to give very satisfactory results, and hence the number of new varieties certified was but limited. Attention was, however, directed to the reduction of so unwieldy a collection by the elimination of inferior or superseded varieties, and accordingly the sorts which are named below under the respective heads were struck out.

Scarlet Selfs.—In this group a variety named *Rainbow,* one of the semi-nosegays, a very free bloomer with orange-scarlet flowers, was sufficiently meritorious to attract considerable notice. The following were discarded :—

Atrosanguineum.
Chief Justice (n *).
Edith.
Eunice.
Fame (n).
Governor.
Little David.
Little Major.
Lord Lyons.
Orange Girl (n).
Punch.
Scarlet Christian (n).
Surpass Orange Nosegay (n).
Thor (n).
Vulcan (n).

Scarlet Zonals.—In this very extensive group the following varieties were certified :—

Vesta (First-class Certificate). A very free dwarf-growing variety, with dark-zoned lobate leaves, and deep scarlet semi-nosegay flowers in abundant trusses of moderate size. Received from Mr. W. Paul.

Vesuvius (First-class Certificate). A variety of dwarfish compact habit,

* The letter (n) indicates nosegay or semi-nosegay varieties.

with small zonate moderately lobed leaves and scarlet flowers, rather paler than those of *Warrior*, of moderate size, freely produced in good trusses. It is a useful bedding sort. Received from Messrs. F. and A. Smith.

William Underwood (First-class Certificate). This excellent variety, by some accidental oversight, was not contributed to the Chiswick collection till last season. It is of good habit, free, with dark-zoned leaves, and close trusses of orange-scarlet effective flowers. Received from Mr. Davie.

There were some other varieties of high promise, as *Louis Van Houtte*, remarkable for its very broad dark zone; *Rival*, a dwarf grower with finely shaped bright scarlet flowers, better than those of *Lord Derby*; and among semi-nosegays, *Godfrey*, a free broad-petaled orange-scarlet.

The following sorts were discarded as being in some point inferior to the other varieties in cultivation:—

Abbott.
Acme.
Adonis.
Adolph Poulain.
Autocrat.
Black Prince (*n*).
Bonaventure.
Charles Aubrey.
Chieftain.
Climax.
Compactum multiflorum.
Constance Haull.
Criterion.
Director.
Donald Beaton.
Eblouissant.
Editor.
Edward Milner.
Emily Thorland.
Emma Barba.
Emperor.
Etoile des Massifs.
Faust.
Fearmongul.
Firebrand (*n*).
Flambeau.
Foxhunter.
Garibaldi (North's).
Glorious.
Glory.
Harry Hieover (*n*).
Henri Lierval.
Highland Chief.
Huntsman.
In Memoriam.
James Campbell.
Kate Anderson.
La Foudre.
La Niagara.
Little Treasure.
Loveliness (*n*).
Magna Charta.
Magnificent.
Manfred.
Martin Gireau.
Mimas.
Miss Parfitt (*n*).
Model.
Montrose.
Mons. Barthère ainé.
Mons. G. Natchet.
Mrs. Anderson.
Mrs. Brock.
Mrs. Sinclair (*n*).
Napoléon (*n*).
Nimrod.
Nyanza.
Philip Crawley.
Pigmy.
Prince of Orange.
Profusion.
Really Good.
Red Riding Hood.
Red Robin (*n*).
Reliance.
RobertFish (*n*).
Royalty.
Satisfaction.
Sunlight.
Sunnyside.
The Dwarf (*n*).
Timothée Trim.
Triomphe.
Triomphe de Courcelles.
Vanquisher.
Vercingetorix.
Victor.
Vivandière.
Welcome.
William Davis.
William Ingram.
Woodwardiana.

Rosy-scarlet Selfs.—From this set the following sorts were discarded:—

Countess of Breadalbane (*n*). Poet Laureate. Prince Teck.
L'Africaine (*n*).

Rosy-scarlet Zonals.—This group, which is a very extensive one, embraces many shades of colour, from the cerise tints approaching to scarlet on the one hand, to the purple or magenta hues on the other. One novelty was certified, namely:—

Clio (First-class Certificate). A variety of moderately vigorous growth, having the leaves marked with an indistinct zone; the flowers of a semi-nosegay character, being well formed, and having the petals scarlet, and the lower ones of a rosy hue. Received from Mr. W. Paul.

There were besides some varieties of a highly promising character, namely :—*The Champion,* a large telling cerise-scarlet; *Fausta* and *Demosthenes,* bright magenta-rose; *Claude Lorraine* and *Robin Hood,* deep purplish magenta, very distinct.

The following varieties were discarded as not being now required :—

Alexander M'Kay.	Evening Star.	Miss Martin.
Alexandra.	Fairy Queen (*n*).	Mrs. Laing.
Andromeda.	Festival.	Mons. Martin.
Blanche Lefèvre.	François Chardine.	Novelty.
Bonnie Dundee.	Germania.	Olivia.
Candidate.	Hermit (*n*).	Persian.
Carmine Stella (*n*).	Hero.	Pink Pearl (*n*).
Chilwell Beauty (*n*).	Illustration.	President Johnson.
Christian Deegen.	Jules César.	Prince of Wales.
Claude.	Lord Chancellor.	Prime Minister.
Cliveden Rose (*n*).	Lord Palmerston (*n*).	Roi d'Italie.
Comet (*n*).	Madame Medeleine.	Rose Queen.
Crimson Cushion.	Magnet.	Rosy Thorn.
Derbyshire Hero.	Magenta Queen (*n*).	Souvenir de Mons. Basseville.
Empress.	Matilda.	St. Pierre.
Endeavour.	Meteor.	Victor de Puebla.
Ephraim.	Minnie Petch (*n*).	
Euchar.	Minnie Rose.	

ROSE-PINK SELFS.—A dwarf variety in this section was awarded a certificate, namely :—

Advance (First-class Certificate). A remarkably dwarf free-blooming variety, with fine self-coloured bright rosy-pink flowers, apparently having every quality to render it a good dwarf bedder. Received from Mr. Bull.

The following were struck out as being no longer required :—

Christine.	Madame Barre.	Pink Pet.
Improved Pink.	Madame Evirens.	Rose Queen.
Lilacinum (*n*).	Peach Nosegay (*n*).	Waltham Lilac (*n*).

ROSE-PINK ZONALS.—Of this group the variety named *Willow* was selected for a Certificate :—

Beauty of Lee (First-class Certificate). A vigorous and compact-growing variety, having faintly zonate leaves, and dense trusses of small flowers of the colour of those of *Madame Barre,* that is, of a bright rose-pink with white base to the top petals. The peduncles in this variety are remarkably long and stout, throwing the trusses well up above the leaves. Received from Mr. Toole.

The following varieties of this section were discarded :—

Amy.	Madame Auguste Laloy.	Pink Rosette (*n*).
Beauty of Dulwich.	Madame V. Nepterre.	Premier (*n*).
Belle Rose.	Mdlle. Emmanuel Gaay.	Queen of Pinks.
Fair Helen.	Melthes de Marcol.	Rose Stella (*n*).
Gloire d'Ecully.	Mary Evelyn.	Stella's Spouse (*n*).
Gloire des Roses.	Mons. Leyens.	Souvenir de Sir J. Paxton (*n*).
Kœtchen Scheurer.	Peach-blossom.	Vanquisher.
Jupiter.	Pink Globe.	Wiltshire Lass.
Lilie Nevil (*n*).	Pink Hermit.	
Lord Fitzherbert.	Pink Perfection.	

SALMON-COLOURED ZONALS.—The following sorts were discarded as not being required or not suitable for bedding :—

Alphonse Karr.	Fanty.	Mad. Rachel.
Archevêque de Paris.	Fascination.	Mdlle. Augustine.
Aurantium striatum.	Floribundum.	Ma Gloire.
Auricula.	François Desbois.	May Queen.
Aurora.	Gladiateur.	Melame Duhet.
Baron de Stael (*n*).	Grussen Nancy.	Minnie Gill.
Beauty of Edmonton.	Henry W. Longfellow.	Nonsuch.
Beauty of Suffolk.	Jeanne de Rohan.	Orange Prince.
Bridesmaid.	John Veitch.	Pioneer.
Britannia.	Lady of the Lake.	Princess of Hesse.
Charles Ruillard.	Lady Hope.	Princess of Wales.
Charles VI.	Lady Parker.	Queen of the South.
Christabel.	La Fraicheur.	Rosabella.
Comte de Pourtales.	Léon Bernum.	Rosy Circle.
Conspicuum.	Lord Vernon.	Seraphim.
Cupid.	Mad. Janvier de la Motte (*n*).	Souvenir de St. Pierre.
Delicatum.	Mad. Lierval.	Souvenir du 8 Juin.
Enchantress.	Mad. Loussell.	Theodore.
Etienne Henri.		Venus.
		Virgile.

OCULATE ZONALS.—The following sorts were struck out :—

Alice.	Madame Dufour.	Mons. Lavigerie.
Beauty.	Madame Gruffier.	Rosebud.
Bright Eye.	Madame Rudersdorff.	Victory.
Henri de Beaudot.		

WHITE ZONALS.—The following sorts were discarded :—

King of Whites.	Mad. Vaucher.	Sprite (*n*).
La Vestale.	Marie Mezard.	White Tom Thumb.
Mad. Barillet.	Snowball.	

MARBLED-LEAVED.—In this interesting little group, of which Sheen Rival is the type, a new variety, called *Kentish Fire*, a semi-nosegay, with deep orange-scarlet flowers, attracted considerable notice. The following were struck out :—

Flossy Fowle.	Kingsburyana.	Lucy.

GOLDEN SELFS.—The following sorts were discarded :—

Andrew Murray.	Hybrid Ivy-leaf.	Pink Beauty.
Golden Dwarf.	Ochroleuca.	

GOLD AND BRONZE ZONALS.—The following varieties were awarded Certificates :—

Rev. W. F. Radclyffe (First-class Certificate). This variety is valuable for its free yet compact habit of growth, and for the endurance of the colours of its leaves, which are of a bright yellow-green, marked with a narrow vandyked zone of clear chestnut-red. This sort has now been pretty well tested. Received from Messrs. Windebank and Kingsbury.

The Moor (First-class Certificate). This variety, in the early part of the season, was very fine, but the colours run out at a later period. In its best state it was very effective, the colour being a bright yellow-green with a clear dark chestnut zone. The leaves are somewhat lobed, which is perhaps its chief fault. Received from Messrs. F. and A. Smith.

Plutus (First-class Certificate). A good deal resembling *The Moor*, but the ground-colour is greener; the zone is bright and telling. Received from Messrs. F. and A. Smith.

This group is now becoming extensive as to the number of named sorts, but shows comparatively little real variety. The following may be dispensed with on account of indistinct colouring or want of constitution :—

Arab.	Her Majesty.	Oriole.
Aureum.	Josephine.	Painted Lady.
Beauty.	Louisa.	Pet of the Parterre.
Beauty of Oulton.	Luna.	Princess Alice.
Beauty of Ribbledale.	Mary Lister.	Princess of Wales.
Compactum.	Midas.	Sceptre d'Or.
Constantine.	Minnie.	Shakespere.
Crown Diamonds.	Miss Maule.	Sunlight.
Eclipse.	Mrs. Bass.	Viceroy.
Edward G. Henderson.	Mrs. Hugessen.	Viscountess Castlerosse.
Egyptian Queen.	Mrs. J. Todd.	Yellow Sovereign.
Electric.	Mrs. Maxwell Hutton.	Zebra.
Glowworm.	Novelty.	

GOLDEN-MARGINED.—The following were struck out :—

Unique, which does not prove so good as *Golden Chain.*

Golden Fleece, not so good a grower as *Cloth of Gold.*

GOLDEN VARIEGATED ZONAL.—The following sorts were awarded Certificates in this class :—

Amy Richards (First-class Certificate). A variety of the *Mrs. Pollock* type, and remarkable for its bold vigorous growth, and its large flat highly-coloured leaves. Both in growth and colouring it is far superior to the older variety, and is a real acquisition as a bedder. Raised at Chiswick.

Sir R. Napier (First-class Certificate). A very distinct variety of this group, remarkable for its very broad and dark zone. Received from Messrs. Carter and Co.

Louisa Smith, Florence, Mrs. Dannett, and *Miss Batten* attracted considerable attention from their promising appearance.

The following sorts were discarded :—

Corona.	Huntingdonian.	Mrs. Benyon.
Dr. Primrose.	Lizzie.	Red Admiral.
Fanny.	Meteor.	Red Gauntlet.

SILVER-MARGINED.—In this group the following variety was regarded as worthy of a Certificate :—

Miss Kingsbury (First-class Certificate). A most telling variety, of dense compact habit; the leaves, which are quite up to the average of merit as regards flatness, having a broad white margin. The flowers are scarlet. Received from Messrs. Windebank and Kingsbury.

The following were discarded :—

Alma.	Castlemeth.	Honeycomb.
Annie.	Cheerfulness.	Jane.
Beaton's Variegated Nosegay.	Daybreak.	Minnie Warren.
Bride.	Ellen Smith.	Mrs. Dombrain.
Brilliant.	Flower of the Day.	Oriana improved.
	Hendersoni.	

SILVER VARIEGATED ZONAL.—The following sorts were discarded :—

Countess of Warwick.	Little Beauty.	Picturatum.
Fontainebleau.	Mrs. Chater.	Rosette.
Gaine's Attraction.		

FLORAL COMMITTEE.

March 2, 1870.

A First-class Certificate was awarded to *Dendrobium cucullatum giganteum* and a white variety of *Lælia Pilcheri* from Messrs. Veitch. Mr. Saunders sent male and female *Stangeria paradoxa*, the latter of which was in fruit; also *Dæmonorops plumosa* and *Agave cuspidata*, both of which obtained First-class Certificates. The same award was made to a new Rose, from Mr. Turner, Marquise de Mortemart, a finely cupped variety with a blush centre and pink outer petals. Mr. Turner obtained the First Prize for Camellias in pots, consisting of *Mexicana nova*, Madame Lebois, Costituzione, Il Cygno, *Saccoi nova*, and De Notaris.

FRUIT COMMITTEE.

The first Prize for a single bunch of grapes was awarded to Mr. Bannerman, gardener to Lord Bagot, for Lady Downe's Seedling; the second to Mr. G. Johnstone, Glamis Castle, for Muscat of Alexandria, which was ripe in the beginning of August and cut November 2; the third to Mrs. Torr for Lady Downe's Seedling. Mr. Bray, gardener to E. A. Sandford, Esq., obtained the First Prize for Rhubarb, Asparagus, and Sea-kale.

SCIENTIFIC COMMITTEE.

W. Wilson Saunders, Esq., in the Chair.

The Minutes of the last Meeting having been read, a Report of the Subcommittee appointed to superintend the experiments carried on with various manures at Chiswick was read and adopted. Dr. Gilbert spoke on the same subject, and it was agreed that the carrying out of certain details, as to the proposition of the ingredients to be used in the several boxes, should be left to Drs. Gilbert and Voelcker. The question of the employment of a special assistant to superintend the experiments for the ensuing season was discussed, and the Chairman promised to bring the subject under the notice of the Council for its determination at its next Meeting.

Dr. Masters exhibited, on the part of Messrs. Downie, Laird, and

Laing, a number of grafted Abutilons showing the effect of stock on scion, and scion on stock. Thus *A. megapotamicum* (green) grafted on *A. Thomsoni* (variegated) had become variegated like the stock; *A. Thomsoni* grafted on *A. megapotamicum* had caused the production of variegated shoots from the originally green stock as well as from the scion; *A. Thomsoni* grafted on *A. megapotamicum* and then pinched back had the effect of inducing the buds on the stock to break, and these, too, produced variegated leaves; another green Abutilon, Duc de Malakoff, grafted on *A. Thomsoni*, also became variegated in consequence; so that the variegated plant, whether used as a stock or as a scion, has the faculty of imparting its variegation to the leaves and buds subsequently produced. Great interest was manifested in these specimens, and Dr. Masters called attention to the remarkable experiment of M. Van Houtte, where the variegation ceased after the accidental removal of the variegated graft (see p. 554, 1869), and to a paper of Professor E. Morren's lately published recording several cases of this kind mentioned in this and other Journals, and also to the circumstance that the mere insertion of a detached leaf of *A. Thomsoni* into a slit in the bark of a green Abutilon was sufficient to innoculate the latter, even though the inserted leaf speedily perished. Dr. Masters stated that at a future Meeting he would direct attention to other recorded cases of this interesting phenomenon.

A specimen of a curious excrescence from the bark of a Camellia, sent by Mr. Miles of Enys Gardens, Penryn, was then shown. The excrescence had much of the aspect of a Polyporus, but seemed to be an excrescence from the bark, from which it was with difficulty separated. In one case two branches had become united together, and the point of union was covered with this shell-like excrescence. None of the Members of the Committee nor any of the Camellia-growers present at the General Meeting had ever seen anything similar. The only suggestion was that the adventitious growth was the result of some injury to the plant. Dr. Masters undertook to submit the growth to microscopic examination, and report more fully at a future Meeting, as also on a curious specimen resembling the "burrs" seen on Birch trees, but in this case stated to be formed on the roots of a Currant-bush.

Dr. Masters further reported as follows on the *Bridgesia spicata* exhibited at the last Meeting:—

"The peculiar outgrowths of this plant are protruded from the young shoots above the axils of the leaves and above the branch proceeding therefrom. In the fully developed state they are about the size of a large pea, of a yellowish colour, and have a general resemblance to the tufts of hair found in similar situations in *Pereskia.* In the youngest condition the excrescences occur in the form of small, smooth, conical projections covered with an outer layer of small oblong cells, the outer walls of which are thickened; subjacent to these are four or five rows of small, spheroidal, densely packed cells, also cortical in their nature. These overlie a mass of ordinary cellular tissue, the cells of which contain chlorophyll. Running into this conical cellular projection are two rows of small spiral vessels, which converge towards the apex of the cone and form a loop. These spiral vessels are continuous with those of the vascular circle of the branch, and are surrounded on all sides by oblong thin-walled cells, whose long diameter is parallel to that of the spiral vessels, and more or less at right angles to the direction of parenchymatous tissue of the cortex and also of the medulla. The constituent cells of the medulla are spheroidal and destitute of chlorophyll. Here and there spiral vessels traverse the medulla, quite isolated from the general vascular circle. In the more fully developed excrescences the appearances are similar, except that the outer epidermal cells now show themselves in the form of long cylindrical cells (hairs), some of which are club-shaped at the extremity. Some of these hairs appear to be unicellular, while others show one or two transverse partitions. The hairs in question are rather thick-walled and contain a few scattered, small, highly-refracting granules (starch) resembling the granules found in autumn when the leaves have assumed their autumnal tints in consequence of the decay of the chlorophyll. From these appearances, the inference seemed to be that the growths in question were of the nature of adventitious roots covered by hypertrophied epidermal hairs."

An *Arum*, from Chiswick, with an adventitious leaf attached to the spadix, and white, like the spathe, was then shown. A similar illustration was forwarded some time since by Mr. D. F. Fisk.

Mr. A. Murray read a communication relating to the presence of a larva in the tubers of certain herbaceous perennials. The larva in question was that of the Ghost Moth or Golden Swift (*Hepialus Humuli*), and did much damage. Mr. Murray then showed a dipterous larva which was attacking Sea-kale roots and doing much mischief. This was referred to Professor Westwood for further examination.

Specimens of the Pine-Beetle and of a species of *Tortrix* * were then shown. A "Rose-scale," supposed to be new, was also shown by Mr. Murray, who also alluded to a curious mite, *Oribata geniculata.*

Mr. G. F. Wilson exhibited a series of water-colour drawings of tropical plants, which have been presented to the Society by Mr. Fernyhough, and the Meeting then adjourned.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

The thanks of the Society were given to Mr. Fernyhough for his handsome present to the Society of a series of coloured sketches of tropical fruits.

Attention was then called to the variegated Abutilons, of which a Report is given in the proceedings of the Scientific Committee.

The Chairman stated that he had 120 species of *Agave* in his collection, an enormous increase within a very few years.

Major Trevor Clarke remarked on the absence of odour in all the beautiful Cyclamens exhibited at the Meeting.

* In a letter in the 'Gardener's Chronicle,' March 5, 1870, signed "Forester," it is stated that the Pine-Beetles (*Hylurgus piniperda*) were found to be most destructive. A *Tortrix*, however, is a great pest in Aberdeenshire, the caterpillar attacking the young shoot and producing a very curious appearance, which may at once be recognized. A species of Sawfly is also very destructive.

SCIENTIFIC SUBCOMMITTEE.

Pursuant to notice, a Meeting of the Subcommittee was held at the Gardens at 10 o'clock on Friday, February 18, to consider the plan and arrangements for the continuation of the experiments at Chiswick on the influence of different manuring substances on the character of development of certain plants selected to represent several important Natural Families.

Present,—A. Murray, Esq. (in the Chair), Dr. Masters, Mr. Moore, Dr. Voelcker, Dr. Gilbert, and Dr. Hogg.

It was admitted that the soil taken for the experiments last year was too rich to allow of sufficient characteristic distinctions between the unmanured and the manured conditions. It had been proposed to select a different soil for the future experiments; but on full discussion it was considered that after the removal of the large quantities of vegetable produce grown last year, the condition of fertility of the unmanured soil would now be so far lowered, and the difference between the condition in the different boxes, in some important respects, so far widened, as to render it admissible, whilst it was, in other respects, desirable to retain the same soils for the experiments of the coming season. It was further decided that the soils should be turned out of the boxes, remanured with the same descriptions of manure as before, sifted, and then returned to their respective boxes. The soils not to be resown with seed, but each box to be planted with plants selected from those grown last year in the same box. A given number of plants to be put into each box, allowing a fixed distance from plant to plant; the number and distance to be settled for each description of plant according to its general character of growth, the result to be aimed at being sufficiently to cover the area, but at the same time to give room for the free development of each individual plant. It was also decided that single plants should be grown in pots of poor sandy soil to be left unmanured, or to be manured in the same way as that in the boxes.

On request, Dr. Voelcker undertook to make an analysis of the unmanured soil of the boxes; Dr. Gilbert promised, on behalf of Mr. Lawes and himself, to provide the manures required, and also a statement of the amount, and of the results of partial analyses made at Rothamsted of the produce grown in the boxes last year. Dr. Masters undertook to draw up a preliminary report on the results of last year's experiments.

Subsequently Dr. Hogg, Dr. Masters, and Dr. Gilbert went to Chiswick to inspect the condition of the plants in the experimental boxes, and decided that, perhaps with one or two exceptions, sufficient plants could be selected for replanting as above proposed.

FLORAL COMMITTEE.

March 16, 1870.

A First-class Certificate was awarded to Mr. Needle, gardener to H.R.H. the Comte de Paris, for a group of *Ophryds*, consisting of a single specimen of *Ophrys fusca* and many plants of *O. tenthredinifera*, or some closely allied form; to Mr. F. Perkins, for *Echeveria agavoides*; to Mr. Turner, for *Primula sinensis semi-duplex striata*; to Mr. B. S. Williams, for *Peristrophe angustifolia aureo-variegata*, and a fine hybrid *Solanum pseudo-capsicum*, named *compactum*; to Messrs. Rollinson, for *Dracæna Guilfoylei* and *Epacris hyacinthiflora carminata*; and to Messrs. Veitch, for the white hybrid *Rhododendron multiflorum* and *Vanda cærulescens*.

FRUIT COMMITTEE.

The most interesting objects were two splendid bunches of Banana, and a fine dish of *Eugenia Jambos* in flower and fruit, sent by Mr. Carr, gardener to P. L. Hinds, Esq.; the flavour of the latter was very good, far better, in fact, than is generally the case in tropical or subtropical localities. There were some fine dishes of Apples, amongst which the Pitmaston Russet, sent by Mr. Ross, gardener to C. Eyre, Esq., who obtained the First Prize for dessert Apples, was supreme, Mr. Earley being second. With kitchen Apples Mr. Gardiner, of Eatington Park, was first, and Mr. Ross second.

SCIENTIFIC COMMITTEE.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

The Secretary stated that the Vine-buds sent on a former occasion, accompanied by specimens of Athöus, were probably injured by a mite.

Mr. Andrew Murray found that the larva on Sea-kale roots, mentioned at the last Meeting, belonged to the genus *Sargus*, and was therefore not the cause of injury.

Mr. Berkeley produced specimens of *Dendrobium chrysotoxus* and *Odontoglossum hippus*, communicated by Mr. Parsons, in which the lip was wanting, and a *Cypripedium* with two flowers from the same spathe; also some Peach-twigs sent by Mr. Gardiner, from Eatington Park, in which three, and sometimes four, carpels were produced in each calyx. Dr. Masters remarked that *Cerasus caproniana*, DC., constantly produced numerous carpels, and Mr. Berkeley has seen the same thing in Plums.

Mr. A. Murray brought specimens of a Weevil, from imported specimens of an *Encephalartos* from Natal, belonging to the genus *Phacecorynes*, to which he has given the specific name of *funerarius*.

The Chairman called attention to the recent fall of snow. It was from 8 to 12 inches deep, but was so light that a cubic foot produced only $\frac{68}{100}$ of an inch of water. It was succeeded by a sharp frost, which at Reigate, on Upper Greensand 450 feet above the level of the sea, indicated 23° Fahr.; in the valley below, on the Lower Greensand at 300 feet, 8°; on the Weald Clay 10°; and on chalk at Dorking 11°. Evergreens on the hill-side in consequence escaped, while those in the valley were injured.

Mr. Glaisher stated that he had often found in balloon-experiments the air at higher elevations warmer than at lower, possibly from their being free from mist and therefore more accessible to the sun's rays. He stated that 12 inches of snow generally correspond with 1 inch of rain, though 8 inches sometimes produce the same quantity of water. He called attention to the necessity of placing thermometers 4 feet above the ground where accuracy is desired.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley, after noticing the specimens of Orchids and the Peach-shoots which had been laid before the Scientific Committee, produced a specimen of *Abies Albertiana* with cones, sent by Mr. Sandbach from Hafodunos, in the centre of Denbighshire, in a very cold and bleak district, where much has been done by the skill of the excellent gardener, Mr. Guthrie, combined with the taste and intelligence of his employer. After alluding to the specimens of Rose Apple and the interesting plants brought from the Pyrenees by the Comte de Paris, from whom other species may shortly be expected, Mr. Berkeley called attention to the influence of fungus-spawn on living plants. That plants are frequently killed by spawn is not a matter of theory, but of fact. Negative observations will not upset positive experience. Several instances were mentioned which admitted of no doubt; and cultivators are therefore cautioned not to listen to mere theory, but to avoid those dangerous composts which have in many cases been found to be injurious, though undoubtedly they may sometimes prove harmless. The notion that fungi only attack unhealthy plants has long been exploded; and any one may prove this for himself by merely dusting perfect grains of wheat with the spores of Bunt, when he will sure to have a crop of bunted ears.

The Chairman confirmed Mr. Berkeley's observations.

A letter was then read on the efficacy of a solution of alcohol or methylated spirits in destroying American blight, which was confirmed by the Chairman. Mr. Berkeley has found the mixture of tar and grease, which is used to anoint the hoofs of horses in stables, efficacious.

Major Trevor Clarke thought the thanks of the Meeting should be given to H.R.H. for sending the interesting specimens of *Ophrys*, a genus which he was cultivating with such success at Twickenham.

The Meeting then adjourned.

FLORAL COMMITTEE.

April 6, 1870.

First-class Certificates were awarded to *Dendrobium thyrsiflorum* from Messrs. Veitch; to *Primula Boveana*, Desc. (exhibited under the name of *P. Contii*), a species closely allied to *P. verticillata*, which occurs also in Abyssinia; to *Thrynax grandis*, a South-American Fan-Palm, and *Encephalartos mirabilis* from Mr. Bull: also to *Odontoglossum triumphans*, var. *nigrescens*, from W. Marshall, Esq.; to *Angræcum Ellisii*, from Mr. B. S. Williams; to a variety of Cyclamen named *giganteum*, from Mr. Hayes, with very large rose-coloured flowers; to *Azalea François de Vos*; and a lovely pink Rose, *Mdlle. Eugène Verdier*, from Messrs. Paul. Amongst other interesting plants were a South-American variety of *Artocarpus incisa*, from Mr. Bull, which has large drooping leaves, and is more hardy than the more generally known form, and *Vellosia candida*, an interesting plant from Brazil, with narrower petals than the form which is figured in the 'Botanical Magazine,' both sent by Mr. Bull. Cut flowers of a variety of *Rosa berberidifolia* were also exhibited, which departs from the character on which Dr. Lindley founded his genus *Lowea*, in having pinnate, not simple, leaves.

Mr. Edmonds, of Hayes, obtained the First Prize for Cyclamens, Mr. Stevens, of Ealing, the Second, and Mr. James, gardener to W. F. Watson, Esq., of Isleworth, the Third. The two first were examples of high cultivation, the third collection was unfortunately rather too far advanced. Mr. Turner, Mr. Edmonds, and Mr. James were the successful competitors for smaller collections. The competition for Cinerarias was confined to two individuals, Mr. James being first and Messrs. Dobson second. The miscellaneous plants, consisting of Orchids, Roses, Spring flowers, &c. were truly admirable.

SCIENTIFIC COMMITTEE.

Dr. T. Thomson, F.R.S., in the Chair.

Mr. Miers presented the second volume of his 'Contributions to Botany' to the Society's Library. Mr. G. F. Wilson sent specimens of various plants and fish preserved in glycerine by Lady Dorothy Neville, which, though put up so long ago as 1855 were in very perfect condition. Mr. Blenkins exhibited a double Apple with two distinct eyes and a single cylindrical stalk. The two individuals were united perfectly, except for a small space in the centre, while the vascular bundles passed from one into the other.

Dr. Masters brought specimens of the roots of the plants which were the subject of experiment at Chiswick under the suggestions of Dr. Gilbert and others. It was clear that the different manures had exercised very different influences on the plants, and there was therefore the greater encouragement to proceed with the experiments another year, for which purpose fresh manures had been mixed with the old soil, and a limited number only of plants placed in each box.

Major Trevor Clark brought white sand blackened with animal charcoal, which he thought might be useful in propagation.

Mr. Glaisher read a paper on the results of his examination of the meteorological reports of the observations at the Chiswick gardens, with a very detailed tabulated analysis, showing the mean temperature of every day in the year as observed at Chiswick from 1826 to 1869, and also brought certificates as to the character of the instruments to be placed at Chiswick. The question of the publication of this valuable paper was referred to the consideration of the Council.

Mr. J. B. Reade exhibited a *Coccus* which is very destructive to Plum-trees, on which it is hoped Mr. A. Murray will give a report at the next Meeting.

GENERAL MEETING.

The Bishop of Winchester in the Chair.

The several awards were detailed by the Rev. I. Dix and Mr. G. F. Wilson.

Mr. Berkeley then called attention to the *Vellosia* exhibited by Mr. Bull, and *Oncidium amictum*, which is now generally known as *O. sarcodes*, though the former is the original name under which it was received from Messrs. Loddiges and published in the 'Botanical Register.'

A supposed variety of *Bletia hyacinthina* was then noticed, sent by Mr. Standish; Mr. Fortune, however, considers it to be a true species, which should be called *B. japonica.*

Mesua ferrea, from Mr. Bull, was then pointed out as yielding a very hard wood, its flowers being objects of adoration in India, and, when dry, sold as a drug in the bazars. The plant, on superficial examination, resembles a *Brownea*; but the leaves are not pinnate. Specimens of the old *Catesbæa spinosa* were also exhibited by Mr. Bull, but not in flower.

Mr. Berkeley then directed attention to the two plants of *Encephalartos giganteus* from South Africa, one of which had thrown up inflorescence only, without any leaf. It would be a matter of interest hereafter to see whether its production would not prove fatal to the plant, appearing, as it did, without leaves.

The admirable condition of the Peach-trees in the large glass wall at Chiswick was especially noticed; and occasion was taken to correct a statement of Mr. Pearson with respect to what Mr. Berkeley said at the last Meeting about the danger of replanting Pine woods before the roots of the old trees were thoroughly decayed. His observation related to Aberdeenshire, and not to the Marquis of Huntly's estate near Peterborough.

Some fine baskets of Mushrooms were sent from the gardens of the Marquis of Exeter and Lord Gainsborough, some of which were from French spawn. Both White and Brown Mushrooms came from the same spawn; and two of the specimens were attacked by a fungus which obliterates the gills and probably renders them unwholesome.

The Bishop of Winchester then referred in very feeling terms to the loss which the Society had sustained in the death of General Grey, under whose auspices the barren slopes of Windsor Castle were converted into a brilliant garden.

FLORAL COMMITTEE.

April 20, 1870.

A First-class Certificate was awarded to Mr. B. S. Williams for Gloxinia, Scarlet Gem, with beautiful deep-scarlet flowers; to Mr. Turner for Auricula, Colonel Champneys, a grey-edged flower with blue ground and white paste; to Mr. Hooper, for Pansies, Sunshine and Mrs. Shirley Hibberd; and to Messrs. Henderson for a fine yellow bedding Pansy named Golden Bedder. J. Anderson Henry, Esq., sent Primulas with leafy calyces still more fully developed than those which were sent to the Scientific Committee last year, and which have flourished at Chiswick; and a noble spike of *Phalænopsis Schilleriana* came from Killerton, with eighty blossoms. The point of greatest attraction, however, was a collection of Orchids belonging to the genera *Orchis*, *Ophrys*, and *Serapias*, from the Comte de Paris, which were admirable both as specimens of good cultivation and great beauty.

FRUIT COMMITTEE.

Mr. Cooling, of Bath, received a First-class Certificate for a new Brocoli called Matchless. Mr. Gilbert, gardener to the Marquis of Exeter, received the First Prize for an excellent collection of forced Vegetables, amongst which the Sea-kale was very fine. There were two fine collections of Apples, in excellent preservation, from Eatington Park and Tyringham Gardens, and some excellent Brown Turkey Figs from Oulton Park.

SCIENTIFIC COMMITTEE.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. A. Murray stated that the *Coccus* referred to by him at the last Meeting was *C. patelliformis*, of which a figure was given in the 'Gardeners' Chronicle' for 1863.

He produced specimens of a gall preserved by electrotyping, which, he thought, might be a good plan for the exhibition of objects which are notoriously extremely subject to decay. He also brought specimens of the eggs of some moth, covered with dark grey hairs, which the Chairman thought might be derived from the moth when in the act of depositing the eggs.

The Secretary then alluded to an observation of Dr. Hooker, made some years since, as to the cause of the well-known change of colour in the leaves of *Selaginella mutabilis*, the chlorophyll being diffused when they have their full glaucous colour, and collected into a little ball when they become pale—an observation which was made long before the recent communications on the subject by continental physiologists.

The Chairman brought a plant of *Lilium Thomsonianum*, which had thrown out a number of pentagonal and hexagonal pedicellated bulbils. These were shown to derive their acute angles from the pressure of the nerves of the two leaves between which they originated. At first sight they had very much the appearance of capsules.

Dr. Masters brought a flower of *Aristolochia grandiflora*, in which there was a broad collar within the narrow part of the flower, which made it a perfect insect-trap, effectually preventing the exit of any insect which once obtained admission.

Mr. Glaisher exhibited an improved ground-thermometer, and brought two interesting diagrams showing the close accordance between the observation of temperature at Greenwich and Chiswick.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley stated that Dr. Masters and himself had examined independently the Primula from Abyssinia, exhibited at the last Meeting by Messrs. Veitch, and had concluded that it was the variety *sinensis* of *Primula verticillata*, differing principally from the typical form in having the tube of the corolla shorter in proportion when compared with the calyx.

A fine specimen of *Oncidium sarcodes* was sent by Messrs. Veitch, which was compared with the original *Oncidium amictum*, and found to be identical, except in the larger size of the flower, though the figure in the 'Botanical Register' seemed to indicate a slight difference in the processes of the lip. An Epidendrum, from Peru, was next alluded to as different from *E. xanthinum*, Lindl., for which Mr. Bateman suggested the name of *E. Bowmanni*, it being the last novelty sent home by the late Mr. Bowmann. Alluding to the charming collection of Orchids sent by the Comte de Paris, to whom the special thanks of the Meeting were voted, he called attention to the number of interesting European plants which might reward the labour of collectors and prove an ornament to our gardens. More than twenty species of Narcissus were recorded in Italian floras, which were quite unknown to British botanists. The Chairman remarked that this observation might be greatly extended, and that numerous extremely beautiful terrestrial Orchids might easily be introduced from other countries, as Australia, North America, &c. Whether the numerous so-called species of Narcissus and Tulipa were true species or not, they at least retained their characters under cultivation.

FLORAL COMMITTEE.

May 4, 1870.

First-class Certificates were awarded to *Carludovica rotundifolia*, *Euterpe sylvestris*, *Areca monostachya*, *Deckenia nobilis*, and *Geonoma pusilla*, all from Messrs. Veitch; also to *Adiantum Veitchii* and a new Azalea named Acme. The same award was made to *Cochliostema Jacobiana* and *Tillandsia Lindeniana*, both of which were much admired. Mr. Parsons obtained a First-class Certificate for *Reseda odorata eximia*, remarkable for its large flowers, and said to be known as the French variety. Mr. Noble sent several fine varieties of Clematis, one of which, shaded with blue and red, named Lord Londesborough, was selected for the same award; Mr. Parker obtained the same for a new yellow bedding Pansy, called *Viola lutea major*, and Mr. Paul for a dwarf white-edged Pelargonium, with a profusion of white flowers, named Avalanche; Mr. Ware for a beautiful Iris, one of the forms of *Iris iberica*, Hoffm.; and Messrs. Henderson for an exquisite Caladium, named Princess Alexandra, with a creamy-yellow ground with rose and green veins.

FRUIT COMMITTEE.

Mr. Carmichael, gardener to H.R.H. the Prince of Wales, Sandringham, sent a remarkably fine dish of President Strawberries; Mr. Cadger, gardener to Shaw Leigh, Esq., Luton Hoo, Beds, a brace of seedling Cucumbers, measuring 32 inches long and 9 in circumference. Major Trevor Clarke brought a smooth seedling Cucumber, the result of a cross between the Sion House and Telegraph. Mr. Barron brought from Chiswick blossoms of Currants, Gooseberries, and Apples entirely destroyed by the frost of the night of May 3, when 12° of frost were registered.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley stated that he had just been asked on what authority *Triteleia uniflora* passed, with his sanction, under the specific name of *alliacea*. It arose from inattention to what had been said at a former Meeting, when it had been exhibited as *Leucocoryne alliacea*, which has entirely different anthers. Specimens of the fifth generation of the Wild Cabbage from the cliffs at Abergele were brought, the greater portion having acquired a red stem and veins, with more pinnate leaves, without, however, any improvement in quality.

Attention was called to the desirability of obtaining again the different species of *Calochortus* (of which *C. splendens* came from the Chairman), a genus which presents no insurmountable difficulties as regards cultivation.

The beautiful *Iris* from Mr. Ware, which proves to be *I. iberica* of Hoffmann, was especially pointed out, and some observations made on the poisonous qualities of *Toxicophlœa*, a specimen of which was sent by Mr. Cooper, of Reigate, and other *Apocynaceæ*. There was a peculiarity about a sprig of *Cœlebogyne ilicifolia* brought by Major Clarke, namely, that the terminal flower alone proves fertile. It is strange that amongst all the seedlings which have been raised not a single male specimen occurred, examples of which, however, are well known to botanists. Comments were made upon the cases in which perfect seed is apparently produced without male flowers. It is possible, however, that in some cases, in the nearly abortive stamen, a solitary grain of pollen may occasionally be produced, sufficient to effect fertilization.

Mr. Berkeley directed attention to a beautiful Aloe from Chiswick (*Aloe humilis*), which, with many of its allies, ought by no means to be neglected.

The Chairman made some interesting observations on the matters which had been brought before the Meeting. Mr. Berkeley had remarked that Hens discriminated between the Wild Cabbage and the Kales which it resembled, and neglected the former, though very fond of the latter.

The Chairman stated that his Brocoli suffered materially from Larks, as Clover and Turnips do from Wood-pigeons, while Blackbirds, apparently from mere idleness, destroyed the flowers of Polyanthus and Primrose.

Cut blossoms of *Serapias lingua* and *cordigera* were then shown, and shoots and leaves of Peach, diseased like the specimens which had on several previous occasions been submitted to the Society.

The Meeting then adjourned.

SCIENTIFIC COMMITTEE.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

The Secretary stated that he had examined, in conjunction with Mr. Broome, the two specimens of the rhizome of *Caladium bicolor* brought by the Chairman to the previous Meeting, and found that the more solid specimen consisted of a mass of extremely minute starch-granules, while the softer contained the excrement of some mite which had also spun a quantity of threads, accompanied possibly by the flocci of some mould, which he compared to the curious heaps which are thrown up in a short time in flour-mills by the common flour-mite.

Mr. Berkeley and Mr. Broome had examined the down on the eggs brought by Mr. A. Murray to the last Meeting. The hairs resembled exactly those which occur on the bracts of Willow-catkins; but Prof. Westwood and Mr. Stainton referred the eggs to *Eriogaster lanestris*, in accordance with the opinion broached by Mr. Saunders when they were first submitted to the Meeting. The subject, however, will be brought before the Committee at the next Meeting.

Mr. Berkeley brought some Peach- and Nectarine-leaves from Chiswick, which, from the centre of a withered spot, produced a manna-like substance in such quantities as to fall on neighbouring leaves. He undertook to examine it microscopically before the next Meeting.

Mr. Munby brought flowers of a Violet collected by himself on the summit of the Atlas Mountains, which has been named *V. Munbyana*. Dr. Thomson, however, has compared it with specimens in the Herbarium at Kew, and finds that it does not differ materially from *V. lutea*.

Dr. Masters brought a specimen of the variegated *Acer negundo*, which had partially reverted to the original form, the variegation being confined to the small shoots on one side only; also a forked carrot, in which the two divisions were regularly twisted round each other spirally. He also read a communication from Mr. Simpson of Broomfield Lodge, Chelmsford, on a supposed case of grafting between the Potato and Jerusalem Artichoke. Though Mr. Simpson's observations produced no conviction, it was decided that the produce should be tested at Chiswick, where specimens have been placed in the hands of Mr. Barron, as it was quite clear, whatever might be thought of the matter, Mr. Simpson was himself convinced.

The Chairman brought specimens of Wheat injured by the Grub of Musca Frit.

Major Trevor Clarke brought the result of a cross between an Oxlip form of the Primrose and Polyanthus. He stated that he could never obtain a cross between the Primrose and Cowslip; it was believed, however, that this had been effected by Professor Henslow.

The Meeting then adjourned.

FLORAL COMMITTEE.

May 18, 1870.

First-class Certificates were awarded to Messrs, Veitch for *Ficus dealbata*, *Oncospermum Van Houttei*, *Pritchardia pacifica*, *Raphis humilis*, *Cyanophyllum spectandum*, and a deep copper-coloured variety of the common Alder; also to:—Mr. B. S. Williams for a fine variety of *Trichopilia crispa* with a dark claret-coloured lip; to Messrs. Paul and Son for *Hydrangea stellata flore pleno*, an exquisite variety, in which the barren flowers were all double; to Mr. Turner for Azalea Roi d'Hollande, a deep scarlet-flowered variety.

FRUIT COMMITTEE.

The subjects brought before the Committee were few in number, and no Class-certificates were awarded. Only one collection of forced fruits was brought for competition. Mr. Miles, gardener to Lord Carrington, obtained the First Prize for a collection consisting of Black Hamburg and Chaoush Grapes, Enville and Queen Pines, Brown Ischia Figs, Elton Cherries, Sir-Charles-Napier Strawberries, and Hybrid Cashmere and Bailey's Green-fleshed Melons.

SCIENTIFIC COMMITTEE.

A. Grote, Esq., F.R.S., in the Chair.

The Secretary brought further specimens of Peach-leaves and young shoots with a manna-like exudation. The microscopic structure, however, was very different from that of the manna of commerce, resembling rather some form of stearine. Dr. Gilbert undertook to examine the substance and report at the next Meeting.

Specimens of *Lychnis* affected with *Ustilago antherarum* were brought. There was no indication of any development of the pistil in consequence of the presence of the parasite.

Specimens of *Tragopogon* affected with *Ustilago receptaculorum* came from Mr. Wilson Saunders.

A Cucumber-stem with a curious gouty swelling, above and below which adventitious roots were developed, was exhibited, showing a complete derangement of the vascular wedges, while the medullary rays, which were greatly increased in size, were white instead of green.

Leaves of vines attacked by the new Vine-pest were brought containing many cocci with their eggs. The Secretary undertook to examine them with a view to ascertain whether there was any difference between the eggs on the leaves and those on the roots.

Mr. Berkeley remarked that at Chiswick, while the lower blossoms of fruit-trees were killed by frost, the upper escaped.

Dr. Hogg brought a Polyanthus in which the terminal flowers exhibited only the rudiments of calyx, corolla, and stamens.

Dr. Masters presented a Report of the experiments at Chiswick on the effects of different manures, which will be published in the Journal, and read two letters from I. Anderson-Henry, Esq., which also appear in the Journal.

Mr. Reeves brought perforated Peach-leaves similar to those which have been before the Committee on several occasions.

Mr. Glaisher brought leaves of the Horse-Chestnut which were dried and shrivelled by a cold wind of the force of from 20 lb. to 30 lb. on the square foot, and laid on the table the result of his examination of the records of rainfall at Chiswick, which, together with the observations of temperature, will appear in the Journal.

Mr. A Murray brought further specimens of the eggs of *Eriogaster lanestris* and Larch-twigs gnawed by *Coleophora laricella.*

The Meeting then adjourned.

GENERAL MEETING.

G. F. Wilson, Esq., F.R.S., in the Chair.

Mr. Berkeley stated that the beautiful *Iris* brought at the last Meeting by Mr. Ware is *I. iberica*, Hoffm., and that he received the plant from Greece. The species is a native of the Caucasus, and has been figured by Regel.

The large white-flowered Cactus sent by S. P. Kennard, Esq., is probably a seedling of *Cactus triangularis.*

Attention was called to *Elisena longipetala* from Mr. Wilson Saunders, which differs from other Amancaes in the compressed crown and narrow waved petals. Some details were then read of the feast of Amancaes in Peru.

Some observations were made on the new Vine-disease, and especial attention was called to the necessity of stamping it out the moment it made its appearance. The swellings on the leaves were so remarkable that there could be no difficulty in recognizing it.

Dr. Hogg made some observations on the value of large compared with small orchard-houses, as retaining moisture longer; while a greater body of heat was maintained, as they were not subject to sudden fluctuations of temperature. He also called attention to the benefit of mulching the pots as practiced by Mr. Barron at Chiswick.

The Meeting then adjourned.

FLORAL COMMITTEE.

June 8, 1870.

First-class Certificates were awarded :—to a fine early white forcing Pink from Mr. Shenton, Biggleswade; to *Gongora portentosa* from W. Wilson Saunders, Esq.; to *Geonoma elegans*, *G. speciosa*, *Wulffia regia*, *Cycas Armstrongii*, *Pandanus decorus*, and *Anœctochilus pardina* from Mr. Bull; to *Korthalsia robusta*, *Bactris marissa*, and a deep purple *Gloxinia*, named Alice, from Messrs. Rollison; to *Adiantum sessilifolium*, *Pandanus Veitchii*, *Dieffenbachia Bowmanni*, *Aralia Veitchii*, a hybrid *Cypripedium* between *C. caudatum* and *C. Pearcii*, and *Aerides maculatum*, from Messrs.

Veitch; to a beautiful white *Clematis*, named Sylph, from Messrs. Cripps; to *Brodiæa coccinea*, Gray, the scarlet-flowered *Delphinium nudicaule*, and a charming annual, *Leptosiphon roseum*, from Mr. Thompson, Ipswich; to a dwarf bedding pink-flowered Zonal Pelargonium, named Master Christine, from Mr. Cannell, Woolwich; and to Mr. Turner for show Pelargoniums, Admiration, Charlemagne, Duke of Edinburgh, Syren, May Day, and Iron Duke.

FRUIT COMMITTEE.

Special Certificates were given to Messrs. Carter for some splendid white Naples Onions; to Mr. Hill, gardener to R. Sneyd, Esq., for fine bunches of Lady Downe's seedling, both of this and last year's growth; and to Mr. Miller, Worksop Manor, for a collection of fruit.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.R.S., in the Chair.

The Secretary reported that he had examined the insects on the Vine-leaves with a view to ascertain whether there was any difference in the size of the eggs on the leaves and those on the roots. He found considerable differences in the same group of eggs; but on the whole it appeared that the latter were smaller than the former, the respective lengths being $\frac{1}{83}$ and $\frac{1}{99}$ inch, of the full-grown insect $\frac{1}{31}$ against $\frac{1}{27}$.

He brought specimens of female plants of *Lychnis diurna* affected with Ustilago. In every flower which had been attacked by the parasite the rudimentary stamens had been forced into development. On a single plant only he had found an unaffected flower, and this was exactly in the normal condition, the stamens being still rudimentary. The conclusion to be derived from these facts is precisely contrary to the views promulgated on the subject at the Meeting of the British Association at Exeter.

He also exhibited partially decorticated twigs of Roses; but no one was able to suggest any explanation. Mr. Berkeley adverted to the manna-like substance on Peach-leaves which was brought before a former Meeting, remarking that the microscopic structure, though very different from that of Manna of commerce, was very like what is figured by Baker in his work on the microscope. He had been unable to produce a specimen of Leaf-manna, Mr. Hanbury having informed him that he had never seen it.

Specimens of the form of German Wallflower, known as var. *gynantherus*, were exhibited, in which the stamens are converted into carpels.

A plant of Mrs. Pollock Pelargonium was shown, in which the greater portion of the plant had reverted to its parent Zonal. The Secretary had observed that the flowers in a similar instance were of different tints.

Mr. Wilson Saunders sent specimens of *Graya Sutherlandi*, to show that on the same plant some branches produced perfectly glabrous leaves, while on others the leaves were densely downy.

He also sent a plant of *Coleus Verschaffelti*, in which one shoot bore small contracted spoon-shaped leaves strongly cupped, and resembling in colour those of an *Iresine* rather than those of a *Coleus*. Dr. Masters stated that some of the white-variegated Ivies constantly produced similarly shaped leaves.

Mr. Parsons sent specimens of Azalea in which the flowers were singularly everted.

Professor Westwood brought specimens of Mint deformed by *Æcidium Menthæ*, a parasite which is often very injurious in Mint- and Peppermint-fields, which are also attacked by the Copper Web, a great pest occasionally to Asparagus-beds. He also alluded to the tuberiform organisms on the roots of Peas as occasionally serving for the food or resting-place of larvæ. These organisms occur on various Leguminosæ, and certainly do not depend on insect action.

A gigantic Gourd, belonging apparently to the genus *Luffa*, was exhibited.

Mr. Berkeley brought Peaches affected with *Oidium*, which is apparently very prevalent this season.

Dr. Hogg stated that those varieties of Peach and Nectarine which have glands on the petioles are comparatively free, while those without glands are very subject to mildew. The Noblesse, for instance, often suffers; but a gland-bearing seedling of that variety often escapes.

Dr. Hogg spoke of the plants in boxes under experiment at Chiswick as being in a state very favourable for observation.

Mr. Glaisher made some remarks on the meteorological observations at Chiswick, and brought a Table showing the deviations above and below the average mean temperature for every day throughout the period during which a record had been kept.

The Meeting then adjourned.

GENERAL MEETING.

SIGISMUND RUCKER, Esq., in the Chair.

Mr. Berkeley, in the absence of Mr. Wilson, called attention to the two Gourds exhibited by Mr. Temple, from Java, under the name of Soocy Qua. They probably belong to some species of *Luffa*, one species of which (*L. acutangula*) is a favourite food in India in a young state, while others are poisonous. When older, the pulp is so full of hard fibres that it is inedible; and the fibres themselves are used as sponges, and are sometimes made up into light hats. Since the Meeting, the following interesting information has been received from Mr. Temple. The Gourds were the produce of one or two seeds raised at Packington, sent from Foo Chow, in China, by Mr. Temple's brother, who is Manager of the Oriental Bank. He had been in many parts of China, but had never seen the Soocy Qua (or Water-Cucumber) before. It is used in China as a vegetable, boiled and eaten with rice, but is served also in various ways and considered delicious. It sometimes reaches a length of from 5 to 6 feet, and has a beautiful flower nearly as large as a Sunflower in diameter. Mr. Temple hopes to be able to cross it with the common Cucumber, which, however, is not very probable, as even the closely allied species of *Cucurbita* seldom admit of hybridizing.

Attention was called to *Gongora portentosa*, which appears to have been derived from M. Linden as uniting *Cirrhæa* with *Gongora*, a circumstance suspected long since by Reichenbach. It was stated, on the authority of Mr. Bateman, that a one-leaved Gongora is an anomaly; but Mr. Marshall, after the Meeting, intimated that this is not the case. Some of the principal Orchids in the show were noticed as being in peculiarly fine condition, especially *Epidendrum vitellinum majus*. *Odontoglossum pendulum*, La Llave (*O. citrosmum*, Lind.), was shown in great variety and beauty—some specimens with white, others with tinted flowers.

Mr. Bateman moreover deprecated "the mixing Orchids with other flowers, even in miscellaneous collections. This was never allowed at Chiswick. The delicate tints of the Orchids are killed by the bright colours of other plants. How can even *Masdevallia Veitchiana* stand against the *Anthurium* with which it is accompanied to-day?"

Attention was then called to the beautiful plant exhibited as *Brodiæa coccinea*, Gray. The crown of the corolla, however, is quite at variance with the characters of *Brodiæa*, as is, indeed, the general appearance. It must certainly belong to a new genus.

The Meeting was congratulated on the exhibition of the scarlet-flowered *Delphinium*, as it was believed that not a single specimen of *D. cardinale* was left in the country, it having proved extremely difficult of cultivation.

A Fly-trap was pointed out, of which a figure has appeared in the 'Gardener's Chronicle,' p. 461, fig. 84.

SHOW OF STOVE AND GREENHOUSE PLANTS.

The successful competitors for twenty distinct stove and greenhouse plants in 12-inch pots were Messrs. Jackson, Mr. J. Ward, and Mr. Wilkie.

In the Amateurs' Class, for nine, in pots of the same size, Mr. Carr, gardener to P. L. Hinds, Esq., Mr. J. Wheeler, and Mr. J. Little, gardener to J. Goddard, Esq., were successful.

In the Nurserymen's Class, for six, Mr. Morse, Mr. B. S. Williams, and Messrs. Jackson, obtained the prizes.

In the corresponding Class for Amateurs, the prizes were obtained by Mr. Baines, gardener to J. Micholls, Esq., Mr. J. Ward, and Mr. J. Carr.

In the Open Class, for nine distinct foliage plants, Mr. Baines was first, Mr. Fairbairn second, Mr. J. Burley third, Mr. J. Wheeler fourth.

Mr. J. Wright was first in the Amateur Class for six; Mr. J. Tebbles, gardener to A. Haines, Esq., and Mr. J. Carr second and third.

Mr. Bull was first in the Open Class for twenty in 12-inch pots, Mr. Fairbairn second, Messrs. Bell and Thorpe third.

These collections were all of them of first-rate excellence, and excited great admiration.

The Orchids were magnificent, the successful exhibitors being Mr. Denning, gardener to Lord Londesborough, Mr. Burnett, gardener to W. Terry, Esq., Mr. Bull, Mr. B. S. Williams, Mr. R. Parker, Mr. J. Ward, gardener to G. Wilkins, Esq. The best single specimen, *Dendrobium devonianum*, with four magnificent spikes about 30 inches long, was sent by Mr. T. Baines, gardener to H. Micholls, Esq., the second, *Lælia purpurata*, by Mr. R. Laing, gardener to P. W. Flower, Esq.

Prizes for Azaleas were obtained by Mr. S. M. Carson, gardener to W. R. G. Farmer, Esq., Messrs. Ivery and Son, and Mr. J. Woodward; for Roses, by Messrs. Paul and Son, and Mr. Turner; for Rhododendrons, by Messrs. Waterer and Mr. C. Noble; for Ferns, by Messrs. Ivery and Messrs. Jackson; for amateurs in the same class, Mr. Smith, gardener to C. Walton, Esq., Mr. J. Carr, Mr. Fairbairn, and Mr. Earley; for Zonal Pelargoniums, by Messrs. Carter, and Mr. Turner. There was also a splendid collection of fruit.

FLORAL COMMITTEE.

June 29, 1870.

First-class Certificates were awarded:—to a *Dendrobium* somewhat resembling *D. Veitchianum*, with greenish yellow flowers marked with purple dotted lines; to *Barkeria spectabilis superba* and *Begonia Chelsonia*, a hybrid from *B. boliviensis*, sent by Messrs. Veitch; to *Chamædorea graminifolia*, from Messrs. Rollisson; to *Agave cucullata*, from Mr. Wood, gardener to W. B. Kellock, Esq.; to *Scolopendrium axion*, *asumbletion*, *euplices*, *Flora*, *inusitatum*, *Komptsotes*, *megeratum*, *pictorium*, *prodonton*, *transformatum*, *Lastrea dilatata spectabilis*, *Asplenium marinum admirabile*, and *Athyrium Filix-fœmina Kephalobares*, from E. J. Lowe, Esq.; to *Erythrina Parcelli*, from Mr. Bull; to a new show Pelargonium, Polly, from Mr. Turner; to *Scolopendrium vulgare Mayloni*, from Mr. Maylon; and to *Hyacinthus candicans*, from Mr. Green, gardener to W. W. Saunders, Esq.

Special Certificates were awarded:—to finely cultivated collections of Lobelias, from Mr. Moon, gardener to F. Stanton, Esq.; to Mr. Wood, for *Agave ensiformis* and *hystrix*; and to Mr. Green, for a collection of small-flowered Orchids.

FRUIT COMMITTEE.

A First-class Certificate was given to Victory-of-Bath Melon, from Mr. Gilbert, gardener to the Marquis of Exeter; to a seedling Strawberry, Royalty, a cross between Black Prince and British Queen, from Mr. Trotman; Special Certificates were given to Messrs. Minier, Nash and Co. for a fine sample of new Early Tripoli White Onion; and to Mr. Gilbert, for ten sorts of vegetables. Messrs. Bell and Thorpe, amongst other potatoes, sent Beta, a red round variety, which was commended as a good early kind.

GENERAL MEETING.

W. W. Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley stated, with respect to the *Luffa* exhibited at the last Meeting, that, though perhaps not positively poisonous in the young state, it was extremely acrid.

Major Trevor Clark made some remarks on the *Dioscorea* exhibited at a former meeting, congratulating the Meeting that colour-worship seemed on the decline, while artistic elegance was duly appreciated.

The Chairman, with reference to *Hyacinthus candicans*, said that he had had it in cultivation for forty-five years, that it was a South-African plant and almost hardy, thriving well under the protection of a wall.

ROSE SHOW.

This was thought on the whole not to be so good as usual. The prizes were carried off by Messrs. Paul, Mr. J. Cranston, Mr. R. R. Cant, and Mr. Keynes for the best seventy-two; for the best forty-eight, Messrs. Paul, Mr. Turner, and Mr. J. Fraser; for twenty-four hybrid perpetuals, Mr. J. Cranston, Mr. Turner, and Mr. Cant; for twenty-four, open to nurserymen only, Mr. Turner, Mr. Keynes, and Mr. Cranston.

In the Amateurs' Class, for forty-eight, Rev. E. R. Pochin, Mr. W. Ingle, gardener to Mrs. Round, T. Laxton, Esq., and Mr. R. P. Portans; for thirty-six, Mr. Pochin; for twenty-four, the Rev. G. Arkwright, Mr. P. Stoddart, gardener to J. G. Rebow, Esq., and Mr. F. Mould, gardener to J. Stratton, Esq. The best twelve new roses were sent by Messrs. Paul, consisting of Reine Blanche, Edward Morren, Julie Flouvais, Duke of Edinburgh, Marquise de Montmart, Devienne Laing, Eugène

Verdier, Perfection de Lyn, Souvenir de M. Poiteau, Nardy Frères, and *Thyra Hansmerich.*

Prizes also were offered for Fuchsias and Palms.

SCIENTIFIC COMMITTEE.

Major Trevor Clarke, in the Chair.

Dr. Gilbert reported, on the manna-like substance from the leaves and shoots of Peach-trees in the orchard-house and glass wall at Kew, that

"The white exuded matter was flaky and semitransparent. A small portion, heated on platinum over a spirit-lamp, gave the odour of a burning fat. It was scarcely at all affected by either water or alcohol, but readily dissolved in ether. It was therefore a solid fat of some kind; but the quantity at command was too small to determine more respecting it."

The Secretary produced radical shoots from the stock of a Pear-tree from Dr. Thomson's garden at Kew, some of the leaves of which were three-lobed. It was stated that, in some Indian species of the genus, leaves were constantly produced of this character.

Mr. Berkeley stated that he had ascertained that the warts which are so common on pear-leaves are produced by a little Acaroid closely related to those which affect the buds of hazels and black-currants.

Mr. Wilson Saunders exhibited specimens of *Papaver nudicaule*, in which the stamens were partially changed into carpels. Dr. Masters stated that the common officinal poppy is sometimes similarly affected.

The *Dioscorea* exhibited at the last Meeting by Messrs. Veitch proved to be a new species, of which Dr. Masters promised a description and figure.

The Chairman produced vine-leaves in which there was a deficiency of chlorophyl, supposed to arise from an insufficiency of nutriment.

A discussion took place with reference to what species of grass had resisted best the unusual drought. Mr. Wilson Saunders spoke highly of a species of *Bromus* from California. Dr. Gilbert stated that at Rothampstead (where the root-development, from whatever cause, had been good) the produce had been as great as in ordinary seasons.

The Meeting then adjourned to the first Wednesday in November.

OXFORD MEETING.

GENERAL MEETING.

July 20, 1871.

G. F. Wilson, Esq., in the Chair.

Dr. Hooker sent nuts of *Macadamia ternifolia*, which had already been considered equal to filberts at South Kensington.

Dr. Voelcker made some remarks on the principles of manuring. He recommended that quick-acting manures should not be applied directly, but by the judicious use of carefully prepared compost. In the discussion which followed, Dr. Gilbert, in answer to some objections, said that Boussingault had conclusively proved, and Mr. Lawes and himself had confirmed the statement, that free nitrogen is not absorbed by plants. Where nitrogenous substances were withheld, and only free nitrogen allowed access to the plant, no increase in the quantity of nitrogen in the plant took place. On the other hand, where only an infinitesimal proportion of ammonia was added, its effects were detected in the plant in less than twenty-four hours. The quantity of carbon in water and air is amply sufficient for the requirements of the plant. An increased percentage of silica does not strengthen the straw, a better crop of straw being produced when the proportion is small.

Major Clarke confirmed Dr. Voelcker's assertion as to the superiority of well-made composts over liquid manures.

THE GREAT SHOW.

For the best twenty fine-foliage and flowering plants Mr. Baines, gardener to H. Micholls, Esq., was first, Messrs. Coles and Son second. In the open class for nine stove- and greenhouse-plants Messrs. Cole and Son were first, Mr. F. Perkins second, Messrs. Bell and Thorpe third. The best nine foliaged or variegated plants were sent by Mr. Johnson, gardener to the Marquis of Ailesbury, Mr. A. Wight, gardener to C. Roberts, Esq., being second; and in the corresponding Class for Nurserymen, Mr. B. S. Williams was first, and Messrs. Bell and Thorpe second. The First Prize for six was taken by Mr. G. Harris, who brought very fine examples of *Chamærops excelsa* and *Pandanus elegantissimus*. Mr. Baines sent a remarkably fine specimen of *Allamanda cathartica*, Messrs. Standish being second with *A. Hendersoni*. Mr. Baines also sent the best greenhouse-plant (*Erica Fairreana*), the second prize being awarded to Mr. A. Wright. Mr. B. S. Williams sent the six best Palms and also the best four Dracænas; he also exhibited a wonderful plant ef *Cycas circinalis*, of which figures appeared in the 'Gardener's Chronicle.'

The Orchids were not so well represented as at Manchester, Mr. A. Wright and Mr. B. S. Williams being first in the respective classes, Messrs. Rollisson second.

Exotic Ferns were not shown so largely as usual; but hardy Ferns appeared in great abundance, First-class Certificates being given to many of Mr. Lowe's and Mr. Mapplebeck's curious varieties.

One of the especial objects of attraction was a collection of hardy Clematis grown in pillar form.

The Florists' Flowers were, on the whole, inferior, perhaps owing to the long drought: while the collection of fruit was quite equal to that at Manchester, and the vegetables excellent.

The cut flowers proved to be a great object of attraction, especially Mr. Turner's Carnations and Roses, and Mr. Walker's double Zinnias.

July 21, 1870.

Major Trevor Clarke, in the Chair.

Professor Lawson read a paper "On the Botanists of Oxford."

The Rev. S. R. Hole made some observations on Roses; and Mr. W. Paul followed with a memoir "On Colour in the Tree-Scenery of our Gardens."

Dr. Hogg made some observations on the rules of judging fruits, Mr. Moore on judging plants and flowers, and Mr. Williams on Pitcher-plants.

FLORAL COMMITTEE.

August 3, 1870.

First-class Certificates were awarded to *Bowenia spectabilis* from Messrs. Veitch, to *Macrozamia magnifica* and *Cycas Broughtoni* from Mr. Bull, to *Hydrangea Japonica speciosa* and to variegated Zonal Pelargonium Rev. E. R. Benyon from Messrs. Henderson.

Special Certificates were given to Messrs. Veitch for a fine group of miscellaneous plants, for *Encephalartos Lehmanni* and a plant of *Renanthera Lowii*, which was considered a fine specimen of cultivation: the dissimilar flowers at the base of the spike are highly fragrant, while the others are scentless. The same awards were made to Mr. Stevens, gardener to J. Simpson, Esq., for fine plants of *Disa grandiflora*, to Messrs. Cutbush for dwarf Cockscombs, while *Pteris serrulata major serrulata* from the Society's Gardens was similarly distinguished. Special Certificates were also given to Mr. Stevens for his splendid Balsams, and to Messrs. Carter for cut blooms of double Pelargoniums.

Mr. C. Turner received a First-class Certificate for a fine variety of *Lilium auratum* (Charles Turner), the golden band being replaced by a suffused tint of reddish brown. The same award was made to Mr. G. Thomson for a hybrid Lily named Purity, said to be a cross between *L. auratum* and *L. speciosum*, and to Mr. W. Thomson for *Godetia Whitneyi*.

Second-class Certificates were given to Mr. Keynes for Dahlias Incomparable and Flora Wyatt.

The show contained many objects of great interest.

The Pelargonium Show was by no means equal to that of previous years.

FRUIT COMMITTEE.

A Special Certificate was awarded to Messrs. Menier, Nash, and Co. for their late white and red Italian Tripoli Onions; to Mr. Stowe, Farnborough, for some splendid specimens of black Naples Currants showing very high cultivation; and to Messrs. Lane for examples of orchard-house trees in pots; and a First-class Certificate to Messrs. Carter for their Covent-Garden Garnishing Parsley, a very fine curled variety.

Mr. M'Laren's Prolific Raspberry, which obtained a Certificate last year as an autumn-bearing sort, fully maintained its character.

GENERAL MEETING.

G. F. Wilson, Esq., F.R.S., in the Chair.

Mr. Berkeley called attention to the paucity of specimens of variegated Pelargoniums exhibited, although special prizes had been offered for them. This was partly attributable to the excessive heat of the weather, which had interfered with the due coloration of the leaves. The dimorphic character of *Renanthera Lowii* was commented on, and the curious habit of *Bowenia spectabilis* throwing up leaves after the fashion of some Arad.

A branch of *Abies Clanbrasiliana* from Mr. Lloyd Wynne's garden at Coed Coch, was exhibited reverting to the typical form Similar growth has been observed in the Douglas Pine.

FLORAL COMMITTEE.

August 17, 1870.

A First-class Certificate was given to *Lilium tigrinum splendens*, from Mr. Bull; to *Pteris serrulata gleicheniifolia*, from Messrs. Henderson; to *Clematis Victoria*, a hardy variety with purplish lilac flowers; to Verbenas (George Peabody and Grand Monarque) from Mr. Eckford, gardener to Earl Radnor; to double Pelargonium Crown Prince, from Mr. Cannell; to *Lælia elegans gigantea*, from Mr. B. S. Williams, which, however, was considered by Mr. Bateman to be *Cattleya elegans*; to Dahlia Marquis of Bath, pale tipped with rose, from Mr. G. Wheeler; and to *Lilium longiflorum albo-marginatum*, from G. F. Wilson, Esq. A Second-class Certificate was given to Hollyhock Rose Queen, from Mr. Porter, gardener to E. Benham, Esq.

A Certificate of Merit was awarded to Verbena Mrs. Boulton, a large white flower with a deep rich crimson eye, from Mr. Perry. Messrs. Cripps also sent a golden-leaved variety of the common *Catalpa*, which promises to be a great addition to our shrubberies.

The Gladiolus show was good, though not a large one. Messrs. Downie and Laird were preeminently first in the class for eighteen; the Rev. H. H. Dombrain was first in the amateur class, Messrs.

Kelway for thirty-six. Mr. W. Chater was first in Hollyhocks for six spikes, and had also the best twenty-four cut blooms, Leviathan and Queen being new. Messrs. Downie and Laird were first with Phloxes; and there was a fine collection of Palms from Mr. Bull.

FRUIT COMMITTEE.

First-class Certificates were awarded to new white Grapes, Chilwell White and Ferdin and de Lesseps, a cross between the American Strawberry-grape and the Royal Muscadine, from Mr. Pearson; also to a fine Plum, Duke of Edinburgh, from Mr. Dry. A special Certificate was given to Mr. G. Ward for four magnificent specimens of Charlotte-Rothschild Pine, the total weight of which was thirty-eight pounds, from plants sixteen months old; also to Mr. Record for splendid Morello Cherries. Messrs. Carter sent specimens of a black-seeded Mustard from China.

GENERAL MEETING.

W. MARSHALL, Esq., in the Chair.

Mr. Berkeley stated that *Rodriguezia suaveolens*, which was sent by Mr. B. S. Williams with the *Lælia* mentioned above, was the same with *Gomesia recurva* of Loddige's 'Botanical Cabinet,' and also figured in the 'Botanical Magazine' under the name of *Pleurothallis suaveolens*.

The beautiful *Lilium Wilsoni*, supposed to be a form of *L. Thunbergianum*, proves quite distinct. Many plants during the present season have shown a tendency to produce golden leaves.

Messrs. Paul's collection of cut branches of ornamental shrubs, which, among other things, contained a specimen of the true *Rhamnus alpina* was highly commended.

The early white Tripoli Onion was said to be raised from seed in a warm district, but is certainly distinct from the late Tripoli.

Fruit-bearing branches of *Gleditschia* were sent from Chiswick.

FLORAL COMMITTEE.

September 7, 1870.

First-class Certificates were awarded to *Daphne elegantissima*, *Calamus cinnamomeus*, *Livistonia rotundifolia*, and *Adiantum peruvianum*, from Messrs. Veitch; to *Thuja semper-aurea*, from Messrs. Lee; to *Lilium Leichtlinii*, from Mr. G. F. Wilson; and to Nosegay-Pelargonium David Garrick, of a fine deep crimson and with immense trusses, from Messrs. Bell and Thorpe.

A Second-class Certificate to *Griffinia dryades*, from Mr. Green; to Verbena Miss Charlotte Mildmay, with a large pale flesh-coloured flower with rosy-crimson eye, from Mr. Eckford.

Special Certificates were given for a fine group of Orchids from Lord Londesborough, to Messrs. Veitch and Mr. Bull for their interesting groups of plants, to Mr. Green for both male and female plants of *Stangeria* with ripe fruit and other objects of interest, to Mr. Pilcher for a splendid group of Nerines and Vallotas, and to Messrs. Osborne for a fine specimen of *Grevillea Banksii*.

Mr. Walker was first for twenty-four Dahlias, Mr. Hopkins for twelve, Second-class Certificates being awarded to Flower of Kent, a good yellow self, from Mr. G. Harris, and Mrs. Harris, a pale show-variety, from Mr. G. Parker.

FRUIT COMMITTEE.

A Special Certificate was awarded to Messrs. Sutton for a collection of fifty varieties of Potato. Messrs. Osborn offered prizes for the best examples of Golden Champion Grapes. One only was awarded, which was gained by Mr. Sage, who sent two fine bunches, each of which weighed three pounds; a small bunch was sent by Mr. J. Douglas, gardener to F. Whitbourn, Esq., which had acquired a slight blackish tinge from being grafted on Trentham Black. The Chinese Mustard was sent again and pronounced distinct. Mr. G. F. Wilson sent bunches of the Early Ascot Frontignan, valuable for growing in cold orchard-houses; it is earlier and produces larger bunches than Chasselas Musqué growing by its side; the flavour was excellent.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

The Chairman alluded to the serious illness of Mr. Dix.

The great secret in the culture of Nerines and Vallotas is to keep the plants in an ordinary greenhouse and never to suffer the soil to get quite dry.

Stangeria paradoxa has been a puzzle to botanists; but it is hoped that the ripe seeds may throw light on its affinities.

FLORAL COMMITTEE.

September 21, 1870.

A First-class Certificate was given to *Livistonia altissima*, from Messrs. Lee; to *Thymus citriodorus aureus*, *Alternanthera magnifica*, and *Cineraria aspleniifolia*, from Messrs. Henderson; to *Polystichum angulare congestum*, *Scolopendrium vulgare lacerato-cristatum*, from Messrs. Ivery; to *Athyrium Filix-fœmina Blakei*, from Mr. Parsons, gardener to W. J. Blake, Esq.; to a robust bronze-foliaged Pelargonium Mrs. John Lee, from Messrs. Lee; to a seedling Gladiolus John Standish, of a pale blush with purple-lake feathers, from Mr. J. Douglas, gardener to F. Whitbourn, Esq.; to Dahlias Annie Hobbs (a white self) and Gem of the Season (deep rose, golden-tipped), from Mr. G. Harris; Mary Keynes, of a creamy white deeply tipped with rose, from Mr. Keynes; to Verbenas Peter Williams, of an intense scarlet with bold white eye, from Mr. Eckford; to *Agave Besseriana candida*, from Mr. Green; and to *Dendrobium chrysotis*, from Messrs. Brooks.

Second-class Certificates were awarded to Dahlias:—Victory (a deep purple self), Flossy Williams (a very large fancy), and James Cocker (a deep broad-petalled crimson), from Mr. Keynes; Robert Lambert, a large purple self, from Mr. Hobbs; and George Peabody, of a lighter shade, from Mr. Rawlings.

Special Certificates were given to Messrs. Veitch for a fine collection of Orchids and other plants, the *Nepenthes* being in peculiarly fine condition, to Mr. B. S. Williams for a fine group of Orchids, to Messrs. Lee for some fine-foliaged plants and a magnificent specimen of *Dendrobium calceolare*.

Mr. Saunders sent a cut spike of a variety of *Acineta Barkeri* and a flowering plant of *Gloxinia insignis.*

Mr. Paul had a large collection of cut Roses and Pelargoniums, to which a Special Certificate was awarded.

FRUIT COMMITTEE.

The leading feature was a very interesting collection of Potatoes, from Mr. Fenn, divided into four sections :—(1) dwarf varieties, (2) seedlings for the frame, (3) for the garden, and (4) for field-culture. With these came a collection showing the effects of grafting. These mainly consisted of Yorkshire Hero grafted on Fenn's Onwards, showing produce ugly in form and dry and harsh in eating; Yorkshire Hero grafted into the Fluke, the produce of which is dry even to grittiness; Fenn's Onwards grafted into Yorkshire Hero, produce not so good in flavour as either of the parents; Wheeler's Milky White grafted into Fluke, drier and harsher, and not so good in flavour; Irrepressible Nigger grafted into Fenn's Purple Kidney, produce of a fantastic form. The result was not encouraging; but a Special Certificate was awarded. He also exhibited Apples, to show the effect of the stock on the scion.

A Special Certificate was given to Messrs. Lane for fifteen well-grown varieties of Grapes.

A First-class Certificate was given to Brocksworth Park Pear, from Messrs. Wheeler, and to Bouckard's Fruit-gatherer, from M. Verhulssen, of Brussels.

GENERAL MEETING.

Major TREVOR CLARKE, in the Chair.

Mr. Berkeley stated that *Dendrobium chrysotis* was introduced from Assam, and was bought amongst a mass of Dendrobes at one of Mr. Stevens's sales. It closely resembles *D. fimbriatum*; but the marking of the petals and size of the lip are different. It was, however, probable that it is one of many allied forms.

Cut specimens of the true *Fuchsia coccinea* were brought by the Chairman, and its history explained.

Mr. Berkeley then spoke of the beauty of *Sambucus racemosa* in Scotland, of which he had secured a quantity of seed for Chiswick; and of Mr. Dunn's mode of extirpating the *Phylloxera*, from whom a memoir appears in our Journal.

Mr. Marshall stated that he had some male flowers of *Nepenthes*, which were at the service of any of the Members.

FLORAL COMMITTEE.

October 5, 1870.

First-class Certificates were awarded to *Platycerium alcicorne majus*, *Adiantum Capillus Veneris maximum*, and *Corypha Martiana*, from Messrs. Veitch; to *Wigandia imperialis*, and tricolor Pelargonium Miss Goring, from Messrs. Henderson; to Dahlia Monarch, of a rich deep velvety maroon, from Mr. Rawlings; and Yellow Standard, from Mr. G. Parker; and to *Senecio argenteus*, from Messrs. Backhouse.

Second-class Certificates were given to *Aster longifolius*, var. with pinky lilac flowers, from Messrs. Backhouse, to a golden-edged Ivy-leaved Pelargonium named Golden Queen, from Mr. J. Parker, and to Dahlia Prince Imperial, of a dull orange with rosy centre.

Special awards were made:—to Mr. W. Paul for a fine group of Tea-roses, now blooming for the third time in this season; to Messrs. Veitch for a miscellaneous group of plants, and also to *Retinospora obtusa aurea nana*, which the late Mr. John Veitch noted as the best of all the varieties he had seen in Japan; to Mr. Green for a group of Orchids in which *Restrepia antennifera* and *Trichoceras parviflorum* were most interesting, a Special Award being given to *Miltonia spectabilis Moreliana*, an extremely handsome form; to Mr. Moore, gardener to C. Leach, Esq., for a beautiful collection of Nervines; to Messrs. Standish for a large group of *Retinosporæ*; and to Lord Londesborough for a fine broad-leaved variety of *Dendrobium chrysotis*.

FRUIT COMMITTEE.

The thanks of the Committee were given to the Rev. G. Kemp for his liberal encouragement of the culture of open-air Grapes, of which there was a splendid and very interesting show. The white Grapes in all cases proved the best.

A Special Certificate was awarded to Mr. Wells for Grapes from Mr. Ball; to *Aucuba aureo-maculata*, a dwarf, compact, boldly grown in Wells's patent ground-vineries; to Messrs. Rivers for a collection of small Apple-trees on the Nonsuch Paradise stock; to Mr. Colburn, gardener to J. Blyth, Esq., for a dish of exceedingly fine Salway Peaches; to Mr. Scott, Crewkerne, for a collection of one hundred and forty varieties of Pears, mostly new; to Mr. C. Halse for Apples; to Mr. Cornford, gardener to H. Streatfeild, Esq., for Walburton Admirable Peaches; and to Messrs. Carter for a collection of Beet &c.

The collection of Fungi was not so good as in the previous year—partly, perhaps, from long-continued drought, and partly from collision with the Fungus raid at Hereford. Mr. English's collection was beautifully arranged. Mr. Worthington G. Smith had a good collection of esculent and poisonous fungi. Messrs. Hoyle and Austen brought many interesting specimens, amongst which was an undescribed *Lycopodon*. Messrs. Cripps sent a striking specimen of dry rot; and Mr. Orchard, gardener to T. Harris, Esq., a lovely specimen of *Hydnum coralloides*.

Mr. English and Mr. W. G. Smith were equal firsts, and Messrs. Hoyle and Austen second.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley called attention to *Trichoceras parviflorum* as a good model for artificial flies.

Mr. Standish's collection of *Retinosporæ* was the more interesting because the species are peculiarly hardy.

A polished specimen of "Coracula" wood from Panama, of great beauty for cabinet-work, was exhibited.

Mr. Berkeley then commented on the Fungi brought before the Meeting, and Mr. Paul on the Tea-roses brought this day before the Meeting. They flowered first in May, then in July, and now in October; and there are buds which may yet be developed. The plants have been kept constantly under glass, though this is not indispensable. They are kept in a cold greenhouse during winter, pruned in January; and after the first flowering the flower-spikes were cut off, as also after each successive flowering. A little heat is requisite occasionally, to mitigate the effect of the superabundant moisture of autumn and winter.

FLORAL COMMITTEE.

November 2, 1870.

First-class Certificates were awarded to *Dracæna porphyrophylla* and *Cattleya Dominiana lutea* from Messrs. Veitch; to *Zalacca Wagneri*, *Curculigo recurvata striata*, and *Licualia horrida* from Mr. Bull; to *Aucuba aureo-maculata*, a dwarf, compact, boldly variegated form from Messrs. Cutbush; to Carnation Vulcan, orange scarlet, to *Mohria thurifraga*, var. *achillæifolia*, from Messrs. Henderson; to *Japanese Chrysanthemum* Jane Salter, white and pinkish, 7 inches in diameter, and Renown, a large brownish orange, from Mr. Bull; to Bismark, of a uniform tawny orange, and *Erectum superbum*, rosy crimson, from Messrs. Henderson.

Special Certificates were given to Lord Londesborough for his magnificent show of Orchids, amongst which *Vanda cærulea* and *Oncidium macranthum* were conspicuous, also for *Cattleya maxima*, *Phalænopsis Lowii*, and the *Vanda*; to Messrs. Veitch for *Zygopetalum maxillare*; to Mr. Clarke, of Twickenham, Mr. C. Edmonds, and Mr. Bull, gardener to I. Montgomery, Esq., for Cyclamens.

There was a fair display of Chrysanthemums, considering the earliness of the show, Mr. Rowe, gardener to Mrs. Lewis, being first in the several classes.

FRUIT COMMITTEE.

A First-class Certificate was awarded to Messrs. Veitch's giant autumn Cauliflower; what is especially wanted, however, is a late medium-sized variety, which covers in well. Special Certificates to P. N. Laurie, Esq., and Mr. M'Kennie, for fine collections of Apples grown on Cordons, and to Mr. Gardiner, gardener, Eatington Park, for a collection of culinary and dessert Apples; Messrs. Lee offered a prize of £5 for the best three bunches of Madresfield Court Black Muscat, which was awarded to Mr. Stevens, gardener to the Duke of Sutherland; Mr. Stephenson, gardener to F. C. Barker, Esq., was first for Peas, Mr. Frisk, gardener, Blankney, being first for Apples.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.R.S., in the Chair.

After reading the Report of the last meeting, the Secretary exhibited some bunches of grapes in which the ovaries had not been impregnated, and in consequence the receptacle was much enlarged and succulent. The case was considered interesting from the analogy of *Anacardium*, and as indicating how, in certain cases, the ovary may become inferior.

Mr. Laxton brought diminutive Walnuts, in some of which there were three, in others four carpels. They were the produce of a tree which usually bears walnuts of the ordinary size.

The Chairman laid on the table specimens of *Chlorops lineata*, which had to a considerable extent attacked ears of barley. An allied species, it was stated, attacks the internodes of wheat-stalks.

It was thought probable that the failure of oats, which has on a former occasion been brought before the Committee, might be due to a similar cause.

The Chairman then asked whether sports were ever reproduced. The feeling of the Committee was, that the same cause which gave rise to a sport in the first instance might do so in a second. It was stated that the same sport had more than once been produced for the Stella Pelargonium.

The Meeting then adjourned.

FLORAL COMMITTEE.

December 7, 1870.

First-class Certificates were awarded :—to a very fine variety of *Mormodes Cartoni*, from Mr. Green, gardener to W. W. Saunders, Esq. ; to *Selaginella Martensii albo-lineata*, from Messrs. Perkins ; to a seedling *Cyclamen persicum*, of a deep purplish rose, from Mr. Goddard, gardener to H. Little, Esq. ; to a seedling tree Carnation, White Nun, from Mr. W. Lee ; also a Second-class Certificate to a variety named Maiden's Blush.

Special Certificates were given :—to Mr. P. S. Williams for a group of Orchids and *Solanum hybridum compactum* ; to Dr. Ainsworth for a very fine spike of *Oncidium Barkeri=O. tigrinum*, La Llave ; to Messrs. Brooke for *Dendrobium bigibbum* ; to Mr. Robins, gardener to Sir E. C. Kerrison, for Capsicum Yellow Gem ; to Messrs. Henderson for a collection of dwarf hardy rock-plants, comprising 113 kinds of Saxifrage, 70 of Sempervivum, and 30 of Sedum, and for tree Carnations ; to Messrs. Standish for Hollies, *Rhaphiolepis ovata*, &c. ; to Mr. Clarke for a collection of Cyclamens ; to Messrs. Brown for Primulas and Cinerarias ; and to Mr. Wiggins, gardener to W. Beck, Esq., for semidouble and fern-leaved Primulas. Mr. Douglas, gardener to F. Whitbourn, Esq., was first for Chinese and Japanese Chrysanthemums ; Mr. H. Youell sent a new garden-peg ; and Mr. Looker a sample of his acme garden-frame, in which the means of ventilation are said to be better than in the usual frames.

FRUIT COMMITTEE.

A First-class Certificate was awarded to a white seedling Grape, with large berries nearly $1\frac{1}{2}$ inch long, named Waltham Cross, from Mr. W. Paul; and a Special to Mr. Chaff, gardener to A. Smee, Esq., for very fine collections of culinary and dessert Apples, amongst which King of the Pippins was conspicuous; to Messrs. Rutley and Silverlock for fine examples of Banbury improved white Spanish Onion; to Messrs. Carter for a collection of vegetables; to Mr. Hibberthwaite for a large collection of Apples grown near Middlesborough-on-Tees, the soil of which is said to be cold and damp; to Mr. Hepper for Chaumontel Pears; to Mr. Bray, gardener to E. A. Sandford, Esq., for early forced Asparagus; to G. F. Wilson, Esq., for Josephine-de-Maline Pears; to Mr. Turner for Cornish Aromatic Apple; to Mr. Maclean, gardener to W. P. Herrick, Esq., for a smooth-leaved Cayenne Pine, weighing eight pounds; and to Mr. Gage, gardener to Earl Brownlow, for Grapes. Mr. Hepper, gardener to C. P. Millard, Esq., was first for an excellent lot of salad-materials, Mr. Gilbert being second. Mr. Bréhaut sent a grand collection of varieties of Indian corn from Guernsey, to which a Special Certificate was most deservedly given. His remarks will appear in the Society's Journal.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.R.S., in the Chair.

The Secretary brought a walnut perfectly flat on one side from pressure of other walnuts in the same cluster; in several instances fifteen individuals or more were closely packed in the same cluster.

A bifid leaf of *Chimonanthus præcox* was sent by Mr. Parsons.

Leaves of a Vine, which produces black and white grapes in the same bunch, were sent by Mr. Squires, gardener to H. G. Ludlow, Esq., Heywood, which, like the bunches, were decidedly piebald.

A letter from Mr. Anderson Henry, on Imperfect Hybridization, was read by Mr. A. Murray, which will appear in the Society's Journal, as also a very interesting communication from the Chairman on Mimetic Analogy, which will also appear in the Journal.

The Meeting then adjourned.

January 1, 1873.

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THE

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EDITED BY

THE REV. M. J. BERKELEY, M.A., F.L.S., F.R.H.S.

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X. Observations on a Collection of Varieties of Maize. By Thomas C. Bréhaut.

The collection of Maize now exhibited has been formed from various sources, but mainly from a selection from the splendid varieties shown in the American section at the Paris Exhibition of 1867. As this was a unique occasion, and specimens from every known variety of a country having such a wide range of climate, and one where the plant is so generally cultivated, were present, the collection must necessarily command European notice. Since that time seeds from other parts of the world have been procured, and an exchange effected with Messrs. Vilmorin, of Paris, who have devoted considerable attention to the culture of maize, the use of which is becoming very popular in France.

An experience of three very dissimilar seasons has been gained since 1867. A certain number of varieties have been discarded, either as too small, too coarse, or as ripening at too late a period of the season to make them generally serviceable. It was to be expected that the sorts which ripened the earliest would become most in demand; but there were other conditions to be fulfilled before maize could be able to hold its ground against so many new and known vegetables. It was not so much a variety which should serve for cattle, or poultry, or even for grinding into flour, which was required; for such are now commonly imported more cheaply, at least so it seems at present, than they can be grown in our climate. But it was sought to popularize the manner of eating maize so common in the States of America and in other regions of the world (including even Southern Europe), as "green corn," *i. e.* in a semiripened condition, when the grains had acquired the consistency and size of good marrow-fat peas. The addition of a table vegetable of this delicious and nutritious nature, the food of millions of the human race, and yet, for want of experience of the sorts adapted to our climate, so strangely unappreciated here, seemed of no inconsiderable importance, the more so as it ripens in the late autumn, reproducing then the lost flavours of the early pea and of asparagus. For this the ordinary yellow maize is not suited, so that its culture becomes of little value. But the collection here exhibited claims not only to be the most complete which has probably ever been presented in Europe, but it also shows varieties which greatly excel the maize known in this country and in France in size and in flavour, while they still fulfil the special conditions required in earliness. More than this, these ears were grown from seeds acclimated by three varied seasons in the Channel Islands, and are even immediately sprung from seeds of plants grown in the damp and sunless season of 1869, which plants were prostrated to the earth when at their fullest and most critical season of growth, on September the 12th, under the weight of a hurricane of 55 lbs. pressure per square foot. The perfectly ripened specimens exhibited attest the vitality of maize when treated with common care.

Remarks on the different kinds will best be made as each is examined. A few observations must now be made on the

Uses of Maize.—It would be without interest here to speak of the numerous purposes to which this most valuable plant is put when in a dried state in tropical regions. The drought of past seasons shows the need of adding to our resources, if possible, whatever green fodder can be grown. There are certain kinds of maize better adapted by their growth than others to fulfil this object, being hardy and luxuriant, and at the same time abounding in saccharine juices, so that animals will devour them speedily. Even the stalks, when hard, can be utilized by slicing them, so that there is really no waste. Mention having been made of these varieties in the French scientific journals, a pressing request was sent here for a large quantity of seed for Brittany, there to be cut down and used as forage during the drought.

Culture.—The seeds should be sown in common raisin-boxes during April, early in the month in the south, and later in the north of England. In the Channel Islands they were sown in boxes very early in April, and planted out three weeks after.

These boxes should be placed in a cool vinery, orchard-house, or pit, and the plants hardened off before planting. This would be best in May, earlier or later according to season or locality, which a short experience would decide. The risk of the young plants is common to other vegetables, that of suffering from spring frosts. A little protection would obviate all this. But this season, Mr. Dancer, of Chiswick, we are told, sowed a quantity of maize in the open ground in March; it was cut down by the frost, sprung up again from the root, and yielded a heavy crop.

By the end of July our maize-plants were already seven feet high, and were then secured from high winds by stout stakes at intervals, and thin cords stretched between them, to which the rows were easily tied. Not being able to give waterings, which materially aid the growth of a plant which luxuriates in the rich alluvial valleys of tropical countries, we had planted in shallow trenches filled with manure and three inches of soil above it. These trenches retained the casual showers, and were gradually earthed in, as for celery. The manure kept the roots perfectly fresh; and two slight waterings of liquid manure were given during the very dry summer. This attention is not greater than is always given to peas and other vegetables. Failures are traceable to a neglect either of some or even of all of these means.

It is not quite so easy to ascertain the exact time to take the ears as "green corn" for the table. A day or two makes a considerable change in their consistency. When as large and as hard as marrow-fat peas, from twenty to thirty minutes' boiling is enough. Serve with fresh butter to spread over them, and they are thus ready. All the uses made of peas for soups and stews are common to green maize. The ears can also be roasted before the fire. When dry these fine white varieties would produce very pure flour for puddings, &c.

Maize, in our climate, requires five months to mature the seeds for sowing, being one month more than in California. Some sorts ripened here in August. The stalks reached to 10 feet, a height only excelled in rich tropical soils. Where several sprang from the same root, the ears ripened soonest. Experiments were made in hybridizing with some results, and also in mutilating the male panicle of flowers with a view to increase the size of the ear. After several generations of mutilated plants had been experimented upon, it was found that the ears were increased sensibly in size. The produce of seed was at the rate of ninety-five bushels the acre, gathered as it was, not from selected plants, but from numerous varieties, some being too small.

Remarks on the Varieties.—Nos. 1, 2, 3, and 4 are specimens of the best pure white maize from Georgia. This is the most delicate for table use; ripened this season at the end of September, and is an early sort, and the most valuable in every respect. No. 4 of these has spiky grains, and is even whiter than the others.

No. 5, King Phillip, from M. Vilmorin, considered a good kind in France.

Nos. 6, 7, and 8 are "flint corn," very much like that grown near Bordeaux, but superior. No. 6 of these is a free-growing and valuable table-maize.

Nos. 9 and 10 are pink corn. The first of these is a remarkably fine specimen; and this variety is earlier than the pure white, is delicate in flavour, and more valuable than No. 10.

No. 11 is the Giant Red, the largest of all, excellent, and a mid-season sort.

No. 12 differs from this in having smooth grains.

No. 13. Jaune Gros, from Vilmorin. This is much grown in the Touraine, and is the cheapest of all, but rather too coarse.

No. 14. A striped yellow, originally from Pau, and raised from seed from plants grown in Yorkshire. A hardy and valuable kind.

No. 15. True Yellow Pop Corn, from America. A very excellent kind, prolific and early, will be very useful for forage also.

No. 16. Jaune d'Auxonne, early, and good for grinding-purposes.

No. 17. Improved Common Yellow. An excellent kind raised here, and larger than the common one.

No. 18. A small, late, yellow maize.

No. 19. A handsome and heavy spotted maize, raised here this season in some quantity.

Nos. 20, 21, 22, 23, 24, and 25 are hybrids of various shades, easy to retain pure. An opinion as to the best would be valuable.

No. 26. A short corn, spiky.

No. 27. A new African maize from Italy, very hardy and prolific, likely to be very useful.

No. 28. Handsome hybrid of this year, mid-season.

No. 29. Darkest ear ever raised here.

No. 30. Blue Corn; very difficult to ripen. One more handsome has disappeared from culture here. Another has magnificent gold-striped leaves, with dark hirsute stem; equals the Japanese variegated maize for gardens, and is 9 feet high. Of this valuable kind only a few seeds exist here, and no ear.

No. 31. Early White Pop Corn. Dwarf and curious, not being so profitable for a sweet meal as No. 15.

No. 32. Boston Ten-weeks' Maize. It excels the French Ten-weeks somewhat, but both are too small.

No. 33. Small-seeded red. Curious, and difficult to ripen.

No. 34. A similar variety, generally of the present size.

No. 35. Large pale red.

It remains only to add that seed for sowing can be obtained in gardens in warmer districts, and always from such places as the Channel Islands; while maize, to be eaten green in the autumn, can be grown anywhere with common attention. The same may be said of its use for forage.

Richmond House, Guernsey,
December 1st.

XI. On imperfect Hybridity. By I. Anderson-Henry, Esq.

Among the same batch of seedlings from which I obtained *Veronica Andersonii,—V. salicifolia* (syn. *V. Lindleyana*) + *V. speciosa,*—came one which, to all appearance, was a reproduction of the *male* parent pure and simple. And deeming it nothing else, I presented it to a friend, *V. speciosa* being then comparatively a new plant; and he, when he flowered it, came to tell me that it had come a very different thing in bloom to the true *V. speciosa,* having much *longer* flower-spikes and of a much lighter colour than those in that species, being of a light crimson instead of a dark purple, as in the *V. speciosa.*

A plant of this hybrid has since afforded a further illustration of a somewhat similar result.

Having obtained a suffruticose species of *Veronica,* under the name of *V. Daubeneyiana,* with light-coloured flowers striated with pink lines, in the way of *V. fruticulosa,* I crossed it on the last-mentioned hybrid, which became the seed-bearer. From this cross I succeeded in raising only two plants; and one of these I believe I have lost. But they seemed both alike in foliage and habit; but both so like the hybrid seed-bearers that I felt doubtful whether the cross had taken. I cannot speak with confidence as to their being *identically* alike, but only of their general aspect. The plant I still possess flowered for the first time this past season; and the singularity of its bloom drew my attention to it more particularly than before. It had, like the seed-bearer, thick fleshy pyriform leaves, but somewhat smaller and more closely set on the stem; but instead of being, like it, simply cruciform, they were *obliquely* decussate, therein slightly approaching the male parent, a creeping *alpine* species whose prostrate stems show still more the same deflected arrangement of the leaves. It was only on a close examination of the part, however, that any resemblance to the male, *V. Daubeneyiana,* could be observed. In fact I looked upon it as another of the *many failures* I had had in my attempts to effect the inverse cross on it. When it at last bloomed, my hopes of having effected a partial cross, if I may use such a term, were strengthened. Like *V. Daubeneyiana*, which has a spikelet with a few blooms, it came even short of it, having had only two flowers, and these much lighter in colour, and no nearer to the male than the hybrid female parent; but whether this is its true permanent character I dare not assert, as it bore no more than this one spikelet of two flowers.

In the first of the above instances the hybrid seemed, till it flowered, a repetition of the *male* parent; in the second, it seemed, till it bloomed, a repetition of the *female* parent, with such slight differences in the arrangement and slightly smaller size of the foliage as might occur in a purely normal seedling. In fact, seldom have I ever seen two hybrids with so much of one parent and so little of the other.

I have no doubt something of the same kind occurs among *Rhododendrons*. But I may only instance one case where I crossed *R. Edgworthii* on *R. caucasicum*; the seedlings, ever few when the cross is a *severe one* (by which term I mean such instances as where the species do not affect each other kindly), were only two in number; and though now about ten years old they show no indications of setting for flower. But while they have both the *glabrous* foliage of the seed-bearer, and even the ochreous *tint* underneath, they differ in having *pyriform* instead of its *lanceolate* leaves. But though in these particulars they depart from the normal state of *R. caucasicum*, they have not one feature of *R. Edgworthii*, the male parent. The *other* case is where I crossed the same *R. Edgworthii* on *R. Jenkinsii*. Here the seedlings, again only two in number, were all of the mother, except in having again the *pyriform* foliage, in which, be it observed, it is a departure from both parents, both having lanceolate leaves, those of *R. Jenkinsii* being acutely so. The hybrid in this latter case is budded for flower; but the flowers of both parents are white, and both sweet-scented, and among the largest of the *genus*, though the scent, texture, and forms of the flowers are different; so that I look for surer *tests* in the coming flowers, though these may be more perplexing too than any that yet appears. It is proper to observe that I take the utmost precaution in all my crossing-operations to prevent miscarriage in any possible way.

While treating of my difficulties with this *R. Edgworthii*, one of the most peculiarly constituted, as it is one of the most peculiarly featured of all the Rhododendron tribe, having its *rugose* leaves densely *pubescent* on the upper while it is perfectly shaggy with tomentum on the under side, every stem being clothed with the same tomentum, I have another most singular peculiarity to note in regard to it, namely that while it will cross other species it will take on a cross from none,—that is to say, while it has been repeatedly made the *male*, it has never with me, though I have tried it often, nor with any other that I have heard of, submitted to become the *female* parent. I have crossed it repeatedly on *R. ciliatum*, one of the *minor* forms, too, of Dr. Hooker's Himalayian species. It has been crossed, too, on *R. formosum* in this neighbourhood, I believe, in the Stanwell Nursery: but I never could get it to take on any cross whatever. *R. Nuttalli* behaved, with me, in the same manner; it would cross but not be crossed; but I did not persevere with it as I did with *R. Edgworthii*. Now I do not assert absolutely that *R. Edgworthii*, in the numerous tribe of which it is a member, may not be hybridized with some other of its kindred, but I could never get it to reciprocate a cross. And this remarkable circumstance of *non-reciprocity* has perplexed and defied me in innumerable instances throughout my long experience in these pursuits. It occurred to me that the pollen of larger forms might be of larger grains, and so might not pass through the necessarily small ducts of the styles of smaller species; yet *R. ciliatum*, a tiny species of 1 foot high, was crossed freely by *R. Edgworthii*, as I have just noticed, a species of 6 feet high. I even crossed this latter species on a pure Indian Azalea, though, by pulling the seed-pod before it was ripe, I raised no seeds of this latter cross.

In these hasty observations I merely wish to direct attention to such instances of *imperfect hybridity* in certain species, and the *non-reciprocity* in others, as I have noticed, in the hope of perhaps drawing out from others their experiences in such matters, which I humbly think are not unworthy the consideration of the Scientific Committee.

XII. On Mimetic Analogy. By A. Murray, Esq., F.L.S.

Some time since I had occasion to study with care, for the purposes of a work on which I am engaged, the phenomena of mimetic analogy made known by Mr. Bates, which have lately formed the subject of discussion at the British Association and in the pages of 'Nature,' in which I observe with pleasure that one of our body, Mr. A. W. Bennett, has borne an honourable part. Neither he nor any of the gentlemen who have written on the subject, have, however, so far as has come under my notice, brought the point to its real issue. They have accepted battle on the field on which Mr. Bates has placed it; and although they may have achieved a victory over him, they have not succeeded in rescuing the subject from its obscurity. He may be wrong without their being right. I am not surprised at their having been led to accept his premises: when I first approached the subject I did the same; but the longer I live and the more extended my experience becomes, the more surely do I find that when a theory looks shaky and unsound, the place to look for the flaw is not in the upper story, but in the basement. It is in the foundation that the crack will almost invariably be found: I am sure it is so here.

Mr. Bates found in the Valley of the Amazons a number of species of a northern tribe of butterflies wearing the colour and form of a Brazilian tribe, and so like in their varieties and strains that they obviously represent some different phenomenon from the ordinary one of mere difference in species. To account for this he devises a theory on the Natural Selection plan. The Brazilian tribe has a bad smell, and birds and insects of prey consequently do not feed upon them; and the northern tribe, in the course of their variation in the dark, accidentally produce one something like the Brazilian one, which produces others in the same direction by Natural Selection, until the mimics are brought to perfection. Every inch of the ground he goes over here is mined and unsound: the bad smell has not been observed in North America, where similar mimicry occurs; birds and insects of prey hunt by sight and not by smell; and the various communications on the subject in 'Nature' point out a variety of other insuperable objections. But my object is not so much to show that a friend and entomological brother has been seduced by a "bad smell" to go on a wrong scent, like a good dog after a red herring, but to find out the true explanation of the phenomenon.

The explanation seems to me to be simply hybridization; but before committing myself to it, as there were one or two points on which I was not sure how far the phenomena corresponded with those of hybridization in plants, I applied to my friend Mr. Isaac Anderson-Henry for information upon them, and he has sent me a paper (for the Scientific Committee of the Horticultural Society), as well as some other information, which enables me now to say that there is not a phase or a fact in the mimicry in question for which I cannot produce the exact counterpart in the hybridization of plants.

In the first place the mimicked and the mimickers are always found together, and even the mimickers of varieties are only found beside the varieties that they mimic. Now it is plain that if the resemblances be due to hybridization, it is inevitable that the two must always be found together, at least in the first instance. It may be that after the hybrids are established and advanced into the position of actual species, the species (*i. e.* the parent and offspring) might diverge from their primary locality, the one to the right and the other to the left, and so cease to be found together; but this must be an after act, and consequently an exception. The natural condition is to find both together, and so they are always found together. But this would not be the natural condition if the mimicry were produced by Natural Selection. The same enemies are found over thousand of miles, and the same kind of enemies over tens of thousands; and there is no advantage to be gained by mimicking one variety of *Danais* more than another. The same advantageous results would be obtained by mimicking in the east the form that prevails in the west, or in the north the form that prevails in the south; but the imitation of each variety is limited to the district which it inhabits, however narrow and restricted it may be. Natural Selection, therefore, fails entirely to account for the localization of the mimickers of varieties.

In the next place the mimicked occur always in overwhelmingly greater numbers than the mimickers. Mr. Bates says:—"The Ithomiæ (Danaids) are all excessively numerous in individuals, swarms of each kind being found in the localities they inhabit. The Leptalidæ (mimics) are exceedingly rare; they cannot be more than 1 in 1000 with regard to the Ithomiæ." This is quite what we should expect if the resemblance is due to hybridization. Hybridization is not the normal mode of producing either species or individuals; it is not the plan laid down by nature. Being exceptional, it is, of course, comparatively rare. But there is no reason for rarity if it be the result of Natural

Selection. That operation is going on equally upon all, and under that hypothesis mimicry is just as powerful an influence in modifying and producing forms as any other; and there is no reason whatever why it should have less conspicuous results; indeed it should have more, if we judge by the long-continued persistence of influence which must have been in operation to produce such exact resemblances, and which, indeed, seems very much thrown away when confined to the 1 in 1000 mentioned by Mr. Bates.

Although mimicry occurs between various tribes or genera, it has been observed most frequently in connexion with the most common species of the country. This is what would naturally be the case with hybridization, supposing all to start fair and to be equally liable to hybridization. But this is an assumption which we are scarcely warranted in making, and I therefore do not press this inference further than as of some conditional value.

After the second generation of hybrids in plants, it was first shown by M. Naudin, and is now well known to all hybridizers, that those which do not revert to type break out into an overflow of irregular variation, which supplies many of his most remarkable sports to the horticulturist, and many of his most puzzling difficulties to the systematic botanist. On the assumption that the mimicry in question is the result of hybridization, we should therefore expect to find a marked degree of variation among the mimicking species. And so we do. Mr. Bates figures no less than fifteen varieties of *Leptalis Ithomiæ*, one of his mimics, which itself mimics seven different species (all very close to each other, however, and perhaps scarcely deserving the name of independent instances). Mr. Trimen figures six varieties of *Papilio Merope*, which supplies four of his instances of mimicry; and Mr. Wallace's imitating Papilios were in like manner remarkable for their variations. It seems a fair inference that when the mimicking species are not variable they have been established before the second generation of hybrids, and where they are variable they have been established subsequent to the second generation, and have experienced the usual shock to stability occasioned by such repeated loosening of the fetters of specific identity.

Mr. Bates's list of mimics and mimicked species shows, too, that when a species is mimicked by one species or genus it is often mimicked by more—a fact which, applied to the idea of hybridization, simply means that that species had a readiness to take to itself wives of more than one of the nations round about. Out of twenty-eight Danaoid species cited by him, which had been mimicked or had families from strange husbands, fourteen had families from one each, three from two each, and six from three each. It is only what we find in plants; and some are more open to hybridization than others; or perhaps, analogous to our moral experience, that where scope is allowed to our own passions, license soon degenerates into libertinism.

Another feature, familiar to all hybridizers, occurs in these mimicries. Notwithstanding the statement of Wichura to the contrary, it is now perfectly well known that in attempting to obtain a cross between two species we often fail when we work with the male of one species and the female of the other, while we succeed when we reverse the process and take the male of the latter and the female of the former. In plants the cases where this capability of crossing in only one direction occurs are beyond number. Mr. Isaac Anderson-Henry cites many of them in his late Presidential Address to the Botanical Society of Edinburgh, and in the paper which I have now the pleasure to lay before the Committee. The very same thing has occurred with the mimicries recorded by Mr. Bates. They are all on one side of the house. According to my view (indeed, if hybridization is once allowed to have been the motive power, it must be according to every one's view), the parents were the Danaids on the one side, and the cabbage whites (Pieridæ) on the other; for all the mimicked are Danaids with their special characters, viz. only four apparent legs, while all the mimickers, like the whites, have their special characters, six legs apparent. If they had been hybridized from both sides, we should have had some Danaids with the form and colour of the whites, as well as whites with the form and colour of Danaids; but we have not. The case which so often occurs in plants has obviously occurred here. The cross was taken only from one side. Which is it? I apprehend, from other examples, that it should be on the side of highest organization—that is, that the male parent has been of the lower organization, and the female parent (the actual bringer forth) of the higher. Now, which is the side of highest organization in the Danaids and Pieridæ? Is it that of greatest strength? If it were so, it would then be the Danaids; for they are larger, finer, and more powerful than the more northern whites. But organization is a higher test than mere strength. This, too, seems to be on the side of the Brazilian tribe. Mr. Bates so considers it; and his reason is that, the essential quality of butterflies being flight, the type which has most attention paid to its wings and least to its legs must be highest of its order. Others think differently, and say that a type which has had two of its limbs (its anterior legs) almost atrophied, cannot be so perfect an animal as one which has them all in perfection. But I agree with Mr. Bates on this point (at all events in his conclusion). The greater number of legs cannot be any indication of higher organization, or a centipede might dispute supremacy with ourselves, and push us from our stools. Multiplicity of subdivision or repetition of parts is acknowledged by all physiologists to be an indicator on inferiority of organization. The fewer limbs, that is, the simpler the apparatus that a creature can do its work with, the higher the perfection of the machine. Therefore, doubtless, Brazilian Danaids are the higher type; and if (as I believe to be the case), in crosses of difficult accomplishment, the female is the higher parent, then the cross from which these mimics resulted was one by the males of the whites upon the females of the Danaids.

In what I have above said as to one-sided crossing, I have assumed that in plant-hybridization the fact would be admitted; but as it is in contradiction to the statement of so eminent an authority as Wichura, I shall remove all doubt from the subject by quoting Mr. Anderson-Henry. He says:—"I regret to differ from so great an authority as Wichura (who has maintained that 'the products which arise from reciprocal crossing in plants, unlike those which are formed among animals, are perfectly alike'), and must venture to demur to the doctrine in more decided terms than Mr. Berkeley does. I have had so many instances of hybrids taking sometimes to one side and sometimes to another, *but most frequently to that of the mother*, that to those who, like me, have tried their hand with many genera, it would be a matter of supererogation to give instances. I have had them by the score."

But the mixed product also corresponds with another fact observed in hybridization. Mr. Anderson-Henry informs me that in some of his crossings of plants he has only succeeded in altering the flowers, the foliage continuing persistently the same as that of one of the parents. He has not succeeded in distributing the union through all parts. That is exactly parallel to what we see in these mimicries. The number of legs and the nervation of the wings (in other words, the more structural portions of the animal) remain special as in one parent, while the colour and form of the wings &c. is taken from the other. In the butterflies it is the more structural parts (legs, nervures of wings, &c.) of the male parent which are observed in the offspring, while the form and general appearance only of the female parent is adopted. In plants it may be a question whether we should consider the flower or the foliage as the more structural parts: for my part I should take the flower as the more important, and therefore equivalent to the structure of the legs and wings; and the foliage and habit of the plant in Mr. Anderson-Henry's case as equivalent to the colour and form of the wings and general appearance of the insect. Another phase of the mimicry, which I have no doubt will be found to have also its parallel in the hybridization of plants, although I am not able to cite any instances exactly in point, is that in species which have dissimilar sexes it sometimes extends to both sexes, the males being like the males and the females like the females, but in other instances is confined to the females. I believe that the reason why I have no case in point to cite in plants is that it can only be had in diœcious plants; and the hybridization of diœcious plants has hitherto been scarcely at all attended to. Mr. Anderson-Henry has some coming forward, but they have not yet flowered.

The last point to be noticed is one of some importance, as being the only one furnishing a shadow of objection to the explanation of the mimicries in question by hybridization. It is that the nearest natural allies of both the mimickers and mimicked are *not* always to be found in the same district. This deserves the more attention, since it appeared so strong to Mr. Bates as to lead him to relinquish the idea of hybridization as an explanation after it had crossed his mind. "The explanation," says he, "that the whole are the result of hybridization from a few originally distinct species cannot at all apply in this case, because the distinct forms, whose intercrossing would be required to produce the hybrids, are confined to districts situated many hundred miles apart."

Before I proceed to show how simple the explanation of the absence of one of the parents is, I must beg to note in passing the admission that there are distinct forms whose intercrossing would produce the hybrids. That granted, I would remind the reader of what Mr. Bates has obviously overlooked, that we are dealing with a phenomenon probably of a very ancient date, and that one side of the parental stock may have disappeared in the course of time. I have elsewhere suggested, in regard to hybridization as a possible originator of species, that it must be a necessary accession to such an event that the hybrids should have opportunity of isolation, such as might be obtained by thinly peopled districts where they might settle, spread, and establish themselves. Now, certainly, the Valley of the Amazons, the Malayan Archipelago, and many parts of the South of Africa (lands whence these mimetic analogies come) have at different periods all been at one time unoccupied land; for all of them have been raised from the bottom of the sea, and been peopled by the influx of the inhabitants of neighbouring lands. No one knows better than Mr. Bates that at one time Brazil was unconnected with New Granada or the Andes. The Danaids were then inhabitants of it, but not inhabitants of the countries about it; while the Pieridæ, or cabbage whites, were what I have elsewhere denominated a microtypal tribe from more temperate climes, and were present in the Andes and the mountain countries, as Columbia, connected with them. In the natural course of things, therefore, when the Valley of the Amazons was changed from the bottom of a sea to dry land, the Danaids would spread into it from Brazil, and the Pieridæ from the north and west, and meeting in an open, as yet, unpeopled country, hybridization might take place under one of the few circumstances where I have thought it possible that it could retain its place and establish its products as species. The objection that frightened off Mr. Bates is, in reality, no objection at all to the hypothesis of the mimicry being due to hybridization, that we are not always, or even that we should not at all be able to identify the probable parents of the mimickers as inhabitants of the same country as their supposed descendants. One of the parents we know to be present (the so-called mimicked), but there are excellent reasons why the other parent should not be present. It is of a northern type, suited for our temperate regions, but not adapted to the tropics except at a higher elevation and a cooler temperature than the damp, hot valley of the Amazons. Although, therefore, it might descend into that region, it is not only a natural but almost a necessary inference that it would not find it congenial or habitable; and although it might live long enough in it to found a dynasty of mimickers, it would soon die off from unsuitable conditions, while its hybrid offspring bred from the tropical Danaids might, from the black blood so imparted to them, find it sufficiently well suited for them.

There is yet another phenomenon connected with mimicry, which possibly may also be connected with hybridization, viz. the occurrence of what Mr. Wallace has called dimorphism in insects among the mimicking or mimicked species. We must not, however, confound this dimorphism with Darwin's dimorphism in plants. The two are totally different things, and, as it seems to me, have no relation or analogy to each other. In plants the dimorphism is always confined to the reproductive organs, in insects it has apparently nothing to do with them. Moreover, it seems to me that all the instances of so-called dimorphism in insects that have yet been recorded are nothing but examples of variation, perhaps complicated by hybridization. M. Reinhard, of Bautzen, has shown that this is the case with regard to Mr. Walsh's conclusions respecting the dimorphism of certain gall-flies; for he had found that the galls of various species appear to be so transitional between other forms, that they can only be known with certainty when the perfect insect appears. It appears to me to be also the case in all those instances where the dimorphism is confined to particular districts, as in the *Papilio Turnus* of North America, where all the females are yellow in the New England States and in New York, while in Illinois, and further south, they are all black, and in the intermediate region both black and yellow females occur in varying proportions. And the case is not open to any doubt, because in the intermediate district both yellow and black insects have been bred from the same batch of eggs. Now, if the case had been that *both males and females* equally varied, and that in the south all were black and in the north all yellow, with intermediate gradations in the districts between, we scarcely suppose that any one would have thought of calling it a case of dimorphism. If they did, then all climatal variations (and their name is legion) would come under the same category. It is only dimorphism, because the change is limited to the female. But is this a good ground? Physiologists are unanimous in holding that neither the male nor the female is the species, but both; and if that be the case, in what does a variation in the female and not in the male differ from a variation in both but in degree? Most of Mr. Wallace's instances of dimorphism are of this character—the male being the same in a number of islands in each of which the female differs. All these I regard as mere instances of climatal variation, in which the variation shows itself only in that part of the species called the female. An occasional case of variation from some other cause, as from hybridism, may possibly come to complicate this phenomenon; but it appears to me to be sufficiently explained by variation; and the circumstance above mentioned is significant, that where mimicry occurs in species having dissimilar sexes, it, too, is often confined to the female.

XIII. On Grafting and Budding. By A. Murray, Esq., F.L.S.

The changes which have taken place at Chiswick afforded so favourable an opportunity of procuring specimens and sections of the grafted portions of fruit-trees of different kinds, that it seemed to me desirable to use the opportunity to make up for the Horticultural Society a case of specimens illustrative of grafting which might be placed alongside of the cases of Economic Entomology for similar purposes of instruction.

I have been the more induced to do so from the circumstance that Mr. Barron, our able superintendent, informs me that he finds the theory and practice of grafting to be so little understood by the young gardeners who come to complete their education at Chiswick, that it is rarely that any of them are able to graft successfully until after the erroneous notions with which they come impregnated are eradicated and corrected. It seems that the drawings and woodcuts which are given of the process of grafting, by the most eminent writers on the subject, almost always convey an erroneous impression on the very point on which success entirely depends. The woodcuts of the slips and grafts prepared for adhesion turn the attention more to an equality of dimension, and to a correct fitting of the outside of the bark of the one to the outside of the bark of the other, than to an exact apposition of cambium of the one to that of the other, on which, in point of fact, adhesion and grafting absolutely and solely depend.

It appears to me that the exhibition of the specimens I have obtained for the Society's case may serve to bring before the eye the true merits and virtues of grafting and budding, as well as their disadvantages, in a form that may be useful.

I may observe that the specimens of which the collection consists have been obtained from Chiswick, and from Mr. William Paul.

The specimens received from Chiswick consist of a selection of sections of fruit-tree grafts of all kinds and ages. The vast number of old fruit-trees at Chiswick, now condemned and about to be rooted out, furnished an almost unlimited supply of this material.

Those from Mr. Paul are of buddings of roses of various ages, which I selected from the desire to show the difference of the effects of budding and of grafting on the part operated upon.

The Members of this Committee know very well that in all instances of transfusing a part of one plant into that of another, whether by grafting, or budding, or any other mode, the only point at which transfusion or union can take place is the single outer circle of vessels which lies between the bark and the wood, in which the passage of the sap alone takes place, and by which the connexion between the roots and the leaves and the consequent deposit of wood and growth of the tree alone take place.

I am afraid, however, that the more general impression is that a branch grafted on to another, is united to the stock on which it is grafted throughout its whole surface, that it grows together as two parts of an animal body united by the first intention, as, for example, part of a finger cut off and immediately clapped on again. The examination of the specimens which I have brought together will serve to correct any such misapprehension. They show that there is no union whatever at any part of the wood of the scion applied to the wood of the stock, except at the single outer ring of the alburnum, already mentioned: indeed a small film of a brownish substance is deposited along every part of the applied surfaces, except the outer ring, where the union takes place; and some of the specimens which I exhibit show isolated deposits of wood and woody fibre enveloped in this brown deposit, which I imagine to be oozings of woody matter something analogous to what is called proud flesh in the animal body.

But what I wish particularly to point out is that in every instance the inner part of the applied surfaces where the union has not taken place, both of the scion and the stock, is in a more or less advanced state of decay. In no instance is this absent, it is an inherent necessity in the very process of grafting that the seeds of decay be shut up along with it. In fact one inevitable ingredient in the manufacture of grafts, concomitant, coexistent, and inseparable from it, is the simultaneous manufacture of an ulcer in its heart. Exactly the same thing takes place in budding, although on a smaller scale—the larger the extent of the cut surfaces applied to each other, the greater being the extent of future decay; and of course in budding this space is small in comparison with that in grafting; and of course, too, the smaller the amount of exposed surface or cut wood, the less will be the amount of ulcer or decay subsequently manifested in the heart of the branch. I was about to say that the smaller the amount of this surface, the greater would be the skill of the operator; but this would imply that the decay in the heart of the branch was injurious to the plant, and was, if possible, to be avoided; and I am not sure that we are to take this for granted. Of course, if we want a perfect tree complete of its kind, doing all its functions in the best manner for itself and the general purpose it is to serve in organic nature, we must say that it would be better without the decay in the heart of the graft, and that that decay must be looked upon as a blemish. But that is not what we want in every case of grafting: in fruit-trees we do not want a normal amount of fruit, we want an excessive amount; in rose-trees our demand for flowers is not limited to nature's natural bounty; like Oliver, we come back for more, not once, but many times. Now it is well known that one of the surest means of inducing an excessive production of flower and fruit, is to weaken the vitality of the plant. It is no uncommon thing to hear people say that a plant had killed itself by its excessive flourish the previous year, whereas it was not the flourish that killed it, but the plant, knowing that it was going to die, made a desperate effort to propagate its species before its life was extinct. Now, if the implanting of decay in the heart of a tree is injurious to the health of that tree, it may have the effect of inducing something of this excessive effort at propagation. I have heard it said that grafted trees always bear better than ungrafted; but as to that we have plenty of practical men who can speak with authority. It is to be observed, too, that the decay of which I speak is limited in its extent and slow in its progress. It is shut up and almost hermetically sealed in by the deposits of wood which have taken place subsequently to the union of the graft; and although I have called it an ulcer, it is only so in the sense of being a source of decay; there is no active or malignant principle at work; it is merely the gradual decay of a perishable body which is situated in the heart of the timber.

It may be asked, too, whether this decay in the heart really does any damage other than weakening the branch or stem at the point where it exists; for it cannot be disputed that to that extent at least it must be injurious. Is the heart of the stem of a tree of any use to it except for the support and solidity which it gives it? We see old piped trees flourishing away after all the heart is gone and nothing left but a thin rind. True, the flourishing is not so vigorous as in a younger and more solid tree. No great sturdy arms are thrown out; and the foliage is limited to a few clustered scrubby twigs. But it does not follow that this weakness of growth is due to the tree being piped. In such cases, we must remember, that tree has generally been growing in the same ground for perhaps hundreds of years, exhausting all the ingredients of the soil which are suitable for elaboration into its sap and fibre—and that if we remove the tree and plant another of the same kind in its place, it grows no better than the old one, seeming to show at all events that it is not the mere absence of pith and heart-wood in the old tree which has caused the declension in its vigour of growth.

The principles of physiology, therefore, would rather seem to say that in all those cases (such as fruit-trees, roses, &c.) where the acquisition of solid timber (whether for the support of the tree or for the uses of man) is not the principal object, grafting, although attended by decay, is not attended with consequences injurious to the purposes for which the tree is cultivated. But where timber is the object, as in forest-trees, the case is different. The decay imbedded at the base of the stem, gives an element of weakness to the tree at the very point where the leverage of the wind is strongest, and exposes it to be snapped off by the root. I do not think it can be said to be injurious to the growth of the timber in other respects; for immediately above the graft the timber is deposited in a solid and continuous stream; and I see no reason why the tree in all other respects should not be as good as an unworked plant. Still we all have a prejudice in favour of seedling trees; and I think that the liability of grafted plants to breakage from wind is quite a sufficient reason why we should continue to retain it.

XIV. On the Loranthaceæ of Angola. By Dr. Welwitsch.

The singular beauty and richness of the gay-coloured flowers of the numerous species of *Loranthus*, which enhance in so considerable a degree the variety and charm of tropical forests, is noticed and acknowledged by every attentive traveller in the torrid zone; and the introduction by culture of these interesting parasites forms objects worthy of attainment by skilful and persevering horticulturists. I beg therefore to offer some brief observations on the occurrence and distribution of the species of this order in South-west tropical Africa, and to add a hint to encourage, and perhaps to facilitate, their future introduction into Europe.

During my travels in Angola I collected about 30 species of *Loranthus*, but only one species of *Viscum*. The number of species, and also that of individuals of the same species, I found to increase progressively from the sea-coast towards the highlands of the more distant inner regions, and to culminate in the mountainous forests of the districts of Pungo Andongo and Huilla, at an elevation of between 4000 and 5000 feet above the sea.

Nearly all the species I encountered are erect, or more or less spreading shrubs, from 1 to 2 or 2½ feet high, with the exception of one species, which forms a pendulous bush, with slender branches 4 to 6 feet long.

Most of the species of *Loranthus*, and also the single species of *Viscum* met with, were growing on the lower or higher or even on the top branches of evergreen trees, less often on trees with deciduous leaves; but a few of the most brilliantly flowering species I encountered in the burning and treeless coast-region, growing at the base of small low shrubs of *Barleria* and *Lida*, very much in the same manner as *Cytinus hypocistus* occurs on *Cistus* in the sandy plains of Portugal. Sometimes in the hot littoral region a beautiful *Loranthus* is met with, growing, not at the base, but on the middle branches, or even on the main stem of low slender twiggy shrubs; and in such instances the natural combination of the bright green and broad-leaved parasite, and its gay crimson flowers, with the more tender and differently shaped foliage of the foster-plant forms one of the most striking features of parasitic vegetation along the sea-coast of Benguella and Mossamedes. Thus in one instance I was most agreeably surprised to find a small bush of *Gossypium microcarpum*, only between 2 and 3 feet high, bearing several stems of a pink-flowered *Loranthus*, nearly a foot long, on its slender branches; whilst on another occasion I met with several low shrubs of the intensely glaucous *Tamarix articulata*, of which nearly every main branch was adorned by immense patches of a pretty *Loranthus* with splendid yellow flowers.

The greater number of the Angolan *Loranthi* glitter with flowers of a more or less pink or scarlet hue; but about half-a-dozen of the species are adorned with golden or orange-coloured blossoms; and nearly all the species are exceedingly free-flowering. The principal flowering-season of the Loranthaceæ coincides in Angola with the spring—that is, from September till November; but many of the finest species continue their blooming during almost the whole summer, when they may be found not unfrequently covered with ripe fruits at the base while they are still in full bloom at the top of one and the same branch of the respective foster-tree. The yellow-flowered kinds, however, seem to begin their season much later; for I met with several golden-blooming species in the months of June and July, which time in Angola is the very middle of the dry and chilly winter season.

All the species have fleshy and rather broad leaves, which, however, vary considerably in colour, being on some species of a dark shining green, in others glaucous green, and in a few species they are covered with a greyish tomentum. Although some few species evince a decided predilection for particular species of trees, I not unfrequently found the same species of *Loranthus* growing on trees pertaining to very different species, genera, or even orders of plants; but the pendulous species of *Loranthus* I observed exclusively on species of *Ficus*, whilst the *Viscum* I found constantly growing on an arborescent composite, a species of *Tarchonanthus*. The forest-trees most frequently inhabited by *Loranthi* are the *Adansoniæ*, several of the larger trees of the orders Mimoseæ, Combretaceæ, Sterculiaceæ, and Sapindaceæ, as well as most of the different Fig-trees, whilst in the southern parts of Benguella, and near Cabo Negro, many beautiful species of *Loranthus* may be observed on the *Tamarix articulata*; on the contrary, I seldom or never saw a Loranthaceous parasite on trees belonging to the orders Anonaceæ, Hypericaceæ, Xanthoxyleæ, and Euphorbiaceæ, although every one of these orders is rather copiously represented by large and mostly evergreen trees in the woods of the Angolan highlands; but I have frequently seen some species of scarlet-flowering *Loranthi* investing introduced trees of *Citrus aurantium* and *Citrus limonum*, and also those of *Ficus carica*: and it seems to me that this curious parasite emigrates with a kind of predilection from the original habitation to the neighbouring fruit trees; for on one occasion I saw a whole orchard of Orange-trees invaded by a blood-red flowering *Loranthus*, and in another instance I met with a plantation of Fig-trees (*Ficus carica*), most of them covered not with figs but with a grey-leaved *Loranthus* with yellow flowers. It seems also that the quality of the sap or juice of a tree exercises little or no influence upon the vegetation of Loranthaceæ; for in several instances I found one of the same species growing, equally vigorously, on *Adansonia*, which has a watery juice, and at another time on Fig-trees, of which the sap is milky and glutinous.

These two latter circumstances seem to hint at the probability and perhaps even facility of the future culture of these pretty parasites in European gardens, wherein such an introduction would vary the rather wearying "Pelargonism" and "Orchidism;" or, at any rate, these plants would be contrasted with many new and graceful forms and strange-looking productions of the tropical zone, never yet seen in a living state in Europe, and until now only admired and praised by travellers.

XV. On the Fruiting of Seedling Fruit-trees. By the Rev. W. Kingsley.

Every one knows how very long is the time between sowing the seed of a fruit-tree and getting fruit from it, so that few men of fifty years of life have the courage to propagate seedlings. I believe the time may be shortened most materially, and that a very few words will explain the correct way of growing seedling fruit-trees. I have been led to the idea by the difficulty I have had in getting some grafted trees into bearing, and by observing that precisely the same sort of growth occurred in some trees that have originated in suckers from old ungrafted trees. In almost all these cases, whether apple, pear, plum, peach, or orange, the wood was thorny; and though I cut back, and used the cuttings for scions, all had the same thorny and fruitless character.

However, in experimenting upon a set of seedling peaches, some were allowed to grow wild, some steadily pinched-in, some cut-in closely and pinched, and some trained as single rods; all these last fruited as soon as the shoot got beyond the thorny part of the stem. It then occurred to me that it was only necessary to get beyond this part of the growth as quickly as possible. This is done by encouraging the growth of the young seedlings to a single upright shoot, and then using the point of that shoot as a scion on a strong stock; then the shoot from this scion is to be again trained at full length, and its point again used as a scion. In this way a shoot may be got having buds 20 feet or more from the root in a couple of years. The old seedling trees may thus be grafted with the scions from themselves; but it is better to graft them in their third year with a scion taken from an intermediate grafted tree. It may be necessary to stop the leader to be used as a scion by the end of August, to ensure its ripening; but this will not seriously affect its nature. I can speak from experience of the success of the process in the case of peaches and oranges, and some plums; pears and apples I have not yet tried; but I may also mention that I have in this way got over the difficulty with thorny pear-trees. The trees that I could not get to fruit had been grafted with scions taken off too near the root, the sorts being new ones. By selecting the scion near the root, or far from it, a grafted tree would be produced that would bear only after a long interval, or quickly, according to the gardener's will. At any rate, what has been said shows the importance of choosing the point of leading shoots as the scions for forming dwarf trees. I should very much prefer having some independent experiments tried to trusting entirely to my own, and therefore hope some one or more of the Royal Horticultural Society will take the matter up; and in the mean time any discussion this statement may provoke will be of service to horticultural science.

XVI. Second Report of Experiments made in the Gardens of the Royal Horticultural Society at Chiswick on the Influence of Various Manures on different Species of Plants. By Dr. M. T. Masters, F.R.S., F.L.S.

In a previous Report made to the Society by Dr. Gilbert and the present writer, and published in the Journal, vol. iii. p. 20, the object and mode of conducting these experiments during the year 1869 were detailed. In that Report was also given a summary of the observations taken at intervals on the growth and development of the several plants from the time of germination up to the maturation of the seed. These observations were strictly comparative, and were also considered in relation to temperature and rainfall. In the second portion of this Report the chemical analyses of the herbage, so far as regards weight, dry matter, and ash, were given by Dr. Gilbert, and certain inferences were drawn which seemed to be warranted by the facts detailed.

The present Report is intended to carry on the history of these experiments during the season of 1870.

For this purpose the condition of the plants in the 72 boxes on 1st of April, 1870, is first of all noted. The last systematic observations on the plants had been made in the preceding October, as already mentioned in the previous Report. The plants remained untouched in the boxes throughout the winter, till it became necessary to prepare for the second season's experiments, by emptying the contents of the boxes and replanting.

Before so doing, however, the following observations on the relative condition of the several plants were made by Mr. Willis, and, strictly speaking, should have accompanied the observations on root-development made at the same time by myself and already recorded in the former Report:—

Notes on the Condition of the Plants of the Former Season's Growth on April 1st, 1870.

i. *Dactylis glomerata.*

Box 1 (unmanured). Surface covered with healthy plants; leaves averaging 2 in. long, $\frac{1}{8}$ in. wide.

Box 2 (mineral manure). Surface covered with healthy plant rather more vigorous than in No. 1.

Box 3 (ammonia salts). Surface covered with healthy plant more vigorous than in 2.

Box 4 (nitrate of soda). Similar to 3, but with broader leaves.

Box 5 (mineral and nitrate), and 6 (mineral and ammonia). Plant healthy, about as in 2.

ii. *Anthoxanthum odoratum.*

In all six boxes fully one half the plants were dead; boxes 5 and 6 had slightly the advantage in regard to the number of living plants. No satisfactory comparison can be instituted between the plants.

iii. *Lolium perenne.*

All the boxes covered with healthy vigorous plants.

Boxes 1, 2. Leaves about 2 inches long.

Box 3. Leaves about $2\frac{1}{2}$ in. long.

Boxes, 4, 5, 6. Leaves 3 in. long.

The leaves in boxes 3 and 4 were rather darker and broader than in 1 and 2; and those in 5 and 6 exceeded those in 3 and 4 in these particulars.

iv. *Poa annua.*

All the boxes thickly covered with rather stunted plants, having leaves about $\frac{1}{2}$ in. long.

In box 1 half the plants were dead; in box 6 about one fourth. The plants in box 3 were much the healthiest and most vigorous of the whole.

v. *Poa trivialis.*

All the boxes fairly covered with plant, but not so thickly as in the case of *P. annua.*

The plants in boxes 2 and 4 appeared dead at first sight, but on closer inspection were seen to be pushing out new shoots.

The plants in box 3 were the most healthy, having leaves about 1 in. long. This relative superiority of plant in box 3 (ammonia), was also noted in the preceding October in the case of the two Poas.

vi. *Bromus mollis.*.

Plant very thin in all the boxes, and little or no growth made. Leaves about $1\frac{1}{2}$ in. long.

vii. *Trifolium pratense.*

All the boxes thickly covered with healthy growing plants, all about alike in vigour; those in the unmanured box the least developed.

viii. *Lotus corniculatus.*

All the boxes had plant at the outside; but in the centre of every box the plants had died.

ix. *Trifolium repens.*

All the boxes covered with healthy plants. Not much progress as to leaf-development; but the plants in boxes 5 and 6 had made long stout runners rooting at the extremities.

x. *Plantago lanceolata.*

Boxes 1, 2, and 3 thickly covered with healthy plants of last year's growth, with many seedlings intermixed.

Boxes 4, 5, and 6 relatively deficient in both particulars.

Boxes 1 and 2 the most forward.

xi. *Achillea Millefolium.*

All the boxes densely covered with vigorous plants, with leaves 2–3 in. long, and numerous runners matted together.

The plants in boxes 3 and 6 appear to have slightly the advantage over the rest. (See remarks on this plant, vol. iii. p. 52.)

xii. *Carum Carui.*

All the plants healthy. Box 4 has the most vigorous growth, then boxes 3 and 5; size of leaves very variable in different specimens in the same box.

The condition of the plants and of the roots (see vol. iii. p. 44 *et seqq.*) having been noted, the boxes were emptied of their contents, and the following observations on the soil of the various boxes taken by Mr. Willis :—

Notes on the State of the Soil in the Various Boxes.

Dactylis, 1 to 6.—All moist and crumbly, being in good working condition. (These were not noted individually.)

Anthoxanthum, 1 to 6.—Damp and sticky. (Not noted separately.)

Lolium, 1, 2, and 3.—Moist and crumbly as in *Dactylis*.
„ 4.—Damp and a little sticky.
„ 5 and 6.—A little drier than in 1, 2, and 3.

Poa annua, 1 and 2.—Moist and crumbly.
„ 3 and 4.—Drier than in 1 and 2.
5 and 6.—Nearly but not quite so dry as in 3 and 4.

Poa trivialis, 1 and 2.—Moist and crumbly.
„ 3 and 4.—Not quite so dry.
„ 5 and 6.—Same as in 1 and 2.

Bromus, 1 and 2.—Moist and very crumbly.
„ 3 and 4.—Not quite so dry and crumbly.
„ 5.—Same as in 1 and 2.
„ 6.—A little damp.

Trifolium pratense, 1 to 6.—Moist and nearly as crumbly as in *Dactylis*.

Lotus, 1 and 2.—Same as in *Trif. pratense*.
„ 3.—The soil of this is heavy and clods together.
„ 4.—A little less heavy than in 3.
„ 5 and 6.—Rather heavier than in 1 and 2, but not so heavy as in 4.

Trifolium repens, 1 to 6.—No material difference, being a trifle more moist than in *T. pratense*.

Plantago, 1, 2, and 3.—Moist and very crumbly.
„ 4.—A little more sticky than in 1, 2, and 3.
„ 5 and 6.—Same as in 1, 2, and 3.

Achillea, 1 to 6.—Moist but crumbly, no material difference.

Carum, 1 to 5.—About the same as in *Achillea*.
„ 6.—Slightly drier than in the other boxes.

Commencement of the Second Series of Observations.

The character of the soil having been noted, fresh manures of the same description as those used in the former season were thoroughly incorporated with the soil. The quantity of manure added was the same as in 1869, except that only one half of the quantity of the mineral manure was used (in boxes 2, 5, and 6). A sufficient number of healthy plants, as nearly equal in vigour as could be picked, were selected for replanting in each box; the remainder were buried beneath the prepared soil. In this way both the soil and the plants belonging to each box were replaced, without admixture with those belonging to other boxes.

In the preceding season too many plants had been allowed to grow in each box, and no thinning was practised; it was consequently difficult to remove the weeds and alien plants that sprang up in the several boxes without injuring the subjects of the experiments. To obviate these inconveniences it was decided in 1870 to replant at equal distances, the number of plants and the distance apart being regulated by the size and vigour of the plant: thus when 16 were planted in each box, they were placed at 3 in. from the side of the box, and 6 in. from plant to plant; and when 9 were planted in a box they were 4 in. from the side and 8 in. from plant to plant.

The following list shows the number of plants in each box, and the time of planting. It may be incidentally observed that even in this second season, in spite of the drought, the plants became too thickly crowded; and hence, in future experiments, it would be advisable to plant at greater distances apart. It should be noted that the plants were watered twice, on the 20th and 28th of April respectively, each box receiving two gallons of rain-water on each occasion. With this exception they received no artificial waterings. As in the former season, a corresponding set of plants were grown in the same manures and soil, in pots in a cold frame; but it was found as before that this mode of culture did not give trustworthy results, partly from the limited number of individuals, partly from the artificial treatment to which they were necessarily subjected.

Notes on the Plants transplanted, 1870.

Dactylis, replanted April 1; 9 average plants in each box.

Anthoxanthum, replanted April 1; 16 small bunches, as the single plants were too small and difficult to separate without injury.

Lolium, replanted April 2; 9 bunches as nearly single plants as possible.

Poa annua, replanted April 1; 16 small bunches in each box.

Poa trivialis, replanted April 5; 16 small bunches for each box taken from a heap of soil in the garden, as that growing in the boxes was a mixture of *P. trivialis* and *P. annua.*

Bromus, replanted April 4; 9 bunches as nearly single plants as possible.

Trifolium pratense, replanted April 2; 9 average plants in each box.

Lotus, replanted April 4; 9 average plants.

Trifolium repens, replanted April 4; 9 average plants.

Plantago, replanted April 4; 9 average plants (not seedlings).

Achillea, replanted April 5; 9 pieces without runners, the plants being so matted that it was not possible to separate individual plants entire; and if possible, they would have been too large.

Carum, replanted April 5; 9 of the smaller plants in each box.

Each box was replanted with its own plants, with the exception of *Poa trivialis.*

Summary of Observations on the Progress of the Plants during the Season of 1870.

The following Tables show the relative state of development of each of the twelve plants in the six boxes repectively, as observed on the dates mentioned. The degrees of vigour are indicated by letters, *a* signifying the least, *f* the greatest degree of general vigour and health. The estimates were arrived at by careful inspection and measurements of the plants in each box, care being taken to get as fair a general average as possible of the state of the plants.

To each Table are subjoined explanatory notes, a comparison with the results of the former season's experiments, remarks on the root-development, &c. The notes on development were chiefly taken by Mr. Burley, an assistant in the Garden at Chiswick, under the superintendence of the writer, whose own personal observations though not so frequent or regular, yet served to control those of Mr. Burley.

Dactylis.

Boxes	1. Unmanured.	2. Mineral manures.	3. Ammonia salts.	4. Nitrate of soda.	5. Mineral and Ammonia.	6. Mineral and Nitrate.
1870.						
April 25	*b*	*a*	*f*	*d*	*e*	*c*
May 2	*b*	*a*	*f*	...	*e*	...
„ 16	*b*	*a*	*e*	*c*	*f*	*d*
„ 23	...	...	*f*	*c*	*e*	*d*
„ 30	*a*	*b*	*f*	*c*	*e*	*d*
June 6...........	*b*	*a*	*f*	*c*	*e*	*d*
„ 13	*b*	*a*	*f*	*c*	*e*	*d*
„ 20	...	...	*f*	*c*	*e*	*d*
„ 27	*a*	*b*	*f*	*c*	*e*	*d*
Cut on June 28.						
August 22	*a*	*b*	*d*	*c*	*e*	*f*
September 5 ...	...	...	*d*	*c*	*e*	*f*
December 17 ...	*a*	*b*	*d*	*e*	*c*	*f*
1871.						
April 22	*b*	*a*	*d*	*f*	*e*	*c*
„ „ Root...	*a*	*b*	*c*	*e*	*f*	*d*

The principal points shown in the Table are these:—Mineral manures alone were of little or no use to the plant, the general vigour being often less than in the unmanured box.

The ammonia salts alone produced, on the whole, the most vigorous development, though this declined somewhat towards the end of the season.

The nitrate of soda produced a uniformly medium effect.

The mineral and ammonia manures secured the highest development next to that produced by the ammonia salts alone.

The mineral and nitrate induced a high medium development.

Considerable inequality of growth was observable among the individual plants in boxes 2, 4, and 6 respectively.

The colour of the foliage varied at different times, but was always palest in boxes 1 and 2. All were about equal in point of date of maturity, except the plants in boxes 1 and 2, which were later than the others.

The plants in box 3 were the first to flower; those in box 2 had on the whole the smallest number of flowers.

As to the roots the least degree of vigour was observable in boxes 1 and 2. The ammonia salts induced a medium development; the nitrate of soda a high development; the mineral and ammonia salts the highest, and the mineral and nitrate a high medium root-development.

In comparison with the results obtained the previous season, it may be stated that the fluctuations of growth were much less. Boxes 1 and 2 presented much the same characters as before.

Box 3 was more uniformly superior.

Box 4 never attained so high a development as in the preceding season.

Box 5, on the other hand, never sank so low; but both it and box 6 showed the same general good development as last year.

The root-development affords the greatest contrast with that of last year. Box 1 is the same relatively as before; box 2 but little superior to box 1, while last year the roots in this box attained the maximum development.

The roots in box 3 were medium instead of high; those in 4 were higher than previously; those in 5 were the highest of all in point of general development, instead of being nearly the lowest, as was the case last year.

In box 6 the difference was not great between the condition of the roots in the two seasons.

It is worth noting that while the root-development last season was greatest under the influence of mineral manures, and nearly lowest under that of mineral and nitrate combined, in the present season the conditions were almost precisely reversed. Whether this was accidental, or whether it was referable to altered conditions of temperature, humidity, or the like, is not determinable from existing evidence.

Anthoxanthum.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*b*	*c*	*d*	*f*	*e*
May 2	*a*	*b*	*c*	*d*	*f*	*e*
„ 16	...	...	*c*	*d*	*f*	*e*
„ 23	*a*	*b*	*c*	*d*	*f*	*e*
„ 30	*a*	*b*	*d*	*c*	*f*	*e*
June 6	...	...	*d*	*c*	*f*	*e*
„ 13	...	...	*c*	*d*	*f*	*e*
„ 20	...	...	*c*	*e*	*f*	*d*
„ 27	*a*	*b*	*c*	*f*	*d*	*e*
Cut on June 28.						
August 22	*e*	*b*	*c*	*d*	*f*	*a*
September 5 ...	*e*	...	...	*d*	*f*	*a*
December 17 ...	*b*	*a*	*d*	*c*	*f*	*e*
1871.						
April 22. All dead.						

This is apparently a plant that thrives better in association with others than when grown by itself; whether because under the former circumstances it receives more shelter and is not dried up so rapidly, is uncertain.

The growth in all the boxes was uneven, especially in boxes 1 and 2, and least so in the most highly manured boxes 5 and 6. Throughout, the plants in the unmanured box and in that in which mineral manures alone were used, were the weakest until after the cutting, when the second growth showed itself in greater luxuriance than in almost any other box,—a high position, however, which it soon lost, as in December the plants in boxes 1 and 2 were again at a low standard.

Can it be that the plants in box 6, being in full growth and vigour at the time of cutting, felt the check caused by that operation more than the weaker, less vigorous plants in boxes 1 and 2?

The ammonia salts produced throughout a tolerably even low-medium growth, about the same as regards degree of vigour as the plants treated with nitrate of soda.

The plants treated with mineral salts and ammonia salts combined showed the highest growth; and not only this, but they were also the most floriferous.

The mixture of mineral manure and nitrate of soda in box 6 also produced a high degree of vigour and abundant bloom. The singular check experienced after the cutting has already been commented on.

As the plants did not survive the winter, no observations were made on the roots.

When the growth in the six boxes is compared with that of the preceding year, it will be seen that the same low relative growth occurred in boxes 1 and 2 as before, though this year the advantage was with the mineral manure.

The ammonia salts, which last season produced so much fluctuation in growth, were much more uniform in their effect than before; and the same may be said of the nitrate of soda.

A slight difference is observable between boxes 5 and 6. Last year it was the mineral and nitrate which produced the greatest vigour of growth, while this year it was the mineral and ammonia which induced the greatest development. Moreover it is worthy of remark that a similar decline in vigour after cutting occurred in box 6 last season as in this.

Lolium.

As shown in the Table on the following page, the lowest development occurred in the unmanured boxes up to the time of cutting, after which, as in the case of the *Anthoxanthum*, the plants in box 6 were lowest in point of vigour and remained so.

The plants grown with mineral manure were also of a low degree of vigour, but increased after cutting, and remained high till the end of April 1871.

In the case of the ammonia salts a low and tolerably uniform growth occurred throughout.

Nitrate of soda produced a very high degree of vigour up to the time of cutting, after which a slight decline was manifest.

The mixture of ammonia and mineral salts also produced a high degree of vigour, which persisted throughout.

Mineral salts and nitrate induced a high average growth, which declined very much after the cutting, as already alluded to.

The plants in boxes 4, 5, and 6 were the earliest to show flowers, while those in box 5, mineral and ammonia, produced the greatest number of flowers. The ripening of the seed was latest in boxes 1 and 6.

Lolium perenne.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	...	...	*f*	*e*	*d*
May 2	*a*	*c*	*b*	*f*	*e*	*d*
„ 9	*a*	...	*b*	*f*	*e*	...
„ 16	*a*	*b*	*c*	*f*	*e*	*d*
„ 23	*a*	*b*	*d*	*e*	*f*	*c*
„ 30	*a*	*b*	*c*	*f*	*e*	*d*
June 6............	*a*	*b*	*c*	*f*	*e*	*d*
„ 13	*a*	*b*	*c*	*e*	*f*	*d*
„ 20	...	...	*c*	*e*	*f*	*d*
Cut on June 28.						
August 22	*b*	*e*	*c*	*d*	*f*	*a*
September 5 ...	*b*	*e*	...	...	*f*	*a*
December 17 ...	...	...	...	...	...	...
1871.						
April 22	*a*	*e*	*d*	*c*	*f*	*b*
„ „ Root...	*b*	*f*	*d*	*c*	*e*	*a*

Roots. The lowest degree of vigour of the roots was shown in box 6, at the same time that the plant was also relatively deficient in vigour. It may be surmised that had the roots been examined in June, when the plants were comparatively highly developed, they would have been found correspondingly developed. This is borne out by the circumstance that in box 2 the roots in April 1871 were at the maximum, while the plant was also high.

Ammonia salts also induced a high medium root-growth, which was somewhat less in the case of the nitrate of soda.

In the mineral and ammonia box root-development was high as well as that of the plant, while in the mineral and nitrate, as before stated, the root-growth was relatively deficient.

As contrasted with the general results observed in the preceding season, the plants in boxes 1, 2, and 3 were about the same; those in 4 (nitrate of soda) were throughout more vigorous than before; those in 5 and 6 about the same, save in the extraordinary decline in vigour manifested by the plants in box 6 after the cutting in 1870.

The root-development also presents some differences as compared with the former season's growth. In box 1 the growth was about the same. In box 2, on the other hand, root-development in 1871 was at a maximum, while in the preceding year it was very low.

In the ammonia, box 3, root-development was high in both years. In the nitrate box the roots attained the same degree of development in both years.

In the case of the mineral and ammonia (5) the roots showed a higher development than in the preceding season.

Lastly, in box 6, while in 1870 the roots were high, in 1871 they were low, the plants never having recovered the check consequent on the cutting.

Poa annua.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*c*	*d*	*f*	*e*	*b*
May 2	*a*	*b*	*d*	*f*	*e*	*c*
„ 9	*a*	*b*	*c*	*f*	*e*	*d*
„ 16	*a*	*b*	*c*	...	...	*d*
„ 23	*a*	*b*	*c*	*f*	*e*	*d*
„ 30	*a*	*b*	*c*	*f*	*e*	*d*
June 6	*a*	*b*	*c*	...	*d*	...
„ 20	*a*	*b*	*c*	*d*	*f*	*e*
„ 27	*b*	*a*	*c*	*d*	*f*	*e*
Cut on June 27.						
August 22	All dead from drought except in 2, in which box they are sickly.					

In the unmanured box growth was uneven and the plant weak.

Mineral manures were of little benefit.

Ammonia salts produced a vigorous medium growth.

Nitrate of soda induced for a time the most robust growth in the series; and it was noted that the plants in this box were the first to flower.

Under the influence of the mineral and ammonia salts, a comparatively very vigorous growth was gained; indeed, at the time of cutting, the plants in this box were the most highly developed of the series.

The plants in the box treated with mineral and nitrate exhibited some fluctuation in growth; at first the degree of vigour was slight, but subsequently it attained to a high degree. The plants in the two last-mentioned boxes suffered less from drought than the rest, though few survived the cutting for any length of time; indeed, as annual plants, having perfected their seeds, it was not to be expected that they would do so.

The colour of the foliage was in general paler in boxes 1 and 2 throughout the experiment, and brightest in box 3 (ammonia).

Owing to the death of the plants months before the roots were turned out of the boxes, I am not able to add any thing as to the comparative root-development. Neither can any trustworthy comparison be made between the growth in the present season and that in the former one, owing to the admixture of species in the boxes.

Poa trivialis.

In the unmanured box growth was, on the whole, at least as good as in the box treated with mineral manures; but in both the plant was throughout sickly and uneven.

Under the influence of the ammonia salts growth was very uniform, but of medium development.

Nitrate of soda produced a rather higher degree of vigour in the plant, equalling, or nearly so, that induced by the mineral and ammonia-salts combined. At the close of the experiments, however, and after the cutting, the plants in this box were the most vigorously developed.

In the box treated with mineral manures and nitrate, the vigour of growth was, till the cutting, uniformly greater than in any of the rest.

The plants in boxes 1 and 2 produced but few flowers, those in the remaining boxes produced their flowers at about the same period; but it was noticed that the flowers were more abundant in boxes 5 and 6 than in the rest.

Poa trivialis.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*b*	*c*	*e*	*d*	*f*
May 2	...	...	*c*	*e*	*d*	*f*
May 9	...	...	*c*	*e*	*d*	*f*
„ 16	*a*	*b*	*c*	*e*	*d*	*f*
„ 23	...	...	*c*	*d*	*e*	*f*
„ 30	...	...	*c*	*d*	*e*	*f*
June 6............	*b*	*a*	*c*	*d*	*e*	*f*
„ 13	*b*	*a*	*c*	*d*	*e*	*f*
„ 20	*b*	*a*	*c*	*d*	*e*	*f*
„ 27	*a*	*b*	*c*	...	...	*f*
Cut on June 27.						
August 22	*d*	...	...	*c*	*f*	*e*
September 5 ...	...	*a*	*b*	...	*f*	*e*

The plants in boxes 5 and 6 suffered considerably from drought. All the plants did badly after the cutting.

Further remarks are omitted for the same reasons as those mentioned under *Poa annua*.

Bromus.

The plants in the unmanured box presented an uneven growth and a low degree of vigour throughout the whole of the summer and autumn of 1870; but it is worthy of note that in the spring of 1871 the plants remaining in this box were more vigorous than any of the rest.

The growth of the plants under the influence of mineral manures was subject to fluctuation and never reached a high degree. At the time of cutting, the plants were somewhat sickly, and their state of maturity comparatively early.

Ammonia salts produced an uneven plant of medium degree of development.

Nitrate of soda seems to have induced, in the early part of the season, the most robust and vigorous growth. It was also remarked that the maturity of the plant was comparatively early in this box.

Bromus mollis.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*c*	*b*	*f*	*e*	*d*
May 2	*a*	*c*	*b*	*f*	*e*	*d*
" 9	*a*	*c*	*b*	*f*	*e*	*d*
" 16	*a*	*c*	*b*	*f*	*e*	*d*
" 23	*a*	*b*	*c*	*f*	...	...
" 30	*b*	*a*	*c*	*f*	*e*	*d*
June 6	*a*	*b*	*c*	*f*	*d*	*e*
" 13	*a*	*b*	*c*	*e*	*f*	*d*
" 20	*a*	*c*	*b*	*e*	*f*	*d*
" 27	*a*	*c*	*b*	*d*	*f*	*e*
Cut on June 27.						
August 22	*a*	*b*	*c*	...	*f*	...
September 5 ...	*b*	*a*	*c*	...	*f*	...
December 17 ...	...	...	...	...	...	...
1871.						
April 22	*f*	*b*	*a*	*e*	*c*	*d*
" " Root...	*d*	*b*	*e*	*f*	*a*	*c*

The plants in the box with the mixed ammonia and mineral salts were also well developed throughout, and at the end of the season of 1870 were the most so of all.

Mineral and nitrate induced the growth of good average plants, with comparatively little fluctuation throughout.

Flowers were produced in about the same numbers in boxes 4, 5, and 6, and much less abundantly in boxes 1 to 3.

The roots in the unmanured box, when examined in April 1871, showed a high degree of vigour, those in the second box (min. man.) a low degree. In box 3 (ammonia) the development was high, in the fourth (nitrate of soda) highest of all; in the fifth (mineral and ammonia) the root-development was lowest of all, while in the sixth (mineral and nitrate) it was medium.

The discrepancy between the development of the plant on April 22, 1871, and that of the root on the same day is well shown in the Table.

A general comparison of results with those recorded in the preceding year, shows a sufficiently close approximation. Thus the plants in boxes 1, 2, and 3 were nearly the same in point of vigour in both seasons. This was even more markedly the case in box 4. Box 5 presented much the same characteristics as previously; but the plants in box 6 presented this year a somewhat lower average.

The root-development was so different from what it was last year that it does not admit of useful comparison. In box 6, however, the root was noted as having attained the same relative degree of vigour in both years.

Trifolium pratense.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	...	*a*	...	*d*	*f*	*e*
May 2	*b*	*a*	*c*	*d*	*f*	*e*
„ 9	*b*	*a*	*c*	*d*	*f*	*e*
„ 16	*b*	*a*	*c*	*d*	*f*	*e*
„ 23	*b*	*a*	*c*	...	...	*f*
„ 30	*c*	*b*	*a*	*d*	*e*	*f*
June 6............	*b*	*a*	*c*	*e*	*d*	*f*
„ 13	...	*a*	...	*f*	*d*	*e*
„ 20	*b*	*a*	*c*	*e*	*d*	*f*
„ 27	...	*a*	...	*f*	*d*	*e*
July 4	...	...	*a*	*d*	*e*	*f*
„ 11	...	*c*	...	*d*	*e*	*f*
Cut on July 15.						
August 22	*d*	*c*	*e*	*f*	*a*	*b*
September 5 ...	*e*	...	*d*	*f*	*a*	...
1871.						
April 22	*f*	*b*	*c*	*a*	*a*	*e*
„ „ Roots...	*f*	*a*	*b*	*d*	*c*	*e*

From the preceding Table it is evident that mineral manures were of little or no advantage to this plant, its development being, for the most part, better without any manure at all than with mineral manure; indeed the plants so treated were unhealthy throughout.

The ammonia salts produced a low medium development, exceeded throughout by that resulting from the use of nitrate of soda (box 4). The latter salt, indeed, in the autumn of 1870, after the cutting, seems to have been productive of the most vigorous development.

The mixed mineral and ammonia (5) and mineral and nitrate (6) were about equal in their results, growth in the one predominating over that in the other at one time, while at another period the conditions were reversed. It is noteworthy that after the cutting in the autumn the plants in these two boxes made comparatively but little growth, as if exhausted by their previous efforts. The flowers were produced at about the same time in all six boxes; but it was noted that the flowers in boxes 1 and **2** were comparatively very few, while those in box 6 were very numerous, and, moreover, that the seeds were earlier ripe in boxes 5 and 6 than in the others.

The effect of the summer's drought was most manifest in boxes 4–6, and least in the three others.

The root-development, as examined in April 1871, was most advanced in the unmanured box, next in that where a mixture of mineral and nitrate was employed, the nitrate seeming to favour the root-development, as shown by the greater vigour of the root in box 4 than in boxes 2, 3, or 5. The mineral manure in box 2 seemed to have been the least favourable of all to root-growth, and, indeed, to the general growth of the plant.

When the general results are contrasted with those noted the previous season, a pretty close correspondence may be observed, except in the case of box 2, the plants in which were throughout unhealthy and injured by drought. The characteristic effect of mineral manures in favouring growth was therefore in this case not obvious. On the whole there was less fluctuation in the periodical amount of growth than in the preceding year; and it seems reasonable to infer that a considerable amount of the fluctuation that was witnessed was attributable to the drought of the summer.

Great contrast is observable in the root-development of the two seasons. In the unmanured box, last year the root was lowest in point of development, in this season highest, some of the roots measuring $2\frac{1}{2}$ feet. On the other hand, the roots in box 2 (mineral manure) last year were very high, in this year they were very poorly developed. A precisely similar remark holds good in the case of box 3. In box 4 the discrepancy is not so great; this season the roots in this box measured two feet and upwards in length.

Lotus corniculatus.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*b*	*c*	*e*	*f*	*d*
May 2	*a*	*b*	...	*c*	*d*	...
„ 9	*a*	*b*	*d*	*c*	*f*	*e*
„ 16	*a*	*b*	*e*	*c*	*f*	*d*
„ 23	*a*	*b*	*c*	*d*	*f*	*e*
„ 30	*a*	*b*	...	...	*f*	*e*
June 6............	*a*	*b*	*c*	*e*	*d*	*f*
„ 13	*a*	*b*	...	...	*e*	*f*
„ 20	*c*	...	...	*d*	*f*	*e*
„ 27	*c*	...	...	*d*	*f*	*e*
Cut on June 28.						
July 4	*d*	*a*	*c*	*b*	...	...
„ 11	*e*	*c*	...	...	*f*	*d*
„ 18	...	...	...	...	*f*	...
Cut a second time on July 21.						
August 22	*a*	*f*	...	*e*	...	*b*
September 5 ...	*a*	*f*	*c*	*e*	*d*	*b*
1871.						
April 22	*a*	*e*	*c*	*f*	*d*	*b*
„ „ Root...	*b*	*f*	*d*	*e*	*c*	*a*

In the unmanured box the plants generally were of comparatively feeble development, improving materially in this respect about midsummer, and retaining the same position after the first cutting, but showing little vigour after the second cutting.

Mineral manures had but slight effect at first; but after the second cutting the plants grown in them manifested the highest degree of development.

Ammonia salts produced a medium growth, rather more favourable on the whole than nitrate of soda.

The mixture of mineral and ammonia produced pretty uniformly the highest development; and the mineral and nitrate was but little inferior, though more subject to fluctuation.

All were in flower at about the same period. The plants in the mineral-and-ammonia box were the earliest to ripen seed, while those in the unmanured box and in that treated with nitrate of soda were the latest. The plants in boxes 3, 4, and 6 were the earliest to feel the effects of the drought, and subsequently those in 2; the plants in box 5 were the least injuriously affected of all. It would thus appear as if the mineral and ammonia not only induced the greatest amount of vigour, but also the greatest abundance of and the earliest ripened seed.

The roots on April 22, 1870, were most imperfectly developed in box 6, were better in box 1, and best of all in the mineral manure, corresponding doubtless with the increased development of the plant noticed latterly in that box.

Comparing the development of the plant with that in the preceding season, we find rather more fluctuation in box 1. Box 2 exhibits about the same relative condition till after the second cutting, when the plants attained greater development than at any time in the preceding year. The effect of a check such as that caused by the cutting, would not be relatively so injurious to a plant of low vigour, other things being equal, as to one in which growth was more active. Moreover the plant in box 2 was less injuriously affected by drought than was the case in most of the other boxes. In box 3 the development was about the same as last year, with rather more fluctuation. In box 4 the plants seem to have attained a higher average growth than last year, but with greater fluctuations. Box 5 is nearly the same as last year. Box 6 is free from that violent fluctuation which marked its occupants in the preceding season.

The root-growth in No. 2 is the highest this season, instead of nearly the lowest as it was last year, the reverse of what was observed in *Dactylis*, while in box 6 it is lowest instead of nearly highest as in the former season.

Trifolium repens.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	...	...	*c*	*e*	*d*	*f*
May 2	...	...	*c*	*d*	*e*	*f*
„ 9	...	...	*c*	*d*	*e*	*f*
„ 16	...	...	*c*	*d*	*e*	*f*
„ 23	Leaves dead.		...	*d*	*e*	*f*
„ 30	*c*	*b*	*a*	*d*	*e*	*f*
June 6............	*c*	*b*	*a*	*d*	*e*	*f*
„ 13	*c*	*b*	*a*	*d*	*e*	*f*
„ 20	*c*	*b*	*a*	*d*	*e*	*f*
„ 27	...	...	*a*	*d*	*e*	*f*
July 4	...	...	*a*	*d*	*e*	*f*
„ 11	*c*	*b*	*a*	*d*	*e*	*f*
Cut on July 15.						
August 22	Nearly all dead.					

The plants in all the boxes, except perhaps those in box 6, were in bad health throughout the early part of the experiment. At the end of May, however, some improvement took place, especially in the case of box 6, the plants in which became vigorous in their development.

The production of flowers was first observed in boxes 4, 5, and 6, all about the same time. With the exception of those in box 6 the plants were so unhealthy that little reliance can be placed on the comparison of the growth of this season with those of the former year. It is worth noticing, however, that whereas in 1869 the plants grown in box 2 (mineral manures) were uniformly of a relatively high degree of vigour, in 1870 the reverse occurred, as was also the case in *Trifolium pratense.*

The herbage was cut on July 15, and on August 22 it was noted that nearly all the plants were dead; hence no notes on root-development were taken.

Plantago lanceolata.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*e*	*a*	*b*	*d*	*c*	*f*
May 2	*e*	*a*	*c*	*d*	*b*	*f*
„ 9	*b*	*a*	*c*	*e*	*d*	*f*
„ 16	*c*	*a*	*b*	*e*	*d*	*f*
„ 23	*c*	*a*	*b*	*e*	*d*	*f*
„ 30	*c*	*a*	*b*	*e*	*d*	*f*
June 6	*c*	*a*	*b*	*f*	*d*	*e*
„ 13	*c*	*a*	*b*	*e*	*d*	*f*
„ 20	*d*	*a*	*b*	*c*	*e*	*f*
„ 27	*e*	*c*	*a*	*b*	*d*	*f*
Cut on June 28.						
August 22	Not yet commenced to grow.					
September 5 ...	Just beginning to grow.					
1871.						
April 22	*a*	Two varieties, much individual variation; some plants seedlings of last year				
„ „ Roots...	*a*	*b*	*f*	*d*	*e*	*c*

In the unmanured box the plants attained a considerably higher degree of development than was usual in the other cases where no fertilizing agent was employed.

With the mineral manure, on the contrary, the lowest degree of development was throughout maintained.

With ammonia salts a similarly uniform and low development occurred.

In the case of nitrate of soda a high degree of development was secured, greater, on the whole, than with the mineral salts and ammonia.

The mineral and nitrate produced uniformly the highest degree of vigour.

This series affords a striking exemplification of the effect of the combination of the manures, the mineral alone being relatively useless, and the ammonia salts alone positively less favourable than the unmanured soil; the nitrate of soda the most efficacious of all the uncombined manures. The value of the nitrate still further showed itself in the admixture with mineral manures as in box 6.

The foliage in boxes 4 and 6 was generally of a richer, darker colour than in the rest. The plants in boxes 4 and 5 were rather unequal, and suffered considerably from drought, as also did those in 6. All began to flower about the same time; but the flowers were not only more numerous, but also finer in boxes 4 and 6 than in the others. In box 2 they were few in number and weak in development.

When examined in April 1871, the roots in box 1 were the lowest in point of development, those in box 3 (ammonia salts) the most luxuriant, next those in box 5 (mineral and ammonia), then those in 4 (nitrate of soda).

Comparing the growth with that which took place in the foregoing season, we find considerable differences and much less fluctuation.

The unmanured plants last season were the feeblest of all—not so this year. The plants subjected to mineral manures were higher last year than this, those in 3 also higher.

In box 4 there was greater similarity in degree of growth in the two seasons.

In 5 the growth was also about the same, but relatively slightly less developed in the present season.

In 6 the development was uniformly higher this year than in the last, when it was also high.

The root-growth in the two years presents some few points of contrast. Boxes 1, 2, 4, and 6 presented the same relative degree of vigour in both seasons. The roots in box 3 in the former season were inferior to those in the present. In 5 the growth was nearly the same.

The plants examined in April 1871, at the same time as the roots, exhibited much individual variation; this is to be accounted for probably by the fact that some of the plants were seedlings from the former year. The fact of these individual variations (in hairiness, breadth of leaf, shape of flower-spike, &c.) showing themselves in the same box is worth notice as indicating that uniformity of external conditions presents no bar to variation. It must be remembered that in speaking of variations I am not here alluding to mere varying degrees of vigour. In box 4, however, all the plants were more "stocky" than in the other boxes; *i. e.* the rhizome was more freely divided into thick branches than was the case in the other boxes. In box 3 the root-fibres were more copious than in the others.

Achillea Millefolium.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*b*	*e*	*c*	*f*	*d*
May 2	*a*	*c*	*e*	*b*	*f*	*d*
" 16	*a*	*c*	*d*	*b*	*f*	*e*
" 23	*a*	*c*	*d*	*b*	...	...
" 30	*a*	...	*d*	...	*f*	*e*
June 6	*a*	*b*	*d*	*c*	*e*	*f*
" 13	*a*	*c*	*e*	*b*	*d*	*f*
" 20	*a*	*c*	*d*	*b*	*e*	*f*
" 27	*a*	*b*	...	*c*	...	*f*
July 4	*a*	*b*	...	*c*	...	*f*
" 11	*a*	*b*	...	*c*	...	*d*
" 18	...	...	*e*	*d*	*f*	*c*
Cut on July 21.						
1871.						
April 22	*a*	*b*	*c*	*d*	...	...
" " Root...	*a*	*b*	*c*	*d*	*e*	*f*

The unmanured plants were the least vigorous of any.

Those treated with mineral manures and with nitrate of soda respectively were of a relatively low degree of development.

The ammonia salts produced a somewhat better growth, while the mixed manures 5 and 6 produced, on the whole, the best plant, though subject in each case to considerable variation.

The roots were least developed in the unmanured box, and most so in box 6. All the plants were healthy till injured by drought, which caused the flowers to fall off before the seed ripened. Flowers were first observed in the box treated with ammonia.

With the exception of the plants in the unmanured box, which this year presented no trace of the sudden rise from the lowest to the maximum degree of development, and of those in boxes 5 and 6, which showed no evidence of that fall from the maximum to the minimum degree which was observed last season, the general results in all the boxes may be said to have been about the same.

The roots also presented much the same characters as during the preceding season, except in the case of the nitrate-of-soda box, which was not so highly developed this year as in the former one, while in box 6 (mineral and nitrate) the condition of the roots in the two years was exactly reversed.

Carum Carui.

Boxes	1.	2.	3.	4.	5.	6.
1870.						
April 25	*a*	*d*	*c*	*b*	*f*	*e*
May 2	*a*	*d*	...	...	*f*	*e*
„ 9	*a*	*d*	*c*	*b*	*f*	*e*
„ 16	*a*	...	*c*	*b*	*f*	...
„ 23	...	*f*	...	*c*	*e*	*d*
„ 30	...	...	...	...	...	...
June 6	*b*	*f*	*a*	*c*	*d*	*e*
„ 13	*c*	*e*	...	...	*d*	*f*
„ 20	*b*	*e*	*c*	*a*	*d*	*f*
„ 27	...	*d*	*c*	...	*e*	*f*
Cut on June 28.						
August 22	*b*	*e*	*c*	*a*	*d*	*f*
September 5 ...	...	*e*	...	*a*	*d*	*f*
1871.						
April 22	*a*	*c*	*f*	*d*	*b*	*e*
„ „ Roots	*a*	*b*	*f*	*e*	*d*	*c*

The plants in the unmanured box, and in that treated with nitrate of soda, manifested the feeblest degree of development throughout.

Mineral manures were more efficacious in securing development than either of the two just mentioned, or than the ammonia salts.

The two mixed manures 5 and 6 secured, on the whole, the best development.

Flowers were shown early in all the boxes, having, probably, been formed the previous season. In box 5 the flowers were more numerous than in the rest, but, perhaps in consequence of the drought, almost all the flowers fell off before the seed was fully ripe.

The roots in the unmanured box were the least developed when examined in April; those in box 2 (mineral manures) were scarcely more developed.

In box 3, however (ammonia salts), the roots attained a maximum of development.

In the nitrate-of-soda box they were nearly equally luxuriant, but less so in boxes 5 and 6.

Looking now to the results of this season's growth as contrasted with that of the preceding year, we find the plants in the unmanured box to have been about in the same relative condition each year.

In box 2 (mineral manure) considerable deviation was observable, the growth this year being much more developed and more subject to fluctuation.

Box 3 (ammonia) presented, on the whole, about the same condition; but the plants in it attained a higher degree of development at the end of the season this year than they did in the foregoing one.

In box 4 (nitrate) the plants this year, except at the end, presented a much lower general average of growth than before.

In boxes 5 and 6 the differences between this season and the last were not so strongly marked, though there was more fluctuation this year than before.

Some of the differences observed were no doubt attributable to the plants having produced flowers this season, which they did not do in the preceding year.

The comparative root-growth differed this year from that of last mainly in the circumstance that it was this year greatest in the boxes treated with ammonia salts and with nitrate of soda respectively.

On the Comparative Effects of the Six Different Conditions of Manuring on the Twelve Species of Plants.

If now, instead of tracing the effect of the several manures upon each description of plant separately, we compare the general effect of each manure on all the twelve plants, *i.e.* consider the comparative effect of the six different conditions of manuring, we find the following general results brought out.

1. *Unmanured.*

In the unmanured box the comparative vigour in all twelve plants was, generally speaking, at its minimum—though, after the cutting, the plants sometimes manifested the highest degree, as in *Bromus* and *Trifolium pratense*; in *Plantago*, on the other hand, the plants were at first high and afterwards degenerated. In general terms, this result is the same as that obtained last year.

2. *Mineral Manures.*

The plants under the influence of mineral manures were also, for the most part, of low growth, as in all the grasses and clovers—with this exception, that in *Lotus* as well as in *Carum* ultimately the plants manifested the maximum degree of development. So far as the grasses, plantains, milfoil and *Carum* are concerned, this tallied fairly with the results of the former year; but in the case of the clovers the case was reversed.

3. *Ammonia salts.*

The ammonia salts acted differently on the different grasses, having been, as in the preceding year, more favourable to the *Dactylis* than to the others, in which but little benefit was observable till the spring of 1871, when the experiments were brought to a conclusion. These salts also were comparatively of little benefit to the *Leguminosæ*, or indeed to the other plants. The general results were much the same as in 1869, but with less fluctuation in the case of *Anthoxanthum*. In *Plantago* the average vigour of growth was lower than in the preceding season.

4. *Nitrate of Soda.*

Nitrate of soda proved advantageous to the development of the grasses in a rather marked degree, less so and with greater fluctuation to the clovers, and still less to the remaining plants, to the *Carum* least of all. The results in the case of the grasses are nearly the same as last year, but with less fluctuation. In the case of the clovers there was rather more fluctuation. *Achillea* and *Carum* were less favoured than before.

5. *Mineral and Ammonia.*

Mineral and ammonia salts in combination were generally serviceable to all the plants, especially to the clovers and to the *Achillea.* The grasses also were considerably benefited by them. In general terms it may be said that the effect on all the plants under treatment was the same as in the preceding season.

6. *Mineral and Nitrate.*

Mineral and nitrate seemed specially favourable to the clovers, the Plantain, Milfoil and *Carum.* On the grasses their action seemed variable; for while they were highly favourable to *Poa trivialis*, they were of little use to the *Lolium.* Here, as in other cases, the broad results were very nearly the same as during the former year.

Notes on the Temperature and Rainfall during the Season of 1870.

In the previous Report some remarks were made on the meteorological conditions during the period of observation, and on their apparent effect on the growth of the several plants. It would have been most desirable that these observations should have been continued and extended during the second series of experiments. It so happened, however, that the instruments and the whole plan of observation of meteorological phenomena in the garden was at this time undergoing modification, under the superintendence of Mr. Glaisher. During this period of transition it was hardly possible to secure sufficiently continuous and accurate observations.

The season of 1870 was uniformly remarkable for the great and prolonged drought which prevailed. The following remarks are based on the Tables and Reports furnished to the *Gardeners' Chronicle* by Mr. Glaisher, wherein are recorded weekly the observations taken at Greenwich.

There are, of course, differences in the climate of Greenwich as compared with that of Chiswick ; nevertheless those differences are so slight, that in a broad sense the climate may be said to be all but identical in the two places*.

TABLE *showing the Mean Temperature, daily Range, and amount of Rainfall, as observed at Greenwich by Mr. Glaisher from April* 1 *to July* 31, 1870.

Date.	Mean temp.	Range.	Rain.	Date.	Mean temp.	Range.	Rain.
	°	°	in.		°	°	in.
April 1 ...	37·9	17·9		April 26...	49·7	23·1	0·05
„ 2 ...	41·1	30·4		„ 27...	45·0	15·2	
„ 3 ...	40·8	24·1		„ 28...	40·7	13·4	0·01
„ 4 ...	38·1	26·9		„ 29...	43·6	16·5	0·03
„ 5 ...	44·1	27·2		„ 30...	47·8	17·5	0·04
„ 6 ...	45·4	37·5		May 1 ...	49·9	16·6	
„ 7 ...	50·6	29·4		„ 2 ...	45·1	15·7	0·02
„ 8 .	51·9	23·7		„ 3 ...	39·7	19·0	
„ 9 ...	46·9	16·2	0·07	„ 4 ...	42·2	24·7	
„ 10...	49·4	25·5	0·07	„ 5 ...	48·1	23·9	
„ 11...	47·8	22·7		„ 6 ...	48·7	23·1	
„ 12...	47·2	23·4		„ 7 ...	47·6	22·6	
„ 13...	49·2	22·1		„ 8 ...	41·7	20·1	
„ 14...	54·0	18·1		„ 9 ...	44·0	31·7	
„ 15...	52·2	22·1		„ 10...	47·4	21·6	
„ 16...	50·4	27·3		„ 11...	46·3	25·6	0·20
„ 17...	50·7	24·3		„ 12...	53·5	15·3	
„ 18...	46·8	18·0		„ 13...	51·9	11·3	0·18
„ 19...	53·0	36·6		„ 14...	55·2	17·6	
„ 20...	60·5	33·2		„ 15...	53·2	21·7	
„ 21...	60·5	23·3		„ 16...	55·5	17·7	
„ 22...	55·3	28·3		„ 17...	53·3	25·7	
„ 23...	53·8	16·5		„ 18...	57·6	33·9	
„ 24...	50·5	23·1		„ 19...	63·9	34·0	
„ 25...	55·4	19·9		„ 20...	65·2	31·6	

* In the 'Gardeners' Chronicle,' 1870, pp. 731, 735, are some remarks on the climate of the two places, and a diagram showing the very close correspondence of the meteorological phenomena at Chiswick and Greenwich respectively during forty years. The reader is also referred to Mr. Glaisher's elaborate "Reduction of the Meteorological Observations made at the Royal Horticultural Gardens at Chiswick in the years 1826–69," Journ. Roy. Hort. Soc. vol. ii. Supplement.

TABLE (*continued*).

Date.	Mean temp.	Range.	Rain.	Date.	Mean temp.	Range.	Rain.
	°	°	in.		°	°	in.
May 21...	67·2	34·0		June 26...	57·5	18·6	
„ 22...	64·1	32·6		„ 27...	61·5	16·1	
„ 23...	51·9	16·2		„ 28...	66·6	19·3	
„ 24...	55·9	38·2		„ 29...	58·2	30·2	
„ 25...	59·7	21·9		„ 30...	58·0	18·5	
„ 26...	55·5	34·1		July 1 ...	54·4	18·8	0·15
„ 27...	54·3	24·9		„ 2 ...	56·5	24·2	
„ 28...	54·9	27·9		„ 3 ...	54·8	18·9	
„ 29...	60·4	33·2		„ 4 ...	65·6	27·9	0·04
„ 30...	62·2	26·6		„ 5 ...	65·3	10·6	0·01
„ 31...	55·5	21·3	0·37	„ 6 ...	59·6	16·8	0·06
June 1 ...	54·6	16·8	0·12	„ 7 ...	67·8	27·9	
„ 2 ...	59·2	26·3		„ 8 ...	69·6	39·7	
„ 3 ...	57·4	18·6		„ 9 ...	67·6	16·0	0·01
„ 4 ...	58·0	18·6		„ 10...	69·4	20·3	0·08
„ 5 ...	60·3	20·2		„ 11...	64·1	20·5	0·35
„ 6 ...	54·1	28·9		„ 12...	63·8	17·4	
„ 7 ...	56·9	32·4		„ 13...	62·4	21·0	0·02
„ 8 ...	62·2	25·4		„ 14...	66·8	21·8	
„ 9 ...	58·4	20·1		„ 15...	68·8	33 0	
„ 10...	55·1	21·1		„ 16...	65·4	20·8	0·35
„ 11...	58·5	19·9		„ 17...	63·7	23·1	
„ 12...	63·2	18·0		„ 18...	61·7	13·7	
„ 13...	66·9	28·7		„ 19...	70·7	23·2	
„ 14...	65·4	32·0		„ 20...	71·1	27·5	
„ 15...	65·7	32·5		„ 21...	72·5	28·8	
„ 16...	69·5	32·9	0·04	„ 22...	72·0	26·6	
„ 17...	61·5	24·1	0·11	„ 23...	66·1	25·4	
„ 18...	60·9	25·4		„ 24...	68·8	22·9	
„ 19...	66·3	30·1		„ 25...	72·3	29·2	
„ 20...	66·4	27·1		„ 26...	66·8	16·2	0·93
„ 21...	67·1	30·4		„ 27...	69·3	22·4	
„ 22...	72·2	32·4		„ 28...	57·6	12·9	
„ 23...	60·4	19·9		„ 29...	58·2	17·6	
„ 24...	54·6	13·8	0·12	„ 30...	63·1	19·5	
„ 25...	56·0	20·3		„ 31...	67·9	20·2	

From the details given in the foregoing Table we may ascertain the aggregate mean temperature and rainfall during the intervals between the successive observations, and also the average range of temperature to which the plants may be supposed to have been submitted, such average having been obtained by adding the amounts of the daily range, and dividing by the number of observations.

Date.	Aggregate mean temperature.	Average Range of temperature.	Aggregate Rainfall.
1870	°	°	in.
April 1—24	1178·1	24·19	0·14
„ 25—May 1	332·1	17·3	0·13
May 2—15	664·6	20·13	0·40
„ 16—22	426·8	29·6	0·00
„ 23—29	392·6	28·0	0·00
„ 30—June 5......	407·2	21·1	0·49
June 6—12	408·4	23·2	0·00
„ 13—19............	456·2	29·2	0·15
„ 20—26............	434·2	23·1	0·12
„ 27—July 3	410·0	20·6	0·00
July 4—10	464·9	22·5	0·20
„ 11—17............	455·0	22·3	0·72
„ 18—31............	938·1	21·2	0·93

It is of course not practicable, except in a general way, to draw any deductions as to the relation between the growth of the plants at Chiswick and the climatal record kept at Greenwich. The temperature, range, and rainfall, especially the latter, probably differed somewhat on every day. Be this as it may, the general results during the four months April, May, June, and July cannot have been very different at the two places. A reference to the diagram and papers before cited will show how extremely small was the difference between the two places during forty years. It may, then, with something like certainty, be alleged that the temperature of April 1870 at Chiswick was lower than the average at first, subsequently higher, and at the end of the month again below average; in May the average was lower in the beginning of the month, but higher towards the end, than the adopted mean. The temperature of June and July presented the same characteristics of deficiency in the beginning, and slight excess over the average in the latter half of the respective months.

The rainfall was notoriously deficient, considerably less than half the average quantity having, in all probability, fallen: there was very little in April, still less in May and June, but rather more in July, in which latter month nearly an inch fell on one day.

It would be very interesting to ascertain whether the greater uniformity observable in the growth of the plants in the season of 1870, as contrasted with that in the preceding one, was due to the more equal conditions of the soil or to climatal differences.

No doubt both causes would be influential in producing the results witnessed; but, unfortunately, there are no means of eliminating the effects produced by one set of causes from those resulting from the other.

It would seem probable that the comparatively rainless summer must have had considerable influence, the fluctuations in the rainfall of the preceding season having been considerably greater and the absolute quantity also much larger. An inspection of the records of temperature, however, and especially of the variations in range and of rainfall, compared with the notes on the progress of the plants at the corresponding periods, does not show any general (but only occasional) correspondence. For instance, there was a great difference in the range of temperature in the interval from May 16 to May 22 as contrasted with that in other intervals; but there was no corresponding fluctuation observed in the growth of the plants at or immediately after that time. So, after the rainfall, no particular effects were observable, the quantity having probably been too small. These facts, if considered separately, would lead to the inference that the greater uniformity of soil-constitution, had more influence in producing the comparatively even growth than either the temperature or the rainfall. But this would be a most unsafe deduction in the face of the many observations and experiments tending to show that the majority of plants, other conditions being equal, will accommodate themselves to almost any variety of soil*. Again,

* In reference to this point it may not be irrelevant to allude to some experiments of Professor Hoffmann, of Giessen, an abstract of which, with comments, was given in the 'Gardeners' Chronicle,' May 14, 1870, from which we quote the following:—"In a previous set of experiments the Giessen Professor had ascertained that the particular plants under observation grew equally well in all the varieties of soil in which they were placed, provided due care was taken to prevent the growth of intruding weeds. Having arrived at this result, Professor Hoffmann next left the several plants to themselves, with the view of ascertaining how they would comport themselves without assistance against the inroads of weeds. The result was that the weeds completely gained the upper hand, as might have been expected from their known habit. The species which held out longest was *Asperula cynanchica.* This plant, after having been grown in a bed for three years, and protected from the weed-invasion by the use of the hoe, was then left to take care of itself. It held out for four years, but was ultimately elbowed out by the intruders. Bearing in mind the principle of 'set a rogue to catch a rogue,' Professor Hoffmann then set himself to observe the results of the internecine struggle between the weeds themselves, thinking that the ultimate survivors would perhaps prove to have special affinities for the soil in which they grew.

"Thus left to themselves the beds became so densely covered, that in a square the comparatively uneven root-growth observed prevents any such inference from being drawn. Repeated experiments under a great

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foot the Professor counted 460 living plants, and the remnants of many others, which had succumbed in the encounter. Every year in July the beds were examined; and every year the number of species was found to have diminished. Melilots, at first abundant, gradually disappeared; *Artemisia vulgaris* succumbed after two or three years; and so on, till at length only a few species were left; and these not only persisted but had slowly gained ground from year to year, and ultimately remained in possession of the plot. The plots under observation were 2 mètres 30 centim. long, 1 mètre broad, all as nearly as possible under the same conditions, save that the soil was varied, in some cases consisting of the ordinary soil of the garden, in others of an admixture of lime, in others of sand, or of sand and lime, and so forth.

"Of the 107 species under observation all, or nearly all, found the most essential requisites of their existence equally well in all the varieties of soil; so that, other conditions being equal, the nature of the soil is indifferent. The species which remained victors, all the others being ultimately dispossessed, were:—*Triticum repens* (Couch), *Poa pratensis*, *Potentilla reptans*, *Acer pseudo-platanus* (Sycamore), *Cornus sanguinea*, native plants; and *Aster salignus*, *A. parviflorus*, *Euphorbia virgata*, and *Prunus padus*, derived from other portions of the garden.

"It may therefore be inferred that the district in which these experiments were made would in process of time, if no obstacle were afforded, become covered with meadows and woods—meadows in the low ground, and woods in elevated places. Again the experiments show that the survival of certain plants has not been influenced by the nature of the soil: thus the Couch-grass was ultimately spread over all the plots, whether of sand, or of loam, or of lime, whether drained or undrained; so also with *Poa pratensis* and *Potentilla reptans*; so that the chemical and physical nature of the soil, as has been so often shown in similar investigations, plays only a secondary part.

"As to the action of shade, it was found by Professor Hoffmann that low-growing plants, especially if annuals, disappeared rapidly, while taller-growing plants, such as Couch, *Prunus padus*, &c., survived. The survival of certain plants, then (Couch, *Aster*, *Potentilla*, &c.), is due much less to external conditions than to the "habit" of the plant itself—that is to say, to the facility the plant has of adapting itself to varying external conditions, and thus of triumphing over others less favourably endowed in this wise.

"The immediate source of victory lies in the powerful root-growth of the survivors, including under the general term root, not only the root proper, but the offshoots and runners which are given off just below or on the surface of the ground. Indeed the latter habit of growth is more advantageous to plants in such a struggle than the development of the true root downwards would be. Among those plants where the roots were equally developed there were nevertheless inequalities of growth, dependent probably on the greater need for light in some species than in others, &c.

"It is clear from Professor Hoffmann's experiments that, but for the continual use of the hoe, and the diligent extirpation of the weeds in our fields variety of conditions are thus required to determine this point. In any case, however, it is desirable to record the facts observed.

Certain effects on particular plants, which in all probability were due to the drought, are mentioned under each plant. Suffice it to say, by way of summary, that they all suffered more or less, and this was especially observable after the cutting. Some died after this; others recovered but slowly. The grasses, trefoils and *Lotus* suffered severely, *Achillea* and *Carum* dropped their flowers before the seed was ripe.

At the conclusion of the previous Report allusion was made to the "habit" or special organization of the plant as an element of the very highest importance in all questions concerning growth; and the result of the observations in 1870 does but increase my sense of the importance of this factor. In no single instance, either in 1869 or 1870, was any *absolute change* in habit observable. Changes in degree there were, a certain peculiarity being intensified, or the reverse, according to varying conditions of manuring; but there was nothing that would lead one to infer that by the agency of any manure, or the operation of any climatal vicissitudes,

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the stronger-growing ones would not only destroy our crops, but also other weeds less vigorous than themselves. The facts thus presented to our notice by Professor Hoffmann are quite in accordance with other observations on this interesting subject; but they are not sufficient, as M. Duchartre well remarks, to explain all the conditions of this complicated problem: thus, in the district adjoining the locality where Professor Hoffmann's experiments were carried on, the predominant plants are not the same as those which ultimately proved victors in the experimental beds.

"Again, there is little in the organization of such a plant as the American waterweed (*Elodea canadensis*) to account for its predominance over the Potamogetons and other water-weeds of our ditches, or in the nature of the common Watercress, which is becoming so great a nuisance in the watercourses of New Zealand—phenomena the more curious when it is remembered that in America the *Elodea* (*Anacharis*) is no more of a nuisance than is the Watercress here."

Note added as this sheet is passing through the press, October 1872.—The general results of Prof. Hoffmann's experiments are given in the *Botanische Zeitung*, July 19, 1872. The Professor regards variation as the manifestation of an innate tendency. The influence of external conditions depends on spontaneous variation and adaptation, or natural selection of the form best adapted to the particular circumstances. But, on the other hand, Professor Hoffmann considers the fixation of varieties or the filiation of species by descent to demand further demonstration.

any change in the plant of a kind that a naturalist would deem of "specific" value could be artificially induced.

All that the manures did in this direction was to enhance the vigour of growth or the reverse. The effect on the vegetative system (leaves, stem, &c.) was in all cases more pronounced and decided than it was on the flowers and seeds.

That greater changes might have been induced by careful selection is of course not open to doubt; but that is not the point with which we are here concerned.

It would seem from this, as indeed all evidence we have yet obtained shows, that "specific" characters are not influenced by external conditions, at any rate within short periods of time. The specific character is an innate quality transmitted by hereditary descent, and not materially altered by changes in external conditions. This was exemplified by the circumstance that in the case of the Plantain (*Plantago lanceolata*), numerous self-sown seedlings appeared in all the experimental boxes (five treated with as many different manures, one unmanured), and among these seedlings were many variations in shape and colour of leaf, pubescence, &c., variations which could not be attributed to the immediate operation of external conditions, seeing that they appeared in all the boxes indifferently, and in each box under the same conditions.

The physiological characters, however, as we have seen, are materially influenced by these agencies; and it is quite conceivable that in course of time they might determine specific changes. These may seem large inferences to be drawn from such premises as are afforded by the Chiswick experiments; but the reader must judge of their value for himself; and he will recollect that few experiments of this character and magnitude have hitherto been made, and few opportunities afforded for examining for so considerable a period so large a number of different plants, and grown under more than usually definite conditions. The magnificent and far more important series of similar experiments carried on for so many years at Rothamsted and at Giessen are not fairly comparable with the Chiswick trials, as the objects and conditions were both different. Moreover the opinions here expressed tally with those of most who have written on the subject.

In reference to the main objects for which these experiments were carried on, the following considerations also seem to claim attention. They are not novel; but, from that very circumstance, as also from the fact that they apply to the cultivation of all or any plants, they seem worth constant attention.

To ensure the successful culture of any plant, and to gain the greatest possible advantage from it, its whole life-history, from germination to death, should be as thoroughly known as possible.

Without such knowledge cultivation must be empirical; and although under one set of circumstances such cultivation may be as successful as could be desired, yet the grower would be at fault in the event of the occurrence of adverse conditions. Possessed of such knowledge the cultivator can do much to remedy any evil which may arise, or make compensation for its effects. At the worst he knows its extent.

Scarcely less important than a knowledge of the mode of life of the plant is an acquaintance with the circumstances causing modifications in it. Among these latter points may be mentioned the physical and chemical characters of the soil,—both important, the former specially so—always presuming there be no excess of hurtful ingredient in the soil and no absolute deficiency of essential elements therein.

The effects of temperature and moisture have already been referred to. All that I would allude to now, in reference to climatal vicissitudes, is the importance in such inquiries as those now under consideration of considering the time at which the changes take place, and the special work which the plant is doing, leaf-, flower-, or seed-making, at that particular period.

Another point which strongly impresses itself in working out the results of the experiments is the advantage that is derived from an admixture of manures. In hardly any instance did mineral manures, or nitrate of soda, or ammonia salts, when applied by themselves, produce any thing like the same amount of vigour as was produced by an admixture of mineral manures with ammonia salts or with nitrate of soda respectively. These are points which will probably be dealt with by the more experienced hands of Dr. Gilbert, who has charge of the chemical points concerned in these inquiries.

Lastly may be mentioned the circumstance which repeated observations seem to justify, viz. that certain plants prefer to grow in association with others rather than by themselves. This was noted, especially in the case of the vernal grass, *Anthoxanthum*, which made very unsatisfactory progress whenever grown by itself. A similar circumstance, though less marked, was observable in the case of the Dutch Clover, *Trifolium repens*.

XVII. On some facts connected with Hybridism. In a letter to A. Murray, Esq., by I. Anderson-Henry, Esq.

You will remember my writing to you a letter of December 24, 1870, which was afterwards printed under the heading of "Hybridism *v.* Mimicry" in the 'Gardeners' Chronicle' of January 7, 1871, p. 10; and if you think what I have now to communicate deserving of being submitted to the Scientific Committee, or of being published, I must beg special reference to that communication.

You will remember that it was written by me as confirmatory of a remark by you, in a leading article of the 'Gardeners' Chronicle" (1870, p. 1639), that "after the second generation of hybrids, those which do not revert to the type break out into an overflow of irregular variation, which supplies many of his most remarkable sports to the horticulturist." And I observed how remarkably that observation was illustrated, not after the second generation, but in the first generation from the hybrid; and I referred you to Darwin's then recent publication of 'Animals and Plants,' vol. i. p. 400, where he did me the honour to cite two experiments of mine, with only one of which I have now to trouble you: he there says, "Mr. Henry fertilized *Arabis blepharophylla* with pollen of *A. Soyeri*; and the pods thus produced, of which he was so kind as to send me detailed measurements and sketches, were much larger in all their dimensions than those naturally produced by either of the male or female parent species." And, as I then went on to observe, Mr. Darwin had there most singularly anticipated the very result I had then to communicate, when he added:—"In a future chapter we shall see that the organs of vegetation in hybrid plants, independently of the character of either parent, are sometimes developed to a monstrous size; and the increased size of the pods in the foregoing cases may be an analogous fact." Mr. Darwin alluded to the large size of the pods of the above *Arabis* crop, and of a Rhododendron, which I had communicated to him.

But I must still so far recapitulate. I had just two seed-pods of the above crop (*Arabis blepharophylla* × *A. Soyeri*), both of which were one-half larger than the natural seed-pods of *A. blepharophylla*, the seed-bearer. Though so large, there was only one ripe seed in one pod and seven in the other, of which only four were sound. I had three or four plants only from both. One was a perfect monster. Unlike either parent, the height of the flower-stem being from 3 to 4 inches in the one parent, and not above 6 inches in the other, it sent up a flower-spike 18 inches high, bearing flowers (followed by seed-pods) for more than half its length on the upper portion of the stem—a thing wholly different from either of the species from which it sprung.

Desirous to find how the progeny of such a monstrous form would behave, I saved the seeds, which were very abundant. They vegetated most freely; and the plants are now for the most part in bloom or offering to flower.

That you may judge how far they have departed in this (the second) generation from the original types, I beg to send herewith:—

1. A small bit with roots of the *Arabis Soyeri* (or *A. Soyerana* of Philippe's 'Flore des Pyrénées'), having a flower-stem of only 3 inches.

2. Three spikes of plants with flowers and rootlets of three seedlings immediately from the original crop (*A. blepharophylla* × *A. Soyeri*), two of these having longer flower-stems than either parent, and one of only 3 inches, being as dwarf as *A. Soyeri*, the male parent. The two longest of these show solitary seed-pods for about 3 or 4 inches below the top umbel, like *A. Soyeri.*

3. Two similar specimens of spikes of the hybrid in the second generation, only just come into flower, one 10 inches, and the other 21 inches high. And you will please observe that, instead of showing solitary blooms (as in the first generation) below the top umbel, they both exhibit tiny umbels at the axils of the leaves about halfway down the stem.

I have lost *A. blepharophylla*, the original seed-bearing species (a not over-hardy plant). But if you will please to turn up Torrey and Gray's 'Flora of North America,' at p. 667 you will find it is described as having a stem of only 3–4 inches, with purple-coloured flowers.

Now to you, so much better able than I am to detect in detail all the particulars in which these seedlings in the second generation have departed from the original types, I need only further observe that while the flowers have dwindled to below half the size, they have increased tenfold in number over those of either parent. The leaves, too, seem wholly altered in character; and the rosy tint of the flowers of the original seed-bearer (*A. blepharophylla*), very faint in the first, is entirely lost in the pure white of the second generation.

In a word, in length of stem, habit of flowering, colour of flowers, and form of leaves, these plants of the second generation might, I venture to assert, be passed by any botanist as a new species, and fully verify what Darwin and you have enunciated as above noticed.

If you think it worthy, would you kindly submit this communication to the Scientific Committee, with the accompanying specimens, at their first meeting.

I have, I find, given the particulars so fully of the first crop as to save the necessity of your referring to my letter of December 24, 1870.

I shall be enabled some time during the summer, I expect, to communicate further results of crossing Begonias, having some of the lobes of the stigmas of the female flowers first removed. I communicated one instance of such a crop last year, where the seedling had wholly departed from the diœcious condition of the parents, and gone into the monœcious state.—I. Anderson-Henry.

May 12.—On looking over a bed of the same second generation of hybrid seedlings this morning, which I had planted apart from the others, I find many of them (forward to flower) of various habits and sizes, one of which, the smallest, I now enclose, No. 4. This tiny thing, not 2 inches in height, has, you will observe, 6 flower-stalks, with large umbels (large for the plant) of flowers at the top, and some having flowers at the axils. All the brood strongly illustrate your doctrine of variation, as not one of them offers a return to either parent, and the excessive tendency to flower is most noteworthy in them all.

XVIII. On the Influence of Foreign Pollen on the Form of the Fruit produced. By C. J. Maximowicz*. Communicated by Professor Dyer.

It is universally admitted that in the fertilization of an organism

* Translated and condensed from the 'Mélanges Biologiques tirés du Bull. de l'Acad. Imp. d. Sc. de St. Pétersbourg,' t. vi 422, by W. T. Thiselton Dyer, B.A., B.Sc., F.L.S.

witn the pollen or semen o another species, the influence of the foreign pollen or semen on the offspring produced is very distinctly observable. But the cases where this influence has previously shown itself in the mother plant, in a change of form, colour, or size in the fruit produced, have been hitherto exceedingly rare. The few instances may be found collected in Gaertner* or Darwin†. Thus Mauz asserts that he observed different kinds of fruit on a pear-tree, of which a number of blossoms had been castrated, and, as he supposed, fertilized afterwards by neighbouring trees.

Pavis maintained that the fruit of apples, melons ‡, and maize underwent alteration in form, colour, and special qualities when they were planted near other kinds. Bradley even says that he had seen an apple which was sweet on one side and sour on the other, and one half of which became soft when boiled, while the other remained hard. But these are only observations and not experimental results. Wiegmann first obtained the latter in peas. Gaertner tested experimentally many of the statements which we have quoted, and made experiments on other plants besides. He was only able, however, to confirm Wiegmann's results to a certain extent. He is therefore disposed (and with much reason) to attribute the majority of such cases to variation in the individual; he allows, however, as a rare exception, the possibility of change even in the mother plant itself. Other observers (as, for example, Knight §, and recently Nägeli||) deny even the possibility of such an iufluence.

More recently Darwin has again quoted cases ¶ where, by crossing yellow and dark maize, cobs were produced which contained both yellow and dark grains. Hildebrand ** confirms these observations, and further cites the instance of an apple which bore traces in its marking of the influence of another sort. But whilst the question has been in these cases only a variation

* Die Bastardzeugung, p. 73.

† Animals and Plants under Domestication, i. 397.

‡ [Livingstone states (and the instance has not, I think, been quoted) that in the case of *Citrullus vulgaris*, Schrad., which varies with sweet and bitter fruit, "melons in a garden may be made bitter by a few bitter Kengwe in the vicinity. The bees convey the pollen from one to the other" (Travels in S. Africa, p. 49).—Tr.]

§ Trans. R. Hort. Soc. v. p. 67.

|| Sitzungsberichte d. bayerischen Akad., cited by Hildebrand.

¶ Savi, cited by Darwin, *l. c.* p. 400.

** Bot. Zeit. 1868, p. 325, t. 6.

in the colour, in the three which follow we find it affecting the form. Hartsen * has seen on *Solanum edule* (the well-known Egg-plant) a fruit which in colour, size, and shape exactly resembled a Tomato, and possessed only the greater dryness and firmness of the flesh of the Egg fruit, besides the smooth border of the seed, which in the Tomato is villous. Dr. Kanitz † met with a case of a hybrid fruit, between *Lycopersicum esculentum* and *Capsicum annuum.* Fritz Müller ‡ fertilized *Cattleya Leopoldi* by *Epidendrum cinnabarinum*, and obtained seeds of the former with the shape belonging to the latter. Meehan §, lastly, observed that the bough of a pear-tree, which had always been altogether unfruitful, projected into the boughs of a neighbouring apple-tree. Fruits were produced which in skin, flesh, and other respects were altogether apples, and had only the seeds, carpellary partitions, and stalk of the pear.

These are all the cases with which I am acquainted. Considering, then, that the observations of Bradley, which are the earliest, date from the year 1721, and that the list has only increased very slowly, notwithstanding the vast opportunities for noticing these cases which botanists and gardeners have had in crossing different species of plants, we must allow that Gaertner was quite justified in declaring that the immediate influence of foreign pollen upon the mother plant is a rare exception.

If we agree with Gaertner in excluding from the list, as possibly due only to bud-variation, those cases which are not the result of direct experiment, the only well-established ones which remain are those of maize, peas, and *Cattleya Leopoldi.* The amount of evidence being so limited, it has seemed desirable to me to publish a case from my own observation, where, two species being reciprocally cross-fertilized, the influence of the foreign pollen upon the fruit fertilized by it has been distinctly recognizable.

During the last summer I cultivated in doors a number of species of *Lilium*, in order to study their specific distinctions. They all came into bloom early, and before those in the open ground. My house being surrounded by high trees for some distance, and there being no other cultivation of lilies in the neighbourhood, no question could arise as to the influence of

* Bot. Zeit. 1867, p. 378.

† Bot. Zeit. 1867, p. 335.

‡ Bot. Zeit. 1868, p. 631.

§ Proc. Acad. Nat. Sc. Phil. 1871, i.

foreign pollen. Moreover my lilies did not come into bloom simultaneously, but one after the other. The capsules being far from well known in all the species, I fertilized the flowers (with which I was better acquainted) as they expanded themselves. I did this when possible with the pollen of their own species, but of a different individual, or, failing this, with the flower's own pollen. The latter was the most frequent; yet the capsule was fully developed in most cases, although it contained fewer seeds; it is well known, however, that in the *Liliaceæ* self-fertilization is reputed to be more successful than in other families*.

Lilium davuricum, Gawler (*L. spectabile*, Link), and *L. bulbiferum*, L., the two species which are the subject of this paper, were amongst the earliest which flowered with me. Both are described by numerous recent authors as forms of one and the same species†. They admit, however, of being distinguished from one another by differences which lie in organs the study of which in the genus *Lilium* has hitherto been very much neglected, namely the bulb and the fruit.

The bulb of *L. bulbiferum* is firm and compact, and composed of numerous pointed scales closely and tightly packed in many rows. The outer scales are attached by their broadest part, and are gradually attenuated to a point; the inner scales are slightly contracted above the base, and are widened out again towards the apex.

Taking in the hand for comparison a bulb of *L. davuricum*, its loose structure immediately strikes us with surprise; it allows mere pressure to crush the whole bulb into separate scales. These are smaller and are curved away from one another, so that the arrangement is imbricated, and the scales can be distinctly counted, while in the former species only the extreme points of the inner scales are visible.

The author describes minutely the form of the scales. Even

* With *L. tigrinum* alone I have failed in producing fruit even in the open air, and after cross-fertilizing numerous individuals. The reason was, perhaps, because I neglected at first to break off the small axillary bulbs; and afterwards it had become too late in the autumn.

† Asa Gray, Mem. Amer. Acad. n. s. vi. p. 415; Miquel, Proc. Fl. Jap. 320; very recently, again, Baker's new synopsis of the genus *Lilium*, Gard. Chron., 1871, p. 1034. [Miquel separates the two plants in the Ann. Mus. Lug. Bat. iii. 156; Baker also keeps them apart as *subspecies*, relying upon the absence of axillary bulbs in *L. davuricum* as the main distinction.—Tr.]

the outermost exhibit above the base a distinct contraction; in the next row this becomes so evident that the scale appears to have a stalk. If, however, a young bulb such as occasionally forms itself in a scale-axil at the base of the previous year's stem is examined, the outermost scales are simply ovate without any trace of a contraction above the base. These are probably absent from the old bulbs through decay.

Although a contraction of the inner scales above the base takes place even in *L. bulbiferum*, it is very different from the constriction in *L. davuricum*, which further inwards in the bulb assumes more and more the character of an articulation. The scales break off at the constricted point very readily and smoothly. The constriction runs quite round the scales; and occasionally broods of small bulbs break out on the broken-off scales at the articulation.

From what has been said, the difference in the structure of the bulb in the two species becomes sufficiently evident. It has, in fact, long been known to gardeners, who amongst hundreds of bulbs can pick out those of *L. davuricum* with the greatest certainty*.

Scarcely less distinct are the differences of both species in the capsules; and as they readily produce fruit, it has been already repeatedly described†. The capsule of *L. bulbiferum* is long and narrow, almost cylindrical, 6-grooved, and the top deeply umbilicate, because each cell projects in an elevated point-like knob. The seeds have a very narrow wing: "seminum discus ala octuplo latior," says Lallemant. The capsule of *L. davuricum* is shorter and broader, nearly obovate, 6-grooved, and the top flat and almost truncate from the cells being shortly rounded off. The seeds have a very broad wing, almost half the width of the seed.

Both species also afford good distinctions in the floccose hairiness of the long-pointed leaves, and the externally pubescent

* *L. avenaceum*, Fisch., exhibits a similar appearance of articulation (see my diagnosis and the figure in Regel's Gartenflora, 1865, p. 290, t. 485). Compare also, and on other structural distinctions of Lily-bulbs, my essay on the Lilies of Japan in the Arbeiten des kais. bot. Gartens.

† See the excellent essay of Lallemant in the Index sextus Sem. Horti botan. Petrop. 1839, pp. 54, 58. For the capsule of *L. davuricum* see Glehn. Supp. ad Ind. Sem. H. Petrop. 1868, p. 19 (under *L. spectabile*). For a figure, Trautvetter, Fl. Ross. Ill. t. 19. f. *g*.

flowers of *L. davuricum*, contrasted with the absence of hairs, the lanceolate pointed leaves, and the externally glabrous flowers of *L. bulbiferum*. These characters, however, are often insufficient to diagnose the species, because in gardens so many intermediate forms and varieties present themselves (possibly originated through hybridization) that one may often be in doubt as to the species in the absence of bulb or capsule to settle the matter*.

As I believed I had noticed that in *L. bulbiferum* the scales of different bulbs sometimes exhibited a very indistinct contraction above the base, while sometimes it was distinct, it occurred to me whether in the last case I might not have had a hybrid between this species and *L. davuricum*.

I fertilized therefore a flower of *L. bulbiferum* with the pollen of *L. davuricum*, and a flower of this with the pollen of the first. This was the only fertilization effected, because these individuals bore only a single flower each, and I neglected the operation in the case of others. The ovaries of both species swelled up and developed. But after the capsule of *L. davuricum* had become about two inches long and 5 lines in diameter, it ceased further growth and dried up. It had, however, sufficiently developed itself to show the characteristic form of the capsule of *L. bulbiferum*, the male parent. On the other hand the capsule of *L. bulbiferum* grew and ripened, and was not cut off till it had dehisced; it had completely the character of the male parent—that is, of *L. davuricum*.

Both species, then, had so completely changed their capsules, that, having forgotten to which the long and deeply umbilicate, and the short and flat one belonged, I did not observe the wonderful state of the case till I was about to incorporate the *corpus delicti* into the herbarium, and compared it previously with descriptions and other fruit-specimens. This inattention of mine was very blamable, because, believing the other capsule which did not complete its growth of no value, I allowed it to drop. The developed capsule I have carefully preserved: it contained about 130 seeds; a few, not exceeding a dozen, may have been lost. The breadth of the wing was about the mean of what it is in the

* [Baker, in fact, describes *L. bulbiferum* proper as having the stem, especially in the upper part, clothed with scattered pubescence, and the perianth slightly cottony externally, while in *L. davuricum* the stem is nearly smooth.—Tr.]

two parents; it varied from $\frac{1}{3}$ to $\frac{1}{6}$ of the breadth of the seed. About 50 of the seeds were abortive; about 70 were well developed, of the normal size of the seeds of these species (8 mm. long, 5 mm. broad), and supplied with an apparently well developed embryo, the characteristic slightly curved, longish, linear form of which was readily recognized by transmitted light.

I would not attach any great importance to the seeds having a middle form between that of the two parents, because the sizes hardly allow themselves to be expressed with the exactness which Lallemant assigns them. The wing of the seed may be bent round or compressed towards the border; and in measuring the breadth of the wing this compression cannot be taken into account.

What objections can be advanced against the case which I have just related? I can foresee the following:—

First of all, some one may say that the whole observation rests upon one fundamental error, an interchange, and so forth. The circumstantial explanation I have given above, I hope, speaks for itself. An obstinate doubter I can only invite to imitate the experiment, and in the event of its not succeeding, to bear in mind that Gaertner was unsuccessful in confirming the observations of Pavis, while Savi, Hildebrand, and others succeeded. I should like to invite all who are interested to repeat my experiments, since probably by that means the second objection might be weakened—namely, that this is a solitary case, which proves nothing, and that it is an accidental sportive variation. Other researches will probably prevent me following further observations of this kind myself.

The weightiest objection would be this, that the *L. bulbiferum* with which I experimented was already itself a hybrid, that this was the explanation of its fertilization by one of its parents turning out so successfully, and that it probably independently of this possessed [owing to its hybrid origin] the capsule which is peculiar to *L. davuricum*.

That this is probable I have already shown in describing the bulbs; and I do not know what form its capsule would have had if it had been fertilized with its own pollen or that of a genuine individual, inasmuch as the capsule which I obtained through the crossing described is the only one belonging to it with which I am acquainted*.

* [The only example of the fruit of *L. bulbiferum* in the Kew Herbarium is

That the capsule of the indubitably true *L. davuricum* did not develop itself to ripeness, might be urged likewise in support of this objection.

Whether the *L. bulbiferum* was a mongrel, can only be ascertained by experiments with plants known to be true. But the fact that *L. davuricum*, the purity of whose pedigree cannot be doubted, had a capsule of the form of that of *L. bulbiferum*, seems to me to best meet the objection, and to show that in this case the influence of the pollen on the fruit stands established.

XIX. On Sericiculture in Canterbury, New Zealand. By William Swale.

Since the introduction here of seeds of *Ailanthus glandulosus*, (about the year 1862)—which germinated very freely on their arrival from England, when sown in the oldest-established nursery of Canterbury—it has become a question whether it might not be utilized for sericiculture. Out of the original seed-bed I purchased 50 seedlings, from about 6 to 9 inches high, and planted them around my botanic garden amongst other trees of much larger size for shelter. I have been very successful as regards its growth. Young shoots of this last summer's growth, many of them, are $3\frac{1}{2}$ to 4 feet in length; and its large pinnate leaves are more like fronds of our tree ferns than any thing I know of, when in full growth. These monstrous growths of this beautiful pinnate-leaved tree are generally made during midsummer; and the young shoots, the result of this quick growth, appear quite gouty, and generally die down a foot or more during the winter. Generally in spring the buds are blackened three or four times by our late spring frosts; hence, probably, such rapid growth when safe from frost.

This tree, quite an infant here yet, is now making a bit of a stir among our old settlers that possess a little capital, to turn

one from Corsica collected by Mabille. This, Mr. Baker assures me, is indubitably the true plant. The capsule, however, almost precisely accords with that attributed by Maximowicz to *L. davuricum*. This, so far, weakens the case as far as *L. bulbiferum* is concerned, and confirms what the author himself states above; it leaves, however, matters unaffected with respect to *L. davuricum*.—Tr.]

that little capital into good account by giving the tree a fair trial to produce food for the Ailanth silk-worm.

Eggs arrived here from Melbourne for our Acclimatization Society in the beginning of our last summer months, and were distributed for trial; and the result, I hope, will be more favourable another season than the last trial with them has been. Success did attend the experiment to a certain extent; but on their arrival we had very bad cold and rough weather. The production of several cocoons, however, was the result, under very unfavourable circumstances. The tallest Ailanth tree we have growing in Canterbury is not more than from 15 to 20 feet high. The trees would have been much taller but for the spring frost and the rapid growth they make late in the season.

It appears from information which I glean, that the whole of the eggs were successfully hatched indoors and placed upon the trees afterwards. It was believed, however, that the worms would have done better had they been hatched outside and placed upon the trees at first. I hope the cultivation of the silk-worm will become very extensive in Canterbury before long. We want manufacturers of every description here. Too much sheep-farming by half. I hope some day we shall be able to cause the silk-worm to produce two sets of cocoons during the season. His Excellency Sir George Bowen, our new Governor, on the occasion of his first visit to Canterbury, saw the experiment at work with the silk-worms, and expressed his satisfaction at the likely result of the experiment. I hope, being so highly flattered by Her Majesty's Representative in New Zealand, we shall in the end produce from the Ailanthus tree a very strong silk—a material which has served for hundreds of years in China as the clothing of entire populations, and is called by the French people "Ailanthine silk."

I certainly have this fact to announce about the trees—that, if properly planted, in this part of the world they will flourish and grow and become great ornaments in our plantations, and, I think I may add, in all probability become as large as those at Sion House, the large one at the Horticultural Gardens, Chiswick, and elsewhere at home. The introduction of this tree is certainly a great acquisition. I am obliged to cut down for fire-wood blue-gums, poplars, and willows; they have become such a nuisance on my property.

It is a generally expressed opinion in the other Colonies, that the climate of New Zealand is, by reason of its great moisture, more favourable than that of New South Wales and Queensland for the Ailanth silk-worm, and that here they will have fewer natural enemies to contend with than in Australia. I read from time to time of their having great success with the worm at these places. I am very much for a little silk-industry being tried here as well.

I grow specimen plants of the black and white mulberry. Both species thrive well. There is always plenty of fruit on the black one; but though the flowers of the white seem to "set" for fruit, they have always dropped off up to the present time. We generally have a few dishes of black mulberries exhibited at our fruit show in autumn every year. At the last show I saw on a plate, from an amateur gardener, some black mulberry-leaves, covered over with worms of *Bombyx mori* in a very healthy condition. These were the first I had seen since I left England. He is now good-natured enough to give away eggs. In my opinion *B. mori* is much hardier than *Bombyx cynthiæ.* I think I shall not be far wrong in stating my impression of what I thought when I saw the black mulberry-worms on the plate, that their strength would produce better cocoons and of more value than cocoons from Ailanth-worms.

One merchant here intends planting one acre of young Ailanth trees. I am not quite sure that he has not already done it. I hope he will succeed with his silk-worm experiment (and may his experience gained this last season be of benefit to him!), and as well that no climatic obstruction will exist; and may the quality of the silk be improved in the forthcoming season!

William Swale.

Avon-Side Botanic Garden,
Christ Church, Canterbury,
New Zealand.

XX. Report on Kales grown in the Garden at Chiswick in 1871–72. By Robert Hogg, LL.D., F.L.S. Pomological Director.

It is exactly ten years since the last trial of kales was made in the Garden of the Society. That was a very partial one in comparison with this upon which I am now about to report, the number of varieties being much less, and the various names under which the different varieties were received greatly more numerous. When I reported on the same subject in 1862, I was struck by the amazing confusion in which the kales were found; and my surprise has not been lessened by the present trial.

From the very much fuller character of this year's experiments, I have been enabled in many cases to add to, and in some to correct, those of 1862. This I have been enabled to do by the very prompt and liberal manner in which the members of the seed-trade have placed their collections at the disposition of the Society.

It is proper here to state that, although many errors in nomenclature are to be found in this report, apparently originating among the seedsmen, no blame is to be attributed to them, nor is there to be any impeachment of their good faith on that account; for this confusion of nomenclature has existed not only for years but for generations, and, however anxious they may have been to correct it, the task was one most difficult of accomplishment.

Now, however, that something like order has been attained, I trust that a more general concurrence in nomenclature will be maintained.

Asparagus Kale.

The original asparagus kale of a century and a half ago was a sprouting broccoli, which was introduced from Italy. It received its name from the young shoots, terminated by a "button," bearing somewhat of a resemblance to the young shoots of asparagus. In course of time the name gradually ceased to be identified with the broccoli, and was applied to another variety of kale also introduced from Italy, called Milan kale, or *Chou de Milan*, which has the property of throwing up in the spring a profusion of long succulent shoots, which, when fully grown, resemble the shoots of asparagus. But there are several other varieties of kale to which the name is applied; and as there seems no uniformity on the subject, I shall quote the varieties which different seedsmen regard as asparagus kale.

Messrs. Minier, Nash & Nash are correct in supplying Milan kale. Messrs. Fraser and Mr. B. S. Williams supply Buda kale. Messrs. Back & Co., Messrs. James Carter & Co., Messrs. Henry Clarke & Sons, and Mr. George Gibbs supply Couve Tronchuda. Messrs. Wrench & Sons, Messrs. Sutton & Sons, Messrs. J. & C. Lee, Messrs. Nutting & Sons, and Mr. William Paul supply Siberian kale; and it is to be remarked that, as all these varieties produce an abundance of succulent shoots in spring, the name is not misapplied; still it would be as well if it were confined to one particular variety, and that this should be the Milan kale.

Buda Kale.

This is one of those varieties that are called asparagus kale. It is very dwarf-growing, the stock being not more than six inches high, and very leafy. In this condition it remains all the winter; and in spring numerous long shoots are produced, some of which are from two to two feet and a half in length. The leaves are smooth and very much waved. There are three varieties of Buda —the *green*, the *purple*, and the *lettuce-leaved* or *strap-leaved*. There is no difference, except in colour, between the green and the purple varieties; but the lettuce-leaved is very distinct, the blade of the leaf being decurrent down the whole length of the footstalk, resembling in that respect the leaf of a lettuce, or of Laing's Swedish turnip. As regards utility and fertility there is no difference; and all are equally hardy.

The Buda of Messrs. Minier, Nash & Nash, and of Messrs. Wrench & Son was true; that of Messrs. G. Gibbs and of Messrs. J. & C. Lee was Siberian; and that of Messrs. A. Henderson & Co. was Couve Tronchuda. It was also received from the following sources perfectly true, under different names, thus:—From Messrs. Fraser and Mr. B. S. Williams the purple variety as asparagus kale. From Messrs. Carter & Co. and Messrs. Wrench & Son as Delaware. From Messrs. Wrench & Son as Jerusalem. From Messrs. A. Henderson & Co., and I. Cattell as purple Jerusalem. The green variety was sent by Mr. J. Grant as Lapland kale, by Mr. Cattell as Egyptian, by Messrs. Sutton & Son as New Winter kale, and by Messrs. Vilmorin, of Paris, as

Chou à faucher. The lettuce-leaved variety was sent by Messrs. Henry Clarke & Sons as Jerusalem kale.

Cottager's Kale.

It seems to be generally agreed that the cottager's kale is to preserve its undisputed individuality, as there were no instances, throughout the trial, of this excellent variety being received under any other name.

Curled Kale.

By far the most popular and most exteasively cultivated of all the kales are the curled or *Scotch kàles*, sometimes also called *Curlies, German Greens*, or *Borecole.*

There are four distinct forms of the curled kale—the dwarf and tall green curled, and the dwarf and tall purple curled. Those which are most generally cultivated are the green forms; and the great object of cultivators is to obtain these with the leaves as finely and as much curled as possible; and in proportion as they are so, the more or less is the stock appreciated. Hence has arisen the great number of names under which they are sold. From Messrs. Drummond Brothers and Mr. Cattell, the green form was received as Prince of Wales, from Messrs. H. Clarke & Son, and Messrs. Carter & Co., as *Hearting kale*, from Messrs. Hurst & Son as *Cabbaging* and *Tall curled*, from Messrs. Sutton & Sons as *Sclater's New Cabbaging*, from Messrs. Carter & Co. as *Feathered Scotch* and *Abergeldi*, from Messrs. Lawson & Son as *Superb Parsley curled*, *William's matchless*, and *Pontefract green curled*, from Messrs. Stuart & Mein as *Tynningham*, from Mr. William Paul as *Jackson's late curled*, from Messrs. Fisher, Holmes & Co. as *Dwarf green curled Handsworth*, from Messrs. Veitch & Son as *Veitch's dwarf late curled*, from Messrs. Minier, Nash & Nash, and Messrs. Beck, as *Dwarf green curled Canada*, from Messrs. F. & A. Dickson as *Dickson's Imperial dwarf curled*, and from Messrs. Barr and Sugden as *New moss curled*. All of these differed from each other only in the degrees of intensity with which the leaves were curled; and in this respect the New moss curled of Messrs. Barr & Sugden was remarkable.

The Dwarf purple form was sent by Messrs. Carter & Co. as *Jerusalem kale*, and by Messrs. A. Henderson & Co. as *Lap-*

land; the Tall purple from Messrs. Wrench & Son as *Brown Borecole.*

Jersey Kale.

This is also called *Cesarean cow-cabbage, Tree-cabbage* and *Jersey Borecole.* It is a tall-growing plant, attaining the height of four or five feet, the stem clothed with long broad glaucous green leaves with long foot-stalks. In spring it throws out numerous long slender shoots, with which cattle are fed. It is never grown as a garden vegetable.

Long Scotch Kale.

This was received from Mr. William Gorrie, of Edinburgh, as the true "Long Scotch kale." It is the normal form of the wild cabbage as it is found on the Dorsetshire coast. It was sent by Messrs. Vilmorin & Co. under the name of *Couve murciana*—and by Messrs. Sutton & Son, of *Buckman's hardy winter greens.*

Marrow Kale.

This is the *Chou moellier* of the French, a form of the Jersey kale which produces a long thickly swollen stem like a gigantic cigar, the swollen part being filled with a mass of tender pith. There are three varieties of the marrow kale, distinguished as the *white*, the *purple*, and the *small*. The white grows from four to four and a half feet high, the stem being smallest at both ends and thickest in the middle, where it is about a foot in circumference in the largest specimens.

Milan Kale.

The name by which this is often called is *Chou de Milan.* It is unfortunate that it is so; for *Chou de Milan* is the name given by the French to Savoys. Except that they both belong to the same genus, there is no resemblance whatever between the Milan kale and a Savoy. The Milan kale produces a stock from eighteen inches to two feet high, clothed with plane bluntly toothed leaves, and terminated by a close rosette of leaves forming a small incipient head. In spring it throws out a large quantity of fine succulent shoots, which, when cooked, form one of the most delicious dishes of the winter-green class; and it is from this circumstance that the plant has be n called *Asparagus kale.*

From Messrs. Beck & Co., G. Gibbs & Co., Nutting & Sons, Minier, Nash & Nash, and Mr. Cooper, it was received perfectly true under the correct name. There is a purple variety received from Messrs. Vilmorin under the name of *Flanders purple.*

Palm Kale.

The stem is two feet to two and a half feet high, clothed with large oblong obovate leaves, the blade of which is decurrent the whole length of the footstalk, of a dark green colour, which curve gracefully upwards and outwards, giving the plant the aspect of a miniature palm. In the spring it throws out a profusion of long slender shoots, which are of no value as a vegetable. After these shoots are produced, the plant entirely loses its ornamental character. It was received from Messrs. Vilmorin under the name of *Chou Palmier.*

Ragged Jack.

Like the Cottager's kale this seems to have few synonymes. Its character is sufficiently distinct to render it easy of identification, being a very dwarf variety with a stock not more than four to six inches high, and leaves which are deeply laciniated, the segments being trifid or multifid. It is generally of purple colour, and occasionally green. In the spring it produces a great quantity of tender shoots, which are much esteemed as a vegetable. It was received from Mr. B. S. Williams as *Camberwell Borecole.*

Siberian Kale.

This is one of the hardiest and one of the best of all the sprouting kales. It is also very distinct, and can never be confounded with any other variety. The stock is very dwarf, being only four to six inches high. The foliage is always green. The leaves are sinuated, coarsely serrated, and plaited on the margin. In spring it produces a large crop of tender shoots, from a foot to fifteen inches in length.

This is one of the varieties the nomenclature of which is very confused. From Mr. B. S. Williams it was received quite true as "Siberian" or *Lapland*; from Messrs. Wrench & Son, Sutton & Son, William Paul, J. & C. Lee, and Nutting & Sons, it was received under the name of *Asparagus kale,* from Mr. George Gibbs as

Buda kale, from Nutting & Son, A. Henderson & Co., J. Cattell and Drummond Brothers as *Delaware*, from Messrs. Minier, Nash & Nash, Sutton & Sons, G. Gibbs, J. & C. Lee, Carter & Co., and Cooper as *Jerusalem*, from Messrs. Carter & Co. as *Acme*, and from Mr. Cattell as *Curled Jerusalem*.

Woburn Kale.

This closely resembles the wild cabbage, and long Scotch kale; but it appears to be of a more perennial character. It may be propagated by cuttings, as, indeed, all the other varieties may; but it is more woody and shrub-like in its growth. It is not worth cultivating, except in very northern and exposed situations, as it is very hardy, and will stand more rigorous winters than perhaps any of the other varieties.

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The following notices of Mr. Anderson-Henry's article, p. 159, have appeared in the 'Gardeners' Chronicle,' July 27 and August 3, 1872.

"In the 'Gardeners' Chronicle' for May 18 (p. 671), a communication to the Scientific Committee of the Royal Horticultural Society is printed, detailing the results of crossing the Pyrenean *Arabis Soyeri* with the North-American *A. blepharophylla*. The most important point was the extreme divergence exhibited by the second generation of plants from both their hybrid parent and the original species of which it was a cross. Having carefully examined the specimens which accompanied the paper, I can hardly refrain from suspecting some error. The plants of the second generation have been submitted to three experienced botanists; and all have pronounced them without a moment's hesitation to be our indigenous *A. hirsuta*. This agrees with my own opinion; and it would be desirable to know, therefore, whether there is any possibility of the seed of the hybrid having been infertile, and of the indigenous *Arabis* having come up accidentally in its place."

W. T. Thiselton Dyer.

"I have to thank Professor Thiselton Dyer for his notice and, I must add, correction of my communication to the Scientific Committee of May 18th last. Having plenty of the seedlings which he and other scientific botanists had pronounced to be *Arabis hirsuta*, I have submitted a specimen to Professor Balfour, who very kindly compared it with dried specimens in his herbarium; and he having concurred in opinion, I cannot for a moment believe that he and they can be in error. Neither can I believe that I had, by the crossing operations detailed, reproduced *A. hirsuta*. But as I am most careful to avoid mistakes, and allow no gardener to interfere in such matters, I am at a loss to account for the mistake. I rather think, however, that it originated, not in the second generation, as Professor Dyer supposes, but in the first, and in that one of the "three or four" original plants which had attained, as I stated, a height of 18 inches. But it rather increases my difficulty how to account for a seed of *Arabis hirsuta* finding its way into the hybrid seed-pot, when I had not in my collection or within my grounds, so far as known to me, a single plant of that species. But happening to have by me still some of the seeds of the original monster seedling, I have sown them to-day, and shall be happy to report if any thing different comes from them."

I. Anderson-Henry.

July 29.

FRUIT COMMITTEE.

A First-class Certificate was awarded to a white seedling Grape, with large berries nearly $1\frac{1}{2}$ inch long, named Waltham Cross, from Mr. W. Paul; and a special to Mr. Chaff, gardener to A. Smee, Esq., for very fine collections of culinary and dessert Apples, amongst which King of the Pippins was conspicuous; to Messrs. Rutley and Silverlock for fine examples of Banbury improved white Spanish Onion; to Messrs. Carter for a collection of vegetables; to Mr. Hibberthwaite for a large collection of Apples grown near Middlesborough-on-Tees, the soil of which is said to be cold and damp; to Mr. Hepper, gardener to C. P. Millard, Esq., for Chaumontel Pears; to Mr. Bray, gardener to E. A. Sandford, Esq., for early forced Asparagus; to G. F. Wilson, Esq., for Josephine de Maline Pears; to Mr. Turner for Cornish Aromatic Apple; to Mr. Maclean, gardener to W. P. Herrick, Esq., for a smooth-leaved Cayenne Pine, weighing eight pounds; and to Mr. Gage, gardener to Earl Brownlow for Grapes. Mr. Hepper was first for an excellent lot of salad-materials, Mr. Gilbert being second. Mr. Bréhaut sent a grand collection of varieties of Indian corn from Guernsey, to which a Special Certificate was most deservedly given. His remarks will appear in the Society's Journal.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

The Secretary brought a Walnut perfectly flat on one side from pressure of other Walnuts in the same cluster; in several instances fifteen individuals or more were closely packed in the same cluster.

A bifid leaf of *Chimonanthus præcox* was sent by Mr. Parsons.

Leaves of a Vine, which produces black and white grapes in the same bunch, were sent by Mr. Squires, gardener to H. G. Ludlow, Esq., Heywood, which, like the bunches, were decidedly piebald.

A letter from Mr. Anderson Henry on Imperfect Hybridization was read by Mr. A. Murray, which will appear in the Society's Journal, as also a very interesting communication from the Chairman on Mimetic Analogy, which will also appear in the Journal.

The Meeting then adjourned.

GENERAL MEETING.

W. Marshall, Esq., in the Chair.

Mr. Wilson stated that the prizes offered by the Rev. G. Kemp for hardy grapes would be continued next year, but the competition would take place in November instead of October.

Mr. Berkeley said, in reference to a fine *Mormodes* from Mr. Wilson Saunders, that he found, on referring to the Plate of *M. igneum* in Paxton's 'Flower Garden,' vol. iii. tab. 93, that it was the var. β there described.

With reference to some observations of Mr. Meehan on fasciation ('Gard. Chron.' 1870, p. 1606), Mr. Berkeley remarked that there had been some confusion between fasciation and polyclady, in which an extraordinary number of branches are produced through the attacks of fungi and from other causes.

M. Bréhaut's paper on Maize was read, and Mr. Bateman announced that his prize for cut blooms of *Cattleya* would be again offered at the next Meeting in January.

FLORAL COMMITTEE.

January 18, 1871.

A resolution was passed unanimously expressing sympathy with the Rev. J. Dix, and regret for his continued absence in consequence of severe illness.

A Special Certificate was given to Mr. Denning for a magnificent group of Orchids from Lord Londesborough. *Lælia anceps* and *Barkeria Skinneri* received special awards. Amongst other objects of interest were:—*Phaius irroratus*, a hybrid between *P. grandiflorus* and *Calanthe vestita alba*, a large white flower of good substance with rose-tinted petals; *Cypripedium vexillarum*, a cross between *C. Farrieanum* and *C. barbatum*, which received a First-class Certificate; while *Mormodes colossus*, from Costa Rica, obtained a Second-class Award.

Special awards were made to Mr. B. S. Williams for a fine group of Heaths, Solanums, Ferns, Palms, &c., to Mr. Wiggins gardener to W. Beck, Esq., for Cyclamens, to Messrs. Lucking for a group of decorative plants and bouquets, to Mr. T. S. Ware for succulent plants, to Mr. Stevens, of Ealing, for Cyclamens, to Messrs. Dobson for Primulas, to Messrs. Brooke and Co., Manchester, for a splendid cut spike of *Odontoglossum*, and to Mr. Turner for a group of Primulas of great merit.

First-class Certificates were given to E. J. Lowe, Esq., for *Adiantum capillus-veneris*, var. *admirabile*, and *Scolopendrium vulgare*, var. *consummatum*.

A Second-class Certificate was awarded to Messrs. A. Henderson and Co. for *Ficus lanceolata*, which, if as hardy as *F. elastica*, will prove a great acquisition.

Mr. Turner obtained the First Prize for Ivies in pots.

FRUIT COMMITTEE.

A very interesting collection of fruits, vegetables, and garden-tools was exhibited by Mr. Robinson from Salt-Lake City. Also specimens of preserved fruits of various kinds.

Special Certificates were awarded to Mr. Meredith for Muscat of Alexandria Grapes, to Domenico Piccirillo for Naples Giant Sweet Oranges and Naples Giant Sweet Chestnuts, to Mr. Scott, of Taunton, for 250 varieties of Apples, to Mr. Clarke, Roehampton Lodge, for Glou Morceau Pears, to Mr. W. Ewart Apethorpe for Easter Beurré Pears. Messrs. Backhouse sent a new culinary apple named Galloway Pippin. Mr. Turner took the First Prize for culinary apples, Mr. Parsons, gardener to R. Attenborough, Esq., being second. Mr. Turner sent also the three best dishes of culinary pears, Mr. Gardener, of Eatington Park, being second.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., in the Chair.

A ripe female cone of *Stangeria paradoxa*, with perfect fruit (which has since germinated), was sent by Mr. W. W. Saunders. Female cones have been produced before at Kew; but as no male cones were ready at the same time, they did not arrive at perfection.

Dr. Masters brought a section of a branch of a Moor-Park Apricot with a view to elicit an opinion as to the cause of the disease which is so common in that variety. It was clear that it did not arise from the root, which was quite healthy. Mr. Rivers had stated that seedlings which have never been planted out suffer in the same way, and that consequently the theory of frost or heat will not hold good. It is certain, however, that many cases of gumming do arise from climatic causes, as has been proved by A. Knight. Different causes in vegetable diseases produce very similar effects; and the disease may be so far deemed constitutional that the variety in question is peculiarly subject to the malady.

Mr. Alfred Smee brought Lemons materially injured by a coccus. The parts affected remain green, and neither absorb salt nor sugar. The only use to which they can be put is for the preparation of lemon-juice or citric acid.

Col. Le Couteur sent Navel-oranges from Bahia, in which the ovules, which were only rudimentary, were confined to a little cavity in the eye of the fruit. It was remarked that they confirm DeCandolle's views as to the structure of the fruit.

The Chairman brought specimens of diseased Oats, which the Secretary undertook to examine more minutely before the next Meeting.

The Meeting then adjourned.

GENERAL MEETING.

G. F. Wilson, Esq., F.R.S., in the Chair.

Mr. Berkeley commented upon several of the vegetable curiosities which had been exhibited by Mr. Robinson, amongst which was a long deep-eyed potato, which is a favourite variety with the Mormons; he stated that the Easter Beurré Pears sent to the Fruit Committee were the produce of an extremely prolific tree which was brought by himself from the garden of M. Desmazières, at Lambersart, as a graft, in 1838. As regards a specimen of *Sonchus platylepis*, sent by Mr. Saunders, he remarked that there are many shrubby species in Madeira and the Canary Isles which are well worthy of reintroduction, which may be easily effected by seeds. In noticing the fine group of Aucubas sent by Mr. Turner, he stated that the reason why so many persons were disappointed about raising Aucubas from seed was that they had not patience enough to wait for their germination, and that they should not be too deeply covered with soil.

The garden-tools from Salt Lake City were noticed, especially the prong-hoe for deeply loosening the soil between lines of plants.

In calling attention to the Pop-corn, he showed three heads of Indian Corn from Mr. Strickland which had ripened perfectly fourteen miles north of York.

FLORAL COMMITTEE.

FEBRUARY 15, 1871.

Mr. Dix, who has so long been such an efficient Chairman, sent in his resignation; but he was requested to retain the position at present in the hope that he might yet again be able to attend.

Special Certificates were given to Messrs. Veitch for Orchids and Cyclamens and Primulas; to Mr. B. S. Williams for Orchids and other plants, including *Tillandsia Lindeni*, var. *Regeliana*; to Mr. Denning for Orchids, including *Cœlogyne cristata* with fifty spikes; to Messrs. Rollisson for Orchids; to Mr. Bull for a miscellaneous collection; to Mr. Ware for spring plants; to Messrs. Cutbush for forced flowering plants; to Mr. Paul for Camellias; to Mr. Stevens, gardener to G. Simpson, Esq., for a fine basket of *Lachenalia luteola*; to Mr. Day for Cyclamens; to Mr. Kinghorn for a wonderful specimen of Aucuba; to Mr. Baxter, gardener to C. Keiser, Esq., for cut Camellias; and to Mr. Goddard, gardener to H. Little, Esq., for Cyclamens.

First-class Certificates were given to Mr. Bull for *Gastronema flammeum*, to Mr. Denning for *Pilumna fragrans*, to Mr. Green for *Agave Besseriana amœna*, and to Mr. Tomkins, Birmingham, for *Primula sinensis* (*Princess Louise*). Mr. Denning obtained the First Prize for Lycastes, Mr. Bull for Dielytras (or more properly Dicentras*), and Mr. Goddard for Primulas, Mr. C. Edmonds being second.

FRUIT COMMITTEE.

The nomenclature of Pine-apples being very confused, the Committee suggest that a Prize should be offered with a view to assign the names more accurately.

Mr. Laxton sent Apples, in fine condition, which had been kept on a deal shelf in a cellar. He also sent a seedling Apple raised between Stamford Pippin and Golden Noble, which was com-

* *Diclytra*, afterwards changed to *Dielytra*, was a mere misprint for *Dicentra*.

mended. Messrs. Backhouse sent again their Galloway Pippin, which received a First-class Certificate. A Special Certificate was given to Domenico Piccirillo for Bergamot Limes and Naples Lemons grown at Portici, and to Mr. Gilbert for Potatoes. Mr. Garland, gardener to Sir J. Dyke Acland, Bart., took the First Prize for Apples, Mr. Parsons, of Danesbury, being second. Mr. Garland was first for Pears.

SCIENTIFIC COMMITTEE.

Dr. Thomson, F.R.S., in the Chair.

The Secretary stated that he had examined the diseased oat-plants which were brought at the last Meeting by Mr. A. Murray, and compared them with young seedlings. There was nothing abnormal in the disposition of the rootlets; but in the axils of the leaves little papillæ occurred, which possibly were the nuclei of some larva.

Mr. A. Murray stated that the Coccus on the Lemons was, he believed, undescribed, and belonged to the group which was devoid of feet. Fruit infested with the Coccus is sent out into the country by the dealers; and it is stated that the juice in such cases is devoid of aroma.

Dr. Masters brought portions of diseased Larch, in which the centre was decayed and infested with fungous spawn. The disease was clearly what is known under the name of "pumping." He also exhibited seedlings of the Osage Orange which were grafted together. He also brought drawings of the fruit of *Stangeria paradoxa*. The embryo is nearly solid and undivided, and there was no trace of a suspensor.

Mr. Wilson brought diseased Snowdrop-bulbs, which the Secretary undertook to examine.

Mr. A. Murray laid on the table plans of an arboretum which it is proposed to make at Berlin.

Mr. E. J. Lowe exhibited earth-worms found amongst his ferns, which had probably been imported. He also brought a plant of *Scolopendrium vulgare*, raised from bulbils, which exhibited a strange variety in the foliage. A bulbil from the variety of *S. Wardii* gave rise to *S. pseudo-Wardii*, and this, again, to the curious specimen on the table.

The Meeting then adjourned.

GENERAL MEETING.

Mr. Berkeley remarked, with respect to the *Tillandsia* exhibited by Mr. B. S. Williams, that it has been often remarked that the plant, which is very desirable on account of its azure-blue flowers, does not bloom freely; but the specimen shown on this occasion had four or five spikes in various stages of development, which would probably produce a succession of flowers during the summer.

Mr. Bull's Amaryllid, exhibited under the name of *Gastronema flammeum*, on examination at Kew, proved to be the same with *G. sanguineum*, figured in the Society's Journal.

Attention was then called to a fine specimen of *Borrera flavicans* sent by Mr. Robinson from California. The lichen has a wide geographical range, and is found in the south of England.

Mr. Berkeley then called attention to an article which had appeared in the 'Agricultural Gazette,' "On the supposed Galls on the Roots of Peas." These protuberances are common on Leguminosæ, and occur also on *Taxodium* and other Coniferæ, and certainly are not the work of insects. Observation of the development of the roots in germinating beans will show clearly that they are not galls, though there are many peculiarities about their structure.

Mr. Bateman remarked on the extraordinary display of Orchids on the present occasion.

The Council hoped shortly to introduce some decided novelties from New Guinea, a country but little explored in a botanical point of view.

Mr. Paul read the first portion of a paper on Camelliæ.

FLORAL COMMITTEE.

MARCH 1, 1871.

Special Certificates were awarded to Mr. Denning for a magnificent specimen of *Dendrobium nobile*, and for a collection of Orchids, which included a fine specimen of *Oncidium leucochilum*, *Dendrobium lasioglossum*, *Oncidium splendidum*, and *Dendrobium capillipes*; to Mr. B. S. Williams for Orchids, Camellias, Cyclamens, and Palms; to Messrs. Veitch for Orchids mixed with fruiting Aucubas and Amaryllis; to Messrs. Rollisson for Dendrobiums and Vandas; to Mr. Lawrence, gardener to Bishop Sumner, for *Cattleya Trianæ*, var. *Laurenciana*; to Messrs. Lane for Camellias in pots; to Mr. T. S. Ware for spring flowers; to Mr. W. Paul for cut Camellias; to Mr. Trapler, gardener to D. J. Kay, Esq., for cut Camellias; to Mr. W. Moore, gardener to C. Leach, Esq., for a fine plant of *Dendrobium speciosum*; and to an equally fine specimen from the Society's collection.

First-class Certificates were given to Mr. Pilcher for *Masdevallia coccinea*, var.; to Messrs. Backhouse for *Odontoglossum retusum*, var. *latro*; to Mr. Denning for a Fern closely resembling *Cheilanthes Mathewsii*; and to Mr. Turner for Golden Tricolor Pelargonium (Mr. Rutter). Mr. Howard, gardener to J. Brand, Esq., took the First Prize for Lily of the Valley, Mr. Searle, gardener to B. C. Steele, Esq., being second, and Mr. Wilkie, third; Mr. Howard was first for cut Camellias, Mr. Baxter second, and Mr. Wilkie third.

FRUIT COMMITTEE.

Mr. Bray, gardener to E. A. Sandford, Esq., was first for Asparagus, Sea-kale, and Rhubarb; Mr. Miles, gardener to Lord Carrington, second. Mr. Sage, Ashridge Park, was first with a single bunch of Black Alicante; Mr. T. Bannerman, gardener to Lord Bagot, second with Lady Downe's seedling; and Mr. Lynn, gardener to Lord Boston, third with Black Alicante.

Special Certificates were given to Mr. Osman, Stanmore Hall Gardens, for Japan Loquat, and to Mr. Batters, Chilworth Manor, for Queen Pine-apple. Domenico Piccirillo sent specimens of Stone-pine, the fruit of which is often eaten in Italy. Mr. Smith, gardener to T. Brassey, Esq., sent a model of a saddle tubular boiler which would evidently be a powerful one; and Mr. Cannell a model of his new registered economizing boiler, which, it is feared, is too complicated for general use.

SCIENTIFIC COMMITTEE.

G. F. Wilson, Esq., F.R.S., in the Chair.

The Secretary stated that the Snowdrop-bulbs which were brought by the Chairman to the last Meeting were attacked by a mould which seems to be undescribed. It appeared from additional and more characteristic specimens that it is the vegetative portion which is principally attacked.

He also brought dendritic spots on paper, which have been described and figured as an Alga, and which were forwarded from Ceylon by Mr. Thwaites. In one case there was a particle of metal in the centre; and in every case the spots seemed to be developed from a fixed centre. It was suggested that the particle of metal was iron pyrites, and that the spots arose from sulphate of iron, which, mixed with logwood, is often used to give paper a blue tint. The spots, however, are by no means confined to the blue-tinted paper.

A plant of *Wigandia imperialis* was sent by Mr. Henderson, affected with the disease known under the name of black top, which is so common in Verbenas. It was considered due to some unsatisfactory condition of the roots.

Dr. Masters stated that Aucuba-berries injured by frost, though apparently sound, had every portion of the contained seed blackened and decomposed, with the exception of the raphe, which was quite uninjured.

Mr. Alfred Smee brought fronds of *Todea superba* affected by a species of Acremonium, which caused half of the frond to decay.

Major Clarke stated that he found the chemist's dropping-bottle useful in applying methylated spirit to mealy bug &c.

The Meeting then adjourned.

GENERAL MEETING.

Major Trevor Clarke, in the Chair.

Mr. Bateman made some comments upon several novelties amongst the Orchids. The Orchid sent from Mr. Rucker's garden as *Masdevallia elephanticeps* was clearly only a variety of *M. coccinea*, so that the true plant is still a desideratum. Masdevallias are cool Orchids, being natives of the highest mountains of Peru and New Granada.

The top of a strong healthy specimen of a Mahonia was shown to the Meeting. The only way to obtain handsome plants was to lop off the tops as soon as they became high enough. He also petitioned Orchid-growers to contribute to make up the loss which had been sustained at Paris *. A bazaar under the patronage of Princess Teck is to be held the first week after Easter for the benefit of distressed French horticulturists.

Mr. Berkeley stated that Mr. Bull's Gastronema ought to bear the name of *G. sanguineum*, var. *flammeum*.

A paper was then read which had been communicated to the Agri-horticultural Society of India, describing a method of reducing the size of stones in fruit by scooping out the pith and afterwards inarching. Dr. Hogg had informed Mr. Berkeley that a similar method had been mentioned by one of the old authors; but he confessed that he was very incredulous of the success of the process.

FLORAL COMMITTEE.

March 15, 1871.

Special Certificates were given to Messrs. Veitch for *Hippeastrum pardinum* and *H. Leopoldii*, to Mr. Bull for *Goodyera Dawsoniana*, to Mr. Laurence for *Dendrochilum glumaceum*, and to Messrs. Henderson for Caladiums.

First-class Certificates were given to Messrs. Veitch for *Amaryllis Chelsoni*, a rich deep-reddish-crimson seedling, also for a new Asplenium from New Zealand; to Mr. Bull for *Areca regalis*; to Mr. G. Goddard, gardener to H. Little, Esq., for a strong white Cyclamen named Snowflake; to Messrs. Rollisson for *Davallia clavata*; and to Mr. W. Paul for Hyacinth Princess Louise, a double red with a very compact spike.

A Second-class was given to Messrs Veitch for *Primula Boveana*, an Abyssinian species closely allied to *P. verticillata*.

FRUIT COMMITTEE.

A Special Certificate was awarded to Mr. Phipps, gardener to the Earl of Shrewsbury, for a collection of well-preserved Grapes, consisting of White Tokay, Black Alicante, Trebbiano, and Lady Downe's Seedling.

An Extra Prize was given to Mr. Phipps forBarbarossa.

A Special Certificate was given to Mr. Wildsmith, gardener to

* A large packet has just been forwarded from the South-Kensington collection.

Lord Eversley, for Lady Downe's Seedling, cut from the vine and preserved in bottles of water in a dark room with a temperature about 45°. Mr. Looker brought capital specimens of Cos Lettuce and Endive grown in patent glass frames without any other protection. Mr. Lynn, gardener to Lord Boston, was first both for dessert and kitchen Apples; Mr. Parsons second in the former Class; and Mr. Beach, gardener to J. Hemes, Esq., for culinary Apples. Mr. Sage, gardener to Lord Brownlow, sent fine Keen Seedling Strawberries, which would certainly have taken a prize had they arrived in time.

SCIENTIFIC COMMITTEE.

Dr. T. Thomson, F.R.S., in the Chair.

The Secretary stated that he had examined the fronds of the *Todea* brought by Mr. Smee at a previous Meeting, but had failed to detect any fungus, the filaments of the mould having been eaten by some mite.

Mr. Wilson Saunders sent specimens showing the effect of frost in tearing asunder the woody fibres in *Erica mediterranea* and *E. vagans*, also specimens of Oak timber split by lightning in a somewhat similar manner as by cold, the latter thus "performing the effect of heat;" "*penetrabile frigus adurit.*"

Mr. Berkeley brought corms of *Crocus imperatorius* from Mr. Ellacombe, showing large spindle-shaped roots. Similar specimens were observed at Chiswick; and, indeed, they occur occasionally in several species. He considers them to be a provision for the production of a new corm.

Dr. Masters brought from Mr. Bennett, of Enville, two specimens of Horse-chestnut, in one of which the flowers are almost ready to open, while in the other they were quite unexpanded. They were taken from two contiguous trees, and call to mind the famed early Chestnut-tree of Paris.

The Secretary read a paper "On the Wild Pears of Surrey" from Mr. Wilson Saunders, which has already appeared in the Journal.

The Meeting then adjourned.

GENERAL MEETING.

LORD H. GORDON LENNOX, M.P., in the Chair.

Mr. Berkeley called attention to *Triteleia porrifolia*, which, like *T. uniflora* and some other allied forms, has the habit of smelling of Garlic.

Mr. Bull exhibited a specimen of *Mesua ferrea*, which at first sight looks like a *Brownea*; but the leaves are not truly pinnate. Its wood is extremely hard; and the sweet-scented flowers are sold in the bazaars under the name of *Nagkesur*.

Mr. Berkeley exhibited a piece of bread eaten during the siege at Paris, a third of which was composed of ground chaff.

Mr. Bateman commented on *Amherstia nobilis*, flowers of which were sent from Chatsworth—and on *Odontoglossum roseum* from the cool parts of Peru, which ought to be more carefully explored.

Mr. Hanbury had forwarded pods of Vanilla, which differed so much that Mr. Bateman expressed a wish that, if any one possessed pods different from those usually in commerce, they might be communicated as a loan.

THE HYACINTH SHOW.

The competition was principally between Messrs. Veitch and Cutbush. Three varieties were selected for First-class Certificates—Marquis of Lorne (single magenta), George Peabody (single red), and W. M. Thackeray (single red). These, with three other new varieties, Lilacina (single magenta), Lord Derby (single black), Robert Lowe (single yellow), were staged by Messrs. Cutbush. Messrs Veitch and Cutbush again competed for Tulips, the latter of whom exhibited a fine group of varieties of *Narcissus orientalis*, to which a Prize was awarded. Mr. Wilkie was first for miscellaneous plants in flower, Mr. Ware being second. Messrs. Rollisson were first for Mignonette. Mr. Laing, gardener to P. W. Flower, Esq., had a First Prize for Tree-mignonette; and an Extra Prize was given to Mr. Goddard for a neatly grown group.

In the Miscellaneous Class a First Prize was given to Mr. May, and the Lindley Medal proposed to be given for his wonderful specimen of *Phalænopsis Schilleriana*. Equal Second Prizes were given to Mr. Denning for Orchids and to Messrs. Veitch for a fine collection of 150 Hyacinths. Messrs. Lane had a Third Prize for young Camellias, and Mr. Ware a Fourth for spring flowers.

Special Certificates were granted to various objects, and amongst them to Mr. Speed for the cut flowers of *Amherstia.*

FLORAL COMMITTEE.

April 5, 1871.

Special Certificates were awarded to Messrs. Veitch for *Darlingtonia californica*; to Mr. Stevens, gardener to G. Simpson, for *Dendrobium fimbriatum*, var. *oculatum*; to Mr. J. Linden for *Odontoglossum Hallii*, and to Messrs. Bell and Thorpe for *Rhododendron Jenkinsii.*

First-class Certificates were awarded to Mr. J. Atkins for *Cotyledon spinosa*, a hardy succulent resembling *Sempervivum californicum*; to Mr. B. S. Williams for Amaryllis, Prince Henry; to Messrs. Rollisson for *Torenia auriculæfolia*; to Messrs. Paul for Climbing Rose, Victor Verdier; and to Mr. J. Atkins for *Saxifraga valdensis*. Mr. W. Saunders sent *Lycaste fulvescens* and *Odontoglossum nebulosum*, var. *candidum*; and Mr. Ware the very beautiful *Iris iberica.*

FRUIT COMMITTEE.

Special Certificates were awarded to Mr. Fowle, gardener to Sir H. Mildmay, Bart., for President and Dogmersfield seedling Strawberries; to Mr. Crow for a Queen Pine; to Mr. Sage, gardener to Earl Brownlow, for Keene's seedling Strawberries; and to Mr. Cadger for the same variety. Messrs. Carter sent a specimen of Marquis of Lorne Cucumber, 28½ inches in length and thick in proportion.

SCIENTIFIC COMMITTEE.

Dr. T. Thomson, F.R.S., in the Chair.

Professor Westwood brought specimens of an Erica which had been partly split by frost and partly stripped by mice. He also brought specimens of the variety of *Peziza lanuginosa* lately figured in the 'Linnean Transactions,' found, like those at Chiswick, under Cedars—and stated that, when properly washed, they were eatable, like allied species of *Helvella* and *Morchella*.

Two letters from Mr. Maw were read, intimating that the experiments on the ripening of fruit with coloured glasses led to no positive result, which agreed with those at Chiswick. The only effect was to prevent colouring. Mr. Horne thought that the flavour of fruit was due to solar light rather than heat.

Mr. Henderson sent a variegated *Acer japonicum* which was reverting to the normal green state.

Mr. Crawley sent a Chinese Primrose in which the white flower was of a deep green. The flowers, however, were metamorphosed in various ways.

A Carnation with spiral torsion was exhibited by Mr. Berkeley. Dr. Masters pointed out similar cases in his 'Vegetable Teratology.'

J. R. Reeves, Esq., brought a *Richardia* with a double spathe.

Dr. Masters brought a sketch of a male flower produced at the end of a tendril in the common Cucumber. Mr. Berkeley had seen cases in *Cucurbita pepo* in which both male and female flowers were produced at the same time on the same tendril. Some varieties are more subject to this peculiarity than others.

Prof. Dyer sent by Dr. Masters a note on the germination of *Tropæolum*. The radicle is endorhizal, with a distant coleorhiza. He also sent a note on the burrs of Birch. Dr. Harvey here described similar growth in a species of *Banksia*. *Pinus clanbrasiliana* owes its origin to something of the same kind; and Mr. Berkeley stated that he had observed it in *Pinus Douglasii*.

A species of *Æcidium* produces somewhat analogous fascicles, known in Germany under the name of *Hexenbesen*, in the common Silver Fir. Specimens have occurred near Hastings and at Luggelaw in Wicklow.

Dr. Baird believed that the worm sent on a former occasion by Mr. Lowe is undescribed; and he proposes for it the name of *Megascolex rigida*. The Committee, however, did not fall in with his views as to its being indigenous.

Dr. Masters brought fruit of *Aucuba* injured by frost, which were alluded to at a former Meeting.

The Meeting then adjourned.

GENERAL MEETING.

Mr. Berkeley directed attention to specimens of *Jonesia asoca*, brought by Mr. Gumbleton, from a plant which had been in flower for three months. The plant figured under this name in the 'Flore des Serres' was clearly not the same, but had a strong resembance to *Brownea longifolia*. The best collection of Browneas in these islands was probably that of W. H. Crawford, Esq., at Lakelands, co. Cork.

Mr. Berkeley brought specimens of Wellingtonia from the Dowager Marchioness of Huntly to show that it is monœcious.

The Prize offered by Mrs. Lloyd Wynn had unfortunately been given, contrary to her express directions, for varieties of *Narcissus orientalis*, and not for the largest collection of species. She would however, renew it for the following year. All could not be brought at once; but a record would be taken at each Meeting, and the prize adjudged accordingly.

Mr. Bateman exhibited two pods of Vanilla sent by D. Hanbury, Esq.—one from Mexico the pods of which were long and thin, the other of inferior quality resembling the fruit of the Banana. The fruit had formerly been largely cultivated in England, and of very superior quality. Major Trevor Clarke spoke of the difficulty of getting it to set, and supposed that there must be more than one variety in the country of *Vanda planifolia*.

SPRING SHOW.

Mr. G. Goddard, gardener to H. Little, Esq., was first with Cyclamens, Mr. C. Edmonds second, and Mr. James third. For twelve varieties Mr. James was first and Mr. Goddard second. For six varieties the decision was reversed. Cinerarias were, on the whole, of inferior quality. Mr. W. Lacy, gardener to C. S. Mortimer, Esq., was first, Mr. James second. Mr. E. Baxter took the First Prize for six distinct kinds of Amaryllis. For six bulbous plants in flower (Amaryllis excluded) Mr. Ware was first, who also obtained the Second Prize for hardy Primroses, there being no competition. Mr. Bull was the only exhibitor of six Odontoglossums, and had the First Prize. There was a fine collection of Roses; and Mr. B. S. Williams had a nice group of Orchids, which obtained a Special Certificate. A fine collection of Ophrys and other terrestrial Orchids was sent by the Comte de Paris, for which it was recommended to the Council that the Lindley Medal should be awarded.

Special Certificates were given to Mr. B. S. Williams for *Reseda odorata*, var. *grandiflora*, and to Messrs. Standish for a grand box of cut specimens of Maréchal Niel Rose. An Extra Prize was given to Mr. Charles Noble for six fine baskets of Clematis.

Mr. Lockie, gardener to F. W. Berger, Esq., was first for white-spined and black-spined Cucumber, Mr. J. Douglas, gardener to F. Whitbourne, Esq., being second. Mr. Hepper, gardener to C. P. Millard, Esq., was first for forced salading, Mr. Record, gardener to the Marquis of Salisbury, second.

To most of the collections in the miscellaneous class extra prizes were awarded.

FLORAL COMMITTEE.

April 19, 1871.

Special awards were made to Mr. J. Chambers, gardener to J. Laurence, Esq., for grand trusses of *Beaumontia grandiflora* and *Rhododendron Dalhousiæ*, to Mr. B. S. Williams for a miscellaneous group of plants, and to Mr. Green for a choice collection of Sempervivums.

First-class Certificates were awarded to Mr. Turner for Tea-rose Belle Lyonnaise; to Messrs. Veitch for *Acer dissectum* and *A. japonicum*, var. *ornatum*; to Mr. Bull for the purple-flowered Azalea Marvel; to Mr. G. Ward, gardener to A. D. Berrington, Esq., for *Cypripedium niveum*; to Mr. Denning for *Odontoglossum odoratum*; to Mr. Turner for two beautiful Alpine Auriculas; to Mr. Fairbairn, gardener to J. T. Noakes, Esq., for white hybrid Rhododendron, Bride; to M. Louis Van Houtte for his new Azaleas, Comtesse de Beaufort, rosy crimson with a deeper blotch, President de Ghellink de Walle, semidouble rosy crimson, George Loddiges, salmon-red, with a deeper blotch, Alice, semi-double, bright rosy carmine, and Marquis of Lorne, salmon-red, a first-rate variety.

FRUIT COMMITTEE.

A First-class Certificate was given to Mr. Cadgers, gardener to J. Shaw Leigh, Esq., for his large seedling white-spined Cucumber called Luton Hoe.

Special Certificates were awarded to Messrs. Rivers for dessert and kitchen Apples; to Mr. Turner for a pot-plant of his prolific black-spined Cucumber; to Mr. M'Crow for two Queen Pine-apples, two years from suckers, grown in 11- and 13-inch pots; and to Mr. Gardiner, of Eatington Park, for a collection of Apples. Mr. Rendle sent Lettuce and Endive grown under his patent plant-protectors at Belvoir Castle. Mr. Barron brought from Chiswick fine examples of Vilmorin's improved varieties of Dandelion, one of the best and most wholesome materials for salad when properly blanched.

SCIENTIFIC COMMITTEE.

Dr. T. Thomson, F.R.S., in the Chair.

A communication from Mr. Carson, of Melbourne, Australia, was read respecting a disease which has lately been very destructive to Vines. Both the leaves and shoots were affected with brown spots, much after the fashion of the diseased Peach and Nectarines which have been so often before the Meeting. There had been upwards of 60 inches of rain during the year in Sydney, and it was believed that the disease was due to the unusual rainfall.

Dr. Gilbert stated the results of the measurements of the amount of rain as collected in some new gauges at Rothampsted. The rain is collected at 20, 40, and 60 inches below the surface, further penetration being prevented by a plate of sheet iron; and about 20 per cent. was collected at 20 inches, 15 per cent. at 40 inches, and 10 per cent. at 60 inches. From pipe-drains at 30 inches in an adjoining field no water was collected. The amount of water collected from drain-pipes affords no trustworthy evidence of the real amount of rainfall.

Mr. Smee read a communication on a simple mode of heating by hot water, the warm and cold water flowing in opposite directions in the same pipe. The Secretary stated that he believed the same arrangement was exhibited at the Horticultural Congress at Hamburg in 1869—a statement which has since been confirmed by Mr. Barron, who examined the apparatus with Mr. Berkeley.

Dr. Masters brought drawings illustrative of the structure of the green Primrose exhibited at the last Meeting; also of a branched *Alsophila excelsa* from Sydney; also of a double-flowered Rhododendron, in which two adventitious styles proceeded from the axile placentæ, which were completely concealed within the central cavity of the ordinary style.

He also made some observations confirmatory of the views respecting the function of the fleshy roots of certain species of Crocus which were brought forward by Mr. Berkeley at a former Meeting *. They appear to supplement the resources of the old corm.

The Meeting then adjourned.

GENERAL MEETING.

Mr. Ellacombe sent a very interesting collection of Narcissus, though it was rather late for the neighbourhood of Bath: others were sent from the Chelsea garden by Mr. Moore; and others from Denbighshire by Mrs. Lloyd Wynne.

Amongst Mr. Ellacombe's contribution was a double Fritillaria, and fine specimens of *Helleborus lividus* and *H. orientalis*, excellent species for planting in shrubberies, but perhaps not quite so hardy as *H. fœtidus*, which was once common in Northamptonshire, but is now nearly extirpated. Also specimens of *Ornithogalum nutans*, the young shoots of which are eaten like Asparagus.

Mr. Berkeley then read the following communication from Mr. Smee:—

"Having to draw up some remarks upon the circulation of water in hot-water pipes, it occurred to me that the flow and return might be managed by the use of a single pipe instead of two, as now universally adopted.

"I directed the experiment to be tried by affixing to the socket end of a 4-inch an inch supply-pipe from an ordinary boiler, and a second pipe communicating with the bottom of the 4-inch pipe and the bottom of the boiler. As I expected, the circulation was most perfect and rapid, the hot water flowing along the upper surface

* Figures will be found of these last in the 'Gardener's Chronicle,' April 22, 1871. They consist of spongy cellular tissue enclosing a central mass of spiral vessels, among which may be seen occasionally intricately netted larger vessels.

of the pipe and the cold returning along the lower surface. Two currents in opposite directions were created in the pipe, and the action was so perfect that I ordered a frame to be fitted up forthwith, which has been in operation ever since.

"The mode of heating by a single pipe may be, no doubt, of frequent use; and manifestly, from the simple and portable nature of the apparatus, the arrangement will commend itself to the attention of horticulturists.

"But engineers whom I have consulted considered that the plan could not possibly answer; but having occasion to write to the eminent hydraulic engineer Mr. E. Easton, I put in a postscript, 'Can you circulate water in a single pipe? I can.' He replied that by accident a single pipe had once been arranged by one of his pupils instead of two; and this, to his surprise, was found to answer. And having my arrangement explained to him, he stated that there were many cases in which he should adopt it.

"With this exception, every practical engineer has considered the plan impossible; nevertheless it is most easy of construction and perfect in action, and I commend it strongly to my brother horticulturists in all cases where a single pipe is sufficient to communicate the necessary heat."

See above the remarks under the head Scientific Committee, April 19.

AZALEA AND AURICULA SHOW.

In consequence of the bad condition of the weather, the Show was comparatively poor, and there was little competition.

Messrs. Lane had the First Prize in the nurserymen's class for nine, also for six. In the corresponding class for amateurs the Second Prize was given to Mr. G. Wheeler, gardener to Sir F. H. Goldsmid, Bart. Messrs. Lane had the best single specimen for President Humann, and also for twelve cut trusses, the second-prize lot being sent by Messrs. Standish, and the third by J. Woodward, gardener to Mrs. Torr. Mr. G. Wheeler had the second prize for hardy spring plants. For Auriculas (six distinct varieties) the Rev. H. H. Dombrain was first, H. Little, Esq., second, and Mr. James third. Mr. Turner had the best single self, Bessy Bell, Mr. James being second with Miss Smith, and the Rev. H. H. Dombrain with Campbell's Pizarro. In green-edged, Mr. James was first with Lovely Ann, Mr. Turner second with

Prince of Greens, and Mr. Butcher, with Mrs. Butcher, third. In the grey-edged, Mr. Turner was first with Richard Headly, Mr. Dombrain second with George Lightbody, and Mr. James third with Superb. Mr. James was first with white-edged Ne-plus-ultra, Mr. Turner second with Earl Grosvenor, Mr. Dombrain third with Sommerscale's Catharina. Mr. Turner was first with twelve show-varieties, Mr. James second. In the amateurs' class for six show-varieties Mr. James was first, Mr. Dombrain second. Mr. Turner sent the best twelve Alpine varieties, Mr. James the second best.

Special Prizes were given to a great many miscellaneous objects. A First-class Certificate was given to *Anthurium Scherzerianum Dixoni*, from Mr. W. E. Dixon, of Beverley.

FLORAL COMMITTEE.

May 3, 1872.

On this occasion the beautiful *Primula japonica* was exhibited by Mr. Bull for the first time, together with a var. *P. japonica*, var. *lilacina*, both of which obtained First-class Certificates. We are indebted for its introduction to Mr. Fortune. The same distinction was awarded to Mr. W. Paul for a new seedling Rose, Princess Beatrice, full cupped, pale pink, with a deeper centre; to Messrs. Veitch for *Croton Johannis* and *Agave festivus*; to Messrs. Rollisson for Gloxinia Rev. H. H. Dombrain; to Mr. R. Wood, gardener to W. B. Kellock, Esq., for *Gasteria nigricans*; to Mr. R. S. Williams for a new species of *Sobralia* and *Amaryllis marmorata*, var. *perfecta*; to Messrs. Downie, Laird, and Laing for Tropæolum Mrs. Bowman, and *Iberis gibraltarica*; to Mr. Green for *Elisena longipetala* and *Dyckia brevifolia*; to Mr. Masters, gardener to Lord Macclesfield, for *Bougainvillea speciosa*, var. *variegata*; to Messrs. Paul for Rose, Earl of Eldon, bronzy orange-yellow; and to Messrs. Veitch for *Todea Wilkesiana.*

Second-class to Mr. Turner for green-edged Auricula, Alderman Wisby; and to Mr. Masters for a fine perpetual-flowering Clove, Miss Jollip.

Special Certificates were awarded to Mr. Needle for terrestrial Orchids; to Mr. Woodward, gardener to Mrs. Torr, for *Eria leucostachya*; to Messrs. Rollisson for *Telopia speciosissima*; to Mr.

Petch, gardener to S. Mandel, Esq., for *Phalænopsis grandiflora*; to Messrs. Williams and Mr. Green for miscellaneous groups.

FRUIT COMMITTEE.

Wonderful dishes of Black Eagle and Bigarreau Cherries were sent from Trentham, of excellent flavour, to which a Special Certificate was awarded; also to Mr. Douglas, gardener to F. Whitbourn, Esq., for a brace of seedling Cucumbers from Blue Gown; to Mr. Batters, gardener to W. B. Fleming, Esq., for early Peas and Potatoes; to Mr. Richards, gardener to Baron Rothschild, for Black Hamburgh Grapes; and to Mr. Sydney Ford, gardener to W. E. Hubbard, Esq., for Apples and Pears. Mr. Temple sent grapes preserved by immersing in a bottle of water. The Committee hoped that he would give a detailed account of his mode of treatment.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

The Secretary brought some specimens of Coffee which had been forwarded from Ceylon by Mr. Thwaites. The albumen was greatly reduced in size, and had acquired a dark tinge. The tissues, however, were not diseased, and it appeared that, in consequence of abrupt changes of weather, the growth had been suddenly arrested. When soaked, it was found that the embryo had not attained its full size, but was surrounded with a transparent gelatinous substance intended probably for its further development. Unfortunately the coffee in many plantations was in the same condition.

Mr. A. Smee read a paper on a blight which had suddenly appeared on a Siberian Crab-tree, which was clearly due to the growth of a parasitic fungus, *Helminthosporium pyrorum*, a species which infests many Pomaceæ.

The Chairman brought Lemons with deep brown depressions in the rind. These have since been examined microscopically, and there is certainly no fungus in them.

He then read a very interesting paper on grafting, which will be published in the Society's Journal.

Mr. Reeves brought part of a stem of a Passion-flower, the central portion of which was dead. This sometimes happens from the stem resting on an iron rod, or against some other good conductor of heat, in consequence of which the tissues of the part are injured and ultimately perish.

Mr. Manby brought corms of an Oxalis, from some of which large fleshy roots had been produced resembling those of some Crocuses which were on a former occasion before the Committee.

The Meeting then adjourned.

GENERAL MEETING.

James Bateman, Esq., F.R.S., in the Chair.

The Chairman called upon the Members in general for donations of books to the Library, and invited M. de Cannart d'Hamale, who was on the platform, to exert his influence in this direction in Belgium.

Mr. Wilson Saunders said that he had lately employed collectors in Peru and Chili, and had obtained, from the latter especially, many novelties.

Mr. Berkeley said that he was wrong in saying that the shoots of *Ornithogalum nutans* are sold as a substitute for Asparagus at Bath. *O. pyrenaicum* is the plant, according to Mr. Ellacombe, which is so employed.

The subjects of interest which had been brought before the Scientific Committee were noticed, and Mr. Bateman read the following note respecting *Primula japonica*, Asa Gray, from Mr. Fortune :—

"In the early days of May 1861, just ten years ago, when I was sojourning in an old temple near Yeddo, the capital of Japan, a native florist brought to my door a basketful of this beautiful Primrose in full bloom. Its flowers, of a rich magenta colour, were arranged in tiers, one above another, on a spike nearly two feet in height, and its leaves were not unlike our own English Cowslip. It was beyond all question the most beautiful of the genus to which it belongs; and I crowned it at once as the 'Queen of Primroses.' I need scarcely say that I bought all the basketful and added it to my already rich collections of Japanese plants. Unfortunately, however, I did not succeed at that time in getting the plants home alive; and the seeds which I had gathered failed to vegetate on their arrival in England. Since that time I have made many efforts to get home living plants and seeds. Mr. Fitch, the talented artist, kindly made drawings for me from dried specimens in the Kew herbarium; and these drawings were sent out to Japan in order that the plant might be recognized by my correspondents. I am, however, almost uncharitable enough to believe that some of those to whom my letters were addressed considered the plant too valuable to send to me, and therefore sent it to more influential friends instead. Be that as it may, I have great pleasure in stating that I succeded at last, through the kindness of Wm. Keswick, Esq., of China, and Messrs. Walsh, Hall, and Co., of Japan, who sent me seeds which vegetated on their arrival in this country. These gentlemen, therefore, have had the honour of enabling me to introduce a very lovely hardy plant from the gardens of Japan to those of Europe. There are several distinct varieties, with flowers of various hues of colour, and all are beautiful. It will prove a grand plant for our hybridizers, owing to its fine habit, large flower-spikes, and brilliant colouring, and no doubt will become the parent of a new race of hardy Primroses. I have only to add that the plant had withstood the late severe winter in the open air without any protection whatever, both in my own garden at South Kensington and in Mr. Bull's establishment in Chelsea.—ROBERT FORTUNE."

ROSE AND AZALEA SHOW.

In the open class for nine Roses, Messrs. Paul were first, Mr. Turner second. In the corresponding class for six, Messrs. Veitch were first. In the amateurs' class for three, Mr. James was the only exhibitor, and obtained a Third-class. Messrs. Paul were first for twelve varieties, 1868, 1869, 1870, Mr. Turner second. Mr. Turner had the best twelve show Auriculas, as also twelve fancy or Alpine varieties. Mr. James was first in the amateurs' class for six, Mr. Dombrain second. The class for Azaleas brought out nothing worth notice. Messrs. Rollisson were first for the best collection of Orchids, Mr. Ball second.

FLORAL COMMITTEE.

MAY 17, 1872.

Mr. Thompson, Ipswich, brought *Collinsia violacea*, which obtained a First-class Certificate. The same award was made to M. Linden for *Masdevallia Lindeni*; to Mr. B. S. Williams for

Adiantum asarifolium, closely allied to *A. reniforme*, introduced by the Rev. Mr. Ellis; to Mr. Smith, Hornsey Road, for a seedling mauve-coloured intermediate Stock (Mauve Queen), which, however, was scarcely a novelty; to Mr. Turner for tricolor Pelargoniums Lady Burdett-Coutts and Mrs. Rousby, for Azalea Comptesse de Flandres, rosy pink, Paul Vernon Rose, a large cup-shaped flower of great substance, of a bright cherry-rose; and to Mr. Denning for *Cattleya Reineckiana*.

A Second-class was awarded to M. Dallière for Azalea La Reine.

Special Certificates were given to M. Dallière for a noble specimen of *Anthurium Scherzerianum*; to Mr. Wilson, gardener to W. Marshall, Esq., for *Hæmanthus tenuiflorus*; to Messrs. Veitch for cut Rhododendrons; to Mr. Denning for Cattleyas and a fine *Vanda teres*, var. *Andersoni*, to which the Council awarded the Lindley Medal; and to Mr. B. S. Williams for *Cochliostema Jacobianum*.

FRUIT COMMITTEE.

Mr. G. Miles, gardener to Lord Carrington, was first for eight dishes of forced fruit.

Messrs. Carter offered prizes for their first-crop Pea; there was only one competitor, who obtained the first place in each class. He brought also Little Gem, sown on turf in November and planted out under a wall March 6.

Special Certificates were given to Mr. A. Colbourn for fine specimens of Loquat, and to Mr. W. Gardiner for Apples.

Messrs. Standish sent specimens of their Early Ascot Frontignan Grape, which, in the same house with Black Hamburgh, was six weeks earlier. It obtained a First-class Certificate.

The following communication came from Mr. Temple relative to his mode of keeping Lady Downe's Seedling, exhibited at the last Meeting:—

"The Lady Downe's Grapes referred to were ripe in August, cut in November. The temperature would average from 40° to 50°, but sometimes nearly down to the freezing-point. They were kept in the dark in a common fruit-room, where apples, pears, seed potatoes, &c. were crammed. The water in the bottles was never changed entirely, but a little was added once or twice. A few pieces of charcoal were placed in many of the bottles, though some had none; but there was no difference in keeping, taste, &c. The water was partly rain- and spring-water from a tank used to catch all the waste water. The ends of the wood above the bunch, about half an inch long, were rubbed with Thompson's styptic. The fruit-room was frequently fumigated with sulphur to keep insects and mice away. About 120 bunches were thus kept, and I am not aware that any of them decayed except a few berries in April on some very close bunches. I attribute their keeping so sound to thorough ripening early in the season, firing hard, with top and front air on, a month or six weeks after the fruit was apparently 'finished.' We have practised this system for five years past with the same results, and have no difficulty in keeping White and Black Muscats in good condition till March. We had some this season till the fourth of that month, which were cut early last August. The latest date to which we have kept Lady Downe's in good condition was June 10. We exhibited a bunch three years ago on that date; they were coloured in the July of the previous year."

Mr. Temple received a Special Certificate and the thanks of the Committee for his letter.

SCIENTIFIC COMMITTEE.

A. Grote, Esq., F.L.S., in the Chair.

The Secretary exhibited a seedling leguminous plant in which strong shoots were produced from the axils of the cotelydons, which had themselves been destroyed, as also the main shoot. He remarked that in *Centaurea* he had observed, when the cotyledons had been destroyed by insects, that the first pair of leaves assumed exactly the form of cotyledons.

He also brought Vine-leaves which were densely and uniformly spotted, probably from drops of water having settled on them.

Some Strawberry-leaves also were shown much spotted. The variety to which they belonged (Sir C. Napier) was said to be peculiarly liable to this condition.

Mr. Glaisher brought fruit of the Horse-chestnut from the tree which he stated on a former occasion was partially parched by wind. The fruit on the exposed side was very imperfect.

Dr. Welwitsch brought a section of some Menispermaceous wood, where irregular zones of liber alternated with woody tissue. Mr. Miers, who has paid much attention to the Natural Order, considered it different from any thing he had before observed.

Dr. Masters read a communication from Mr. Early respecting Mr. Smee's plan of heating with a single tube, believing that it might be applied in connexion with the air-supply to glass structures, especially in very early forced vineries.

Mr. Glaisher then exhibited the last improvement in thermometers, for ascertaining the temperature of roots.

The Meeting then adjourned.

GENERAL MEETING.

Lord H. Gordon Lennox, M.P., in the Chair.

Mr. Berkeley remarked that Mr. Thompson's *Collinsia* was no doubt a variety of *C. grandiflora*, and was the same plant which Sweet had figured under the name of *C. verna*, a very rare species. He then called attention to Mr. Barr's large collection of Scillas, amongst which one was preeminent for size and beauty. Numerous as they were, all were referable to three species, and the greater part to *Scilla campanulata*.

Mr. Bateman commented on the Orchids which had been exhibited, calling special attention to Mr. Linden's *Masdevallia*, and to the magnificent specimen of *Vanda teres*, which had travelled without injury in Lord Londesborough's heated van.

PELARGONIUM AND HEATH SHOW.

Mr. Ward, gardener to F. G. Wilkins, Esq., was first for nine show Pelargoniums, which were peculiarly good; Messrs. Dobson second. Mr. Ward was first in the Amateur Class for six, Mr. James second. For six fancy varieties (amateurs) Mr. J. Weir, gardener to Mrs. Hodgson, was first, Mr. James second. Mr. C. Noble was first for Clematis; but there was no competition. Mr. B. S. Williams, Messrs. Rollisson, and Messrs. J. & E. Lee obtained the Prizes for Palms. For Heaths in the open class for eight, Mr. Ward was first, Messrs. Jackson second. In the amateurs' class for six, Mr. Carr, gardener to P. S. Hinds, Esq., was first, Mr. Ward second, and Mr. Wheeler third. For the collection of twelve in 12-inch pots, Mr. Ward and Messrs. Jackson were first and second. The Prizes for Stove Ferns were secured by Mr. J. Carr, Mr. J. C. Smith, gardener to C. Walton, Esq., and Mr. G. Wheeler. In the open class for twenty stove- and greenhouse-plants, Mr. J. Ward, Messrs. Jackson, and Mr. Kemp, gardener to the Duke of Northumberland, were the successful competitors. In the amateurs' class for nine stove- and greenhouse-plants, Mr. J. Carr was first. The best twenty foliaged-plants came from Mr. Bull, Mr. B. S. Williams being second, and Messrs. Bell and Thorpe third.

Extra Prizes were awarded to Messrs. A. Henderson and Co. and Mr. G. Wheeler. M. A. Dallière sent two fine specimens of *Dracæna indivisa*, var. *lineata*, two good examples of a Pandanus from Madagascar, besides other remarkable specimens, to which, and to many other objects, special awards were made.

FLORAL COMMITTEE.

June 7, 1872.

First-class Certificates were awarded to Messrs. Ivery for *Polystichon angulare*, var *pulchrum Bellarsiæ*, and *Polypodium vulgare*, var. *Whytei*, and a Second-class for *Athyrium filix-fœmina*, var. *trifidum*; to Mr. J. George for Scarlet Nosegay Pelargonium Flame, and a Second-class for salmon-pink Polly King; to Mr. Masters, gardener to Lord Macclesfield, for Perpetual Clove Miss Jolliffe, which received a Second-class at a former Meeting; to Mr. J. Atkins for *Linum flavum*, var. *campanulatum*, bearing a profusion of orange-yellow flowers; and to Mr. W. Paul for Pelargonium Wellington (very dark red), Ianthe (scarlet), both with a bluish tint, Sir C. Napier (bright scarlet), all raised by Mr. Denny.

Second-class Certificates were given to Mr. Paul for silver-edged Pelargoniums Virgin Queen and Mont Blanc, and Lady D. Neville, a silver tricolor.

A Special Certificate was given to Mr. Croucher for a fine collection of Agaves, and a First-class for *A. revoluta*. A similar award was made to Mr. Bull for *Oncidium cryptocopis*.

A Second-class was given to Mr. Turner for a new Pink named Lady Blanche, and to Messrs. Carter for *Solanum ciliatum*.

Special Certificates were given to Messrs. Veitch for *Lælia majalis*, with which was *Palumbina candida*; to Messrs. Jackson for boxes of Clematis; to *Chysis aurea* from the Society's collection; to Mr. W. Thompson for *Lathyrus Sibthorpii.* Messrs. Barr and Sugden sent a series of cut blooms of Lilies and several species of *Ferula*, a genus well adapted for shrubbery-borders.

FRUIT COMMITTEE.

Mr. Temple again sent a bunch of Lady Downe's Grapes preserved as before reported, which was of a first-rate flavour. Messrs. Barr and Sugden, amongst other kinds, sent Earley's Selected Double Parsley with peculiarly curled leaves.

A Special Certificate was given to Mr. W. Gardiner for Apples, also to Mr. Fillery for Nectarines, Strawberries, and Cherries, and a dish of Lady Downe's Seedling which had been kept for a long time. Mr. Cox sent Carter's Early Paris Market Lettuce from seed sown in the open ground, February 18; and the Rev. C. C. Ellison Brown Batavia Endive, to show how soon it hearts.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

Several foreign Delegates were present.

Flowering sprigs of *Cytisus Adami* were sent by Mr. Burton, consisting partly of *C. purpureus* and partly of an intermediate form between that species and *C. laburnum.* It has been said that the seeds will not vegetate; but if what were sent to the Secretary were from the true plant, they vegetate freely.

The Secretary exhibited male and female flowers of *Lychnis*, the former of the white-flowered scarce variety, the latter of the common red variety, confirming the observations of Miss Lydia Becker as to the development of stamens in the female plant when affected by *Ustilago antherarum.* Both were from plants collected last year and placed in pots to ascertain whether they would be again affected with the Ustilago, and, if not, whether the female plant would become hermaphrodite.

He also brought leaves of Pear and Peach, the one blistered with *Ascomyces bullata*, the other with *A. deformans.* With the former there was also *Helminthosporium pyrorum.*

He also brought from Mr. Willard roots of a vine penetrated with fungus-spawn, which was clearly extending to the parts which were still healthy.

Dr. Masters brought a drawing of *Scilla bifolia*, var. *alba*, to show that other plants besides *Crocus* and *Oxalis* produce the thick fleshy roots which have been exhibited at two or three late Meetings.

Leaves of Cattle's Eclipse Brocoli, with their apices coherent, were brought by Dr. Masters, which had formed a natural defence against frost.

Specimens of Roses came from Mr. Fish and others, infested with *Coleosporium pingue*, which, according to Léveillé's observation, is propagated through the roots.

Bunches of Apples were sent by Mr. Dean destroyed by the caterpillar of a moth (*Cheimatobia brumata*).

Specimens of Black-currant shoots were sent which had been destroyed in a single night by frost. They were also, as is the case with currant-trees very generally this year, much damaged by *Aphis*, as also by scale and fungus.

Specimens of Cucumber Murrain came from Mr. Hollingsworth, Cheltenham.

A malformed Geranium (Robertianum) was sent by Mr. Broome, a report on which was promised for the next Meeting.

Dr. Masters brought a large section of an American Elm grafted on the common Elm, in illustration of the views lately proposed by Mr. A. Murray.

Dr. Welwitsch brought specimens of a *Cicada* which attacks the leaves of a *Ficus* near to *Ficus elastica* from Angola, which produces a profuse flow of watery juice.

Some Pelargoniums were sent with cup-shaped leaves similar to to those which often occur on variegated Ivies.

The Chairman stated that the American Blight, like the *Phylloxera,* attacks the roots as well as the leaves.

Dr. Gilbert, after some observations by the Secretary on Clover sickness, read an interesting paper on the subject, which will be published in the Society's Journal.

The Meeting then adjourned.

The following observations were sent by Mr. Dean:—

"The accompanying branches were gathered from an orchard at Bedford, and are samples of the mischief and destruction that has been wrought upon hundreds of large Apple- and Pear-trees by the caterpillar of the Winter Moth (*Cheimatobia brumata*). The larger branch, and which has its foliage literally charred, is a sample of the present appearance of several acres of the trees in the orchard, line after line of trees looking as though consuming fire had passed through them. The other Apple-branch represents the nature of the damage done to the major portion of the remainder of the orchard, scarcely a tree being found whereon the foliage has not been more or less eaten. The small branch of Currant-bush sent also shows how the caterpillars, after they had stripped the Apple-foliage, came down to the Currant- and Gooseberry-bushes beneath, and served them as they had the trees above. This sweeping damage has unfortunately not been confined to the orchard in question, but has extended to many of the market-gardens in West Middlesex, and will of necessity entail upon their proprietors a very heavy loss; as not only is the prospect of a crop on many hundreds of trees entirely annihilated for the present year, but the chances of a crop next year are put in great doubt also. It is worthy of notice that Pear-trees have not suffered so largely as the Apple-trees have, and also that the trees of dwarfer growth have suffered more largely than the latter ones. Thus especially noticeable was the entire damage done to alternate lines of trees of the Yellow Ingestre, whilst the crowns of the stronger-growing Wellingtons were comparatively untouched. On the whole, it would be difficult to conceive a sadder specimen of the mischief insects are capable of bringing to horticulturists than was presented in this orchard. Inquiry elicited the somewhat obvious fact that entomological knowledge was not very widely distributed amongst the market-garden fraternity here. Little or nothing seemed to be known of the character or habits of the moth, or fly, as usually termed here; but because there were a considerable number of large flies seen hovering over the bloom of the trees in the month of April, it was generally assumed that the eggs from which the caterpillars germinated were then deposited. Not a little of the blame is laid to the drought of last summer, and not a little also to the prevalence of cold north-easterly winds during the blooming-period, and which, by generating a very dry atmosphere, no doubt tended largely to assist the caterpillars in their work of destruction. The attempted remedy of dusting the trees with slaked lime was largely tried, but with little effect. Indeed, to perform this operation with any degree of success upon large trees of forty years' growth and upwards, is a matter reasonably to be doubted. The most effectual preservative that can be found is to make the stems of the trees an impossible means of ascent to the female moth, which, being without wings, has to crawl to the branches of the tree to deposit its eggs, and which operation is usually performed during the winter months. To accomplish this desideratum, a band of tar several inches deep put on around each stem has been recommended, but this soon hardens and requires frequent renewal. A considerable infusion of grease has been also devised as likely to promote the necessary softness. In any case, if the statement is correct that the female moth is wingless, then whosoever shall concoct and make known to orchardists a composition, the application of which to the trunks of the trees shall make the ascent of the insect an impossibility, will have performed good service to horticulture"*.

GENERAL MEETING.

J. Bateman, Esq., F.R.S., in the Chair.

The following Continental horticulturists were present:—Prof. Reichenbach, Prof. Morren, M. Doucet, M. Coer van der Maeren, M. Wautier, and M. Marabot.

Mr. Berkeley directed attention to Mr. Bull's Liliaceæ, and especially to *Amaryllis spectabilis*, figured in Andrew's 'Repository,' which, though not so brilliantly coloured as some others, was interesting from its very distinct habit; and a new form of *Eurycles*, var. *elegans*, which Mr. Bull has introduced from the island of Ternate. The only difference between this and the one figured in the 'Botanical Magazine' was that the crown of the one is entire, whilst in the other it is cut down to the base. There are two other species, one from the Solomon Isles, the other from Australia.

A new variety of Ivy, under the name of *Hedera conglomerata*, from its dwarf compact habit, promised to be an acquisition for many purposes.

The Chairman then said he was glad to see *Lælia majalis* once more, one of the grand Orchids of Mexico, where there was a

* It is curious that in Curtis's 'British Entomology,' under *Hybernia*, to which genus he refers *Cheimatobia* as a subgenus, we have the following information:—"Fortunately for this country, the larvæ are never known to do any mischief; but in France the caterpillars do very extensive injury by destroying the leaves, especially of fruit-trees. But M. Duponchel mentions an admirable plan for checking their ravages; it is by washing a space round the base with a glutinous matter, so that the females as they pass up the trunk in order to lay their eggs upon the leaves may be entangled by the gluten and perish. By the destruction of one female the birth of at least three hundred caterpillars is prevented. Shaking the trees smartly is also effective by causing the larvæ to fall, but it is likewise injurious to the fruit."—M. J. B.

monster *Cypripedium*, of which a plant was once in the country, but which was now a great desideratum.

FIRST JUNE SHOW.

The Orchids were well represented by Mr. G. Ward, Mr. B. S. Williams, Mr. J. Linden, and Mr. Bull. Mr. Linden obtained the First Prize for a single Orchid with *Cypripedium caudatum*. Messrs. Jackson and Mr. Moore were equal for stove- and green-house-plants; Mr. J. Ward and Mr. T. Wheeler first and second in the Amateurs' Class. Mr. Bull was first for fine-foliage plants, whose lot was magnificent. M. A. Dallière had an admirable group of young Palms and a fine pair of pyramid Bay trees, both rewarded with a Medal. Mr. Linden contributed an interesting group of new plants, of which the following received First-class Certificates:—*Xanthosoma Lindeni*, *Dracæna lutescens striata*, *Acer palmatum*, var. *roseo-dissectum*, and *A. palmatum*, var. *crispum*. Messrs. Jacob-Makez received First-class Certificates for *Lycopodium taxifolium*, *L. mandioicanum*, *L. dichotomum*, and *Tillandsia Morreniana*. The following new show Pelargoniums sent by E. B. Forster:—Lord Byron, Conquest, Bluebell, Achievement, and Cæsar. The same award was made to a new double Petunia (Pantaloon), one of a series of excellent new varieties raised by Mr. Barron at Chiswick.

There was a good show of fruit of various kinds.

FLORAL COMMITTEE.

June 21, 1872.

Special Certificates were awarded to G. F. Wilson, Esq., for a fine group of Lilies; and to Mr. Anderson for some fine cut spikes of Orchids.

First-class Certificates were given to Mr. Parker for *Passiflora vitifolia*; to Messrs. Fisher, Holmes, and Co. for a dwarf white-margined new Lemon-thyme; to Mr. Turner for a new seedling Pink (Godfrey), white, heavily laced with purple; and to Mr. Rye, gardener to E. B. Forster, Esq., for show Pelargoniums (Prelate and Pompey).

Mr. Wilson, gardener to W. Marshall, Esq., had a Second-class Certificate for *Phajus Marshallæ*, white with orange-tinted lip; and Mr. Pestridge for Pelargonium the Bride, a strong white-edged variety with white flowers.

In the International department, First-class Certificates were awarded to Mr. Linden for three new Palms, *Verschaffeltia melanochætes*, *Thrinax elegantissima*, and a *Calamus*, from Menado. Mr. Williams and Mr. Linden were awarded equal First Prizes for Palms, Mr. Burley second, and Mr. Bull third, who contributed a nice group of handsome young specimens of the newer kinds, including the true *Latania rubra* and *Ptychosperma regalis*. As usual, there was a magnificent display of Orchids, which certainly ought to compete as a separate class without being mixed with other objects, though undoubtedly they are more effective for show purposes when staged judiciously with other Phænogams.

FRUIT COMMITTEE.

A Special Certificate was given to Mr. Douglas, gardener to F. Whitbourn, Esq., for a fine dish of President Wilder Strawberries; also to Mr. J. Plumridge, gardener to H. Vallance, Esq., for Sir J. Paxton Strawberries. Messrs. Barr and Sugden sent the Cloche Cabbage-lettuce, the earliest as well as the variety most grown in the market-gardens near Paris, with several other kinds.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

Mr. Jones sent a Pelargonium with a large tuft of hair-roots on the stem similar to one shown last year.

Mr. Odams sent Wheat much injured by a curious parasite (*Dilophospora graminis*).

Mr. Begbie sent specimens of *Araucaria imbricata* with male and female fruit on the same branch.

Dr. Hogg read a communication from the Rev. W. Kingsley relative to the fruiting of seedlings. This, he stated, is greatly forwarded by encouraging the leading shoot and training the plants as single rods. It was suggested that experiments should be made on this subject at Chiswick.

Dr. Weltwitsch read an interesting paper on the Loranthaceæ of Angola, which will be published in the Journal.

The Meeting then adjourned.

GENERAL MEETING.

J. Bateman, Esq., F.R.S., in the Chair.

M. Antoine, Director of the Imperial Garden of Vienna, was received by the Council in his official capacity as delegate from the Austro-Hungarian Government.

Mr. Wilson commented on the Lilies which he cultivates with such success. He found from experience that the best mode of out-of-doors culture is to plant in deep beds of peat amongst dwarf Rhododendrons. Some, however, succeed in the boulder-clay of the Upper Lias, a single plant of *Lilium Sovitzianum* having in such a situation borne sixteen flowers, all open at the same time and affording a magnificent spectacle.

The Chairman read a communication from Mr. Anderson respecting some of his cut flowers. One of the flowers of *Odontoglossum Alexandræ* had been fertilized by a bee, the effect of which is at once to impair the texture, the mere abstraction of the pollen masses not having the same effect. It is treated with abundance of atmospheric moisture during the growing-season, but is kept quiet in winter, being reduced as a minimum to 60° and a mean of 67° for at least three of the darkest months.

SCIENTIFIC COMMITTEE.

Chiswick, June 25.

A. Murray, Esq., F.L.S., in the Chair.

On inspecting the seed-boxes it was found that the plants had for the most part grown too thick and close to allow a fair comparison to be instituted, and in some instances they had even begun to decay. This was ascribed to their having been too thickly sown and to the soil having been too rich. It was therefore resolved:—1st. That they should be cut over and allowed to start afresh. 2nd. That after being cut, the product should be entrusted to Dr. Gilbert for examination, viz. such weighing, drying, analyzing, &c. as he might think necessary; and he undertook to send his assistant to take notes previously, and assist in the work of cutting, sorting, packing, &c. 3rd. That the plants be not thinned this season, but allowed to take their chance; and that they should be again inspected later in the season, when the course of experiment for next year could be discussed.

It was ordered that these resolutions should be communicated to Dr. Masters, who had already taken full notes of the progress of the experiment, in order that he might complete any observations he wished to make before the plots were cut.

EXHIBITION OF THE ROYAL HORTICULTURAL SOCIETY AT NOTTINGHAM.

June 27 to July 1.

This was the first of the Provincial Shows held by the Society which took an independent character, those of previous years having been held at the same time as, and usually in close proximity to, those of the Royal Agricultural Society. This arrangement, owing to the preponderating attractions presented by the Agricultural Show, did not prove so satisfactory as could be desired, and hence the determination to hold the Provincial Horticultural Shows at some independent centre and at a season more suitable for a display of flowers. Of the success of the Nottingham Show there was never any doubt, thanks to the active exertions of the Local Committee and the well-known horticultural proclivities of the inhabitants of the town.

Since the great International Horticultural Show of 1866 there has not been so grand an exhibition in this country as that at Nottingham, which, in the unavoidable absence of the President, was opened by Col. Scott, R.E., in the presence of the Mayor of Nottingham and other officials of the town. The spaciousness of the tent under which the main portion of the show was arranged permitted of a picturesque disposition of the plants, which, as regards the condition in which they were produced, were deserving of all praise. Foliage-plants, flowering plants, Palms, and Ferns were alike good, and well represented as to quantity. Fruit, as usually happens at these prolonged shows, was not so plentiful as could have been wished. The local show, especially of Roses, which was so ordered as to come in and freshen up the remainder towards the close of the week, was very fully contested, and the flowers were in many instances of excellent quality. Amongst the stove- and greenhouse-plants exhibited the specimens of *Dipladenia amabilis* and *D. splendens* from Mr. Baines, of Southgate, were strikingly fine and attractive, as was a wonderfully perfect example of *Ixora javanica*, 5 feet high, clothed with foliage down to the foot, and superbly bloomed, from the same rich collection; grand plants of *Anthurium Scherzerianum* were also shown by Mr. B. S. Williams and Mr. Baines. Of fine foliage-plants, Mr. W. E. Dixon had the finest specimens of *Phormium tenax variegatum* which have ever been exhibited; while a plant of *Croton angustifolium* from Mr. Baines, which was fully 5 feet high, was splendid both in foliage and colour. Many grand examples of exotic Ferns graced the show; and of new varieties of British Ferns, a most extensive and interesting collection came from E. J. Lowe, Esq., while some fine specimens of hardy Ferns were staged by J. E. Mapplebeck, Esq. Roses were abundant, and, considering the season, good in quality. T. Laxton, Esq., and Messrs. Paul and Son occupy the premier positions in the Amateurs' and Nurserymen's Class. The Fruit Show was not so extensive as on some previous occasions; but as the vegetables were much better shown than usual, the combined display was tolerably satisfactory; and some excellent orchard-house trees in pots from Mr. Pearson, of Chilwell, and of pot-vines from Messrs. Lane and Son, were really effective, and as good as could be desired. Mr. Miles, gardener at Wycombe Abbey, won the First Prize for a collection of fruit consisting of twelve dishes. The "Gardeners' Prize" for vegetables (a Prize raised by subscriptions amongst gardeners themselves) was won by Mr. A. Gilbert, of Burghley, whose group was very neatly arranged.

There was an extensive display of implements and also of horticultural buildings and requisites, a feature which is always of much interest at these miscellaneous gatherings.

FLORAL COMMITTEE.

July 5, 1871.

First-class Certificates were awarded to Mr. Croucher for *Agave Verschaffeltii variegata*, the variegation consisting of a golden band down the centre of the leaves; to Mr. Bull for *Alsophile Sherpherdii*, a miniature tree-fern; to Mr. Green for *Houlettia odoratissima*, var. *antioquensis*; to Messrs. Backhouse for *Linum salsoloides* and *Lithospermum petræum*; to Mr. Wiggins, gardener to J. W. Beck, Esq., for Show Pelargonium Ada; to Messrs. E. G. Henderson and Son for Petunia Coquette, semidouble, with a white ground and crimson-flaked margins; and to Mr. Turner for two large heavily-laced Pinks (Dr. Masters and Shirley Hibberd); the latter gentleman received a Second-class for Show Pelargonium Euterpsia; and Mr. Bull for *Lobelia erinus*, var. *omen.*

A Special Certificate was given to Mr. J. Steven for a fine group of Balsams.

FRUIT COMMITTEE.

Special Certificates were given to Mr. Gilbert for a highly flavoured Melon called Selected Cashmere; to Mr. Tillery for Galande Peaches and Violette Hâtive Nectarines; to Mr. Perkins Stanmore for Queen and Ripley Queen Pines; to Mr. J. Douglas for Lucas Strawberry; and to Mr. Turner for Buckland Sweet-water and Black Hamburgh Grapes. Mr. Colbourne sent Mushrooms measuring from 8 to 10 inches across. Messrs. Wrench sent a bast-like substance from Japan, to which, on account of its strength and softness, a First-class Certificate was voted.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

The foreign Delegates to the exhibition were introduced by Dr. Masters.

Mr. G. F. Wilson brought leaves and flowers of various Lilies affected by a spot which seemed exactly analogous to that which is so fatal to Orchids. It could not be attributed to the continued wet weather, as the plants under cover were equally affected.

The Secretary read extracts from a letter from Dr. Schomburgk respecting a substance known as mineral gamboge. It occurs in large quantities on sand near the river Coorang, varying in thickness from $\frac{1}{20}$ to $1\frac{1}{2}$ inch. On microscopical examination it appeared to be a condition of some Collemal, exhibiting in the upper granulated surface the moniliform chains of gonidia characteristic of the group.

Mr. C. W. Strickland sent rhizomes of *Adiantum setulosum* = *A. diaphanum*, bearing alternate tubercles analogous to those of Leguminosæ. Dr. Masters said that the root-tubers of *Nephrolepis tuberosa* were of the same nature. The Secretary has since obtained specimens of the latter which had parted with every particle of starch.

The Secretary again exhibited Wheat attacked by *Dilophospora graminis* and a graft of Camellia illustrating the views lately brought forward by the Chairman.

Mr. Laxton brought plants of variegated Pelargonia inarched with self-coloured varieties. The graft was in no case affected by the stock. The specimens showed, moreover, that many varieties or species quite distinct in appearance will inarch with those which are very different.

A twig of Beech was brought by Dr. Masters with a decayed spot which was just analogous to the disease of Vine-shoots from Australia exhibited at a former Meeting.

He brought also an Ustilago on *Bromus mollis*, from Mr. Earley, which, on examination, was found to be *Ustilago bromivora.*

Messrs. Ottolander, of Boskoof, sent leaves of ornamental trees, on which Prof. Koch promised a report.

The Chairman then read a paper on Blights, which will be published in the Journal.

Dr. Bastian made some remarks on spontaneous generation.

The Meeting then adjourned.

GENERAL MEETING.

J. Bateman, Esq., F.R.S., in the Chair.

M. Karl Koch, MM. Regel and Volkenstein, M. v. Heyder, M. Morren, together with MM. Linden, Gloner, and Prof. Perard, M. Antoine, and Mr. D. Moore were formally received by the Council.

Mr. Wilson stated that a Medal had been awarded by the Council to the Queen Pines shown by Mr. Perkins, on account of their extraordinary quick production from unrooted suckers in twelve months. He then adverted to some promising Peas sent by Mr. Laxton; but it had been determined that no Peas should have certificates till they had been tested at Chiswick.

The Chairman stated that the importation of Orchids was not so profitable as was generally supposed, in consequence of the number which were dead when they arrived.

ROSE SHOW.

The weather had been highly unfavourable, still the blooms were good in colour and substance and remarkably clean. The miscellaneous class was enriched by collections of plants from Mr. J. Linden and M. A. Dallière. To the former were given First-class Certificates for *Epidendrum Frederici Gulielmi*, *Alleplectus vittatus*, *Dioscorea chrysophylla*, *D. Eldorado*, and *D. prismatica*, *Maranta Mazellii*, *M. Wallisii*, var. *discolor*, *Dieffenbachia imperialis*, and *Dioscorea meleagris*, *Aralia japonica*, var. *aureo-reticulata*, had a Second-class; a Silver Medal was awarded to him: M. Dallière also had a Silver Medal for his magnificent collection of Marantas, and a Special Certificate for a series of Palms.

FLORAL COMMITTEE.

July 19, 1871.

First-class Certificates were given to M. Jean Verschaffelt for *Agave elegantissima*, *A.* sp. nov., *A. Regeli*, var. *macrodonta*, and *A. Mescal*, var. *foliis striatis*, *Encephalartos Vroomi*, *Zamia* sp. nov., from New Caledonia, and for a new form of *Dicksonia* from St. Catharine's, Brazil; to Messrs. Mackoy for *Tillandsia complanata* to M. Wendlam for *Æchmea Maria regina*, with rosy-pink bracts; to Messrs. E. G. Henderson and Son for *Lobelia*, dwarf, Celestial Blue and Brilliant, rich deep blue; to Messrs. J. & C. Lee for a free-flowering plant of *L. speciosa*, White Perfection; to Mr. Norman for Mrs. Brown and Morning Star Picotees; to Messrs. Paul for Roses, Comtesse d'Oxford and Louis Van Houtte; and to Mr. T. Milner for Fuchsia (tricolor) Sunray.

Special Certificates were awarded to Mr. Stevens for a fine spike of *Odontoglossum hastilabium* and *Barkeria spectabilis*; to Messrs. Veitch for cut flowers of *Spiræa*; to G. F. Wilson for his beautiful Lilies, including one of the *Canadense* type brought by Mr. Robinson from the Rocky Mountains; to Mr. Lawrence for *Dendrochilum filiforme*, with 150 spikes of flowers, and *Maxillaria venusta*; to Mr. Denning for Orchids; to Mr. M'Intosh for Ivy-leaved Pelargonium; and to Mr. Cranston for some fine cut Roses.

In a small tent were large collections of very choice plants. Mr. Denning had, in his fine collection from Lord Londesborough, *Oncidium macranthum*, with a spike very brilliant in colour 10 feet long. In Messrs. Veitch's was *Grammatophyllum Ellisianum*, with a charming spike. Messrs. Downie, Laird, and Laing took a First Prize for Phloxes; Mr. Parker for a wonderfully rich group of perennials. Mr. Norman was first for Picotees, and Mr. Pizzey, gardener to Sir E. Perry, second, the awards being reversed for Carnations. In another class Mr. Norman was first for Picotees and Mr. Turner for Carnations. Mr. Hooper, of Bath, had an Extra Prize for cut blooms.

FRUIT COMMITTEE.

A Special Certificate was awarded to Mr. Miles for four varieties of Pine-Apples; to Mr. Tillery for a collection of fruit; and to Mr. Bland, gardener to Lord Kilmorey, for Early Gross Mignonne Peaches.

A First-class Certificate was awarded to Messrs. Rivers for a new large deep-black Cherry (Bigarreau Noir de Schmidt); to Mr. Bradley for a large fine-flavoured Strawberry (Amateur); and to Messrs. Standish for an excellent new Grape (Ascot Citronelle). Messrs. Carter offered two Prizes, for which Mr. Miles was the only competitor.

SCIENTIFIC COMMITTEE.

A. Murray, Esq., F.L.S., in the Chair.

The Secretary brought twigs of *Rhododendron ferrugineum* with fleshy gall-like bodies on the terminal buds. Similar bodies also occur on the leaves, and like productions, though much flatter, have been found by Mr. Broom on the leaves of *Vaccinium Vitis Idæa.* In all cases there was a white bloom on them which Mr. Berkeley referred to the genus *Ascomyces.* He had in vain hunted for larvæ; but he has since been informed that the larva of a Cynips had been detected in them, but that these larvæ are very difficult of detection.

Professor Karl Koch reported on the leaves sent by Messrs. Ottolander. A second collection was received from the same quarter, on which he also promised a report.

Major Trevor Clarke brought a seedling Cotton grafted on *Gossypium herbaceum*, which had made rapid growth and in which the cotyledons were still in good condition.

The Chairman brought specimens of a Pinus attacked by *Tortrix histrionella.*

Professor Dyer brought capsules of a Poppy much swollen by the presence of some larva.

Dr. Masters brought drawings of some Melastomads, under the generic name of *Amaroboya*, which appear to be near to *Blakea.* At first sight they seemed to be mere myths; but on comparing them with *Blakea*, there seemed reason to believe, allowing for a little exaggeration, that they were striking representatives of the order.

He also brought from Mr. Earley double flowers of a Sweet Pea. Major Clarke had seen similar flowers.

Mr. Grote sent specimens of Maize with male and female flowers on the same inflorescence. Similar cases are common in India, and occasionally occur in this country.

Dr. Masters stated that he believed that the supernumerary styles in *Eschscholtzia* are the rudiments of a second whorl of carpels at right angles to the first.

He then read a communication from Mr. Grieve on the possibility of inducing variegation by grafting on a variegated stock, the results, as in Mr. Laxton's case, being of a negative character.

The Meeting then adjourned.

GENERAL MEETING.

J. Bateman, Esq., F.R.S., in the Chair.

Mr. Berkeley called especial attention to Messrs. Veitch's cut flowers of *Spiræa*, especially *S. sorbifolia*, the foliage of which is most elegant, and *S. Lindleyana*, one of the most effective shrubbery plants when well grown.

He directed attention to a remarkable new variety of Lily of the Valley shown by Messrs. Standish, to whom a very large batch was forwarded by mistake from the Continent some months since; but they refused to start: but having been placed in a cool frame they were now in perfection and very valuable. The variety has shorter, blunter, and more rigid leaves, and the flowers very sweet-scented.

Amongst Mr. Saunders's plants was a rush-like plant with flowers resembling those of *Statice*, which proved on examination to be *Watsonia plantaginea*.

A number of seedlings of Black Hamburgh crossed with Monukka, with a view to obtain a good stoneless grape, had been raised by Mr. Barron at Chiswick, amongst which it was hoped there might be some good varieties, as the seedlings partook of the Monukka character in their foliage.

FLORAL COMMITTEE.

August 2, 1871.

A First-class Certificate was given to Mr. Guildford, gardener to R. Tryon, Esq., for his new Coleus, half of the leaf being of a rich crimson, the other half a golden yellow; it was a sport, but it does not appear of what peculiar variety. Mr. Laxton brought a dwarf double-flowered Pelargonium (Jewel) raised from Madame Rose Charmeaux, which also had a First-class Certificate. Similar awards were made to Mr. M. Young for *Juniperus chinensis aurea*, which bids fair to be constant; to Messrs. Kelway for three new Gladioli, Hogarth, blush flamed with crimson, Blush, heavily flamed with crimson, and Pictus, with a dark maroon centre; Messrs. Wood and Ingram for Picotee, delicate white, and, Second-class, Mrs. Ingram, white with crimson edge; to Messrs. E. G.

Henderson and Son for *Begonia multiflora elegans*, said to be a perpetual flowerer; to Mr. Fraser, Lea Bridge, for a new Dracæna of a deep bronze-colour edged with crimson; to Mr. N. Norman for Picotees Miss Ingleton and Ada Ingleton, and one of the Second-class for Charles Williams; to Mr. Green for a small orange-flowered Cyrtanthus from the Cape of Good Hope; and to Mr. Lawrence for *Anœctochilus Ordianus*. Messrs. Carter had a Second-class Certificate for Tricolor Pelargonium Prospero; and Mr. G. F. Wilson a Special for his Lilies. There was also a fine collection of Tricolor Pelargoniums for competition, besides many miscellaneous plants.

FRUIT COMMITTEE.

The principal feature in this day's show was the exhibition of wonderful Gooseberries. Mr. Turner was first, Mr. J. Sharp, gardener to W. Martin, Esq., second, and Mr. Bead, gardener to C. J. Herries, Esq., third, the last-named exhibitor being first and second for the six heaviest fruit.

A First-class Certificate was given to Mr. Knight, of Hailsham, for a new Peach (Knight's Markley Admirable), a freestone of the Téton-de-Vénus type: the flavour was far superior to that of other early peaches. Messrs. J. and C. Lee sent specimens of their Hammersmith Early Kidney Potato, grown on light and heavy land. Mr. Rivers sent ten varieties of Filberts and nuts grafted on *Corylus arborescens*.

GENERAL MEETING.

W. Wilson Saunders, Esq., F.R.S., in the Chair.

Mr. Berkeley, with reference to the golden forms of *Juniperus Chinensis* from Mr. Maurice Young, stated that such plants, when grown in the shade, usually reverted to the green state, and that they kept their golden colour only when fully exposed to the sun.

The *Dieffenbachia* sent by the Chairman exhibited a most curious case of fusion, two leaves being joined together back to back, the result of the coalition of two petioles. Such an instance occurs not unfrequently in *Ficus reticulata*.

The pretty little *Cyrtanthus* from the Cape of Good Hope seemed to be a form between *C. angustifolius* and *C. collinus.*

With respect to the new Catalpa from Messrs. Cripps, he stated that it seemed not to be generally known that the petioles contained an abundant pith, while in those of *Paulownia imperialis* there was a similar pith, but hollow.

The Chairman said, with respect to the *Cyrtanthus*, that he was informed that plants at the Cape assumed such differences under different conditions, and that though he thought this distinct, he would be sorry to say so definitely.

FLORAL COMMITTEE.

August 16, 1871.

First-class Certificates were awarded to *Agave Simsii* and *A. imbricata*, two of six interesting species sent from Mr. Peacock. Mr. Wilson Saunders sent *Anthurium ornatum*, a new species from Santa Martha, with bright green cordate leaves, a white spathe, and delicate pink spadix, to which also a First-class Certificate was awarded. Mr. Marshall sent a flowering plant of *Lælia elegans Marshalli*, remarkable for the distinct form of its richly coloured lip.

For twenty-four cut spikes of *Gladioli*, Messrs. Kelway were first, First-class Certificates being given to Araximenes, vermilion-scarlet, crimson-feathered; Yellow King, pale yellow flamed with crimson; Astræa, bright scarlet feathered with crimson; Lady Bridport, a shaded pink, deep crimson-feathered; Archelaus, white-feathered and flamed with crimson; and Phidias, claret-crimson, shaded with white; Mr. Douglas second, Mr. G. Wheeler third. Mr. Dombrain had an Extra Prize.

The Amateur Class also included some fine seedlings raised by Mr. Douglas, to which First-class Certificates were awarded:—Francis Whitbourn, white, flamed with rich crimson; Mrs. F. Whitbourne, pure white, feathered purplish crimson; William Earley, faint yellow, flamed with reddish pink; and one of M. Souchet's novelties (Talisman), clear deep rose. Messrs. J. and C. Lee exhibited a very large collection of cut branches of ornamental trees and shrubs, including 146 species and varieties, which formed a striking feature of the show.

FRUIT COMMITTEE.

Special Certificates were awarded to Mr. Tillery for Barrington Peaches, with a seedling Nectarine from Violette Hâtive, which becomes of a peculiar black colour when ripe; to Mr. Thomas, gardener to T. Chamberlayne, Esq., for Queen Pines; and to Mr. Douglas for Royal George and Bellegarde Peaches and Washington Plums. Mr. Thornton, Heatherside Nursery, sent his Heatherside Rival Cucumber, which, if good for winter use, the Committee thought might be useful, and desired to see it again in January. Mr. Pearson sent several Seedling Grapes; but unfortunately all were unripe, so that their merits could not be ascertained.

GENERAL MEETING.

W. Marshall, Esq., in the Chair.

Mr. Pearson returned the Certificate which was awarded to his Chilwell White Grape, which did not answer his expectation, as it proved a bad keeper; and he had therefore destroyed the whole stock.

The Trefoil exhibited by Messrs. Carter was the well-known *Melilotus cærulea*, with which the Schafzieger cheese is flavoured. It used frequently to be laid in wardrobes to keep away moths.

Mr. Berkeley stated that his crop of Onions was almost destroyed by a fungus, *Peronospora destructor*, very closely allied to the mould which causes the Potato-disease.

FLORAL COMMITTEE.

September 6, 1871.

A First-class Certificate was given to Messrs. Veitch for a new *Masdevallia* and *Amaranthus salicifolius*, which seems to promise well as a bedding-plant and ornament to the conservatory; to Mr. Bull for *Dracæna splendens*; to M. J. Verschaffelt for *Agave celsiana albida*, *A. Toleniana*, *A. Mescal nigrispinis*, and *A. dealbata compacta*, *A. dealbata angustifolia* having a Second-class; to Mr. Turner for Dahlias John Standish, Mr. Saunders, Souvenir d'Herbert Turner, a fine white, and Kate Haslam, a delicate pink; to

Mr. G. Rawlings for Dahlia Maid of Essex; to Mr. G. Parker for Dahlia Old Port; to Mr. Tillery for Gladiolus Celestial, white, margined with bright scarlet; to Mr. D. M'Kellar, gardener to C. Magniac, Esq., for Seedling Hollyhocks Jeanie, white, and Rose of Sharon, crimson; to Mr. J. J. Chater for Seedling Hollyhock Peerless, buff; to Mr. Keynes for Seedling Dahlias Dolly Varden, fancy, pinkish white, tinged with crimson, William Laird, purplish blush, William Keynes, orange-red, and Marchioness of Lorne, creamy yellow, tipped with crimson; and Mr. Eckford for Verbenas Lady Edith, white, and Plato, deep scarlet with white eye.

Special Certificates were given to Messrs. Veitch for a fine collection of Asters; and to Messrs. Ponsford for cut specimens of *Clerodendron Bungei.* For twenty-four cut blooms of Dahlias in the open class, Messrs. Kelway were first, Mr. Turner second, and Mr. C. T. Perry third. In the amateurs' class for twelve, Mr. Perry was first. For the best twenty-four Asters, Mr. G. Wheeler, Messrs. Kelway, and Mr. J. J. Chater were the successful competitors; for twelve, Mr. Rowe, Mr. Farndell, gardener to the Surrey County Asylum, and Mr. P. Porter. In the open class for twelve, Mr. J. J. Chater, Mr. J. Walker, and Mr. E. Rowe. Mr. Perry sent the best twenty-four Verbenas, Mr. J. J. Chater being second. Mr. Bull was the only competitor for Lilies.

FRUIT COMMITTEE.

A First-class Certificate was given to Mr. Pearson for a fine White Grape named Dr. Hogg, which will supersede Foster's White Seedling; two other black varieties were requested to be shown again.

Special Certificates were voted to Mr. J. Reid, gardener to Lord Crawford, for very fine fruit of *Passiflora*; to Mr. Perkins, Thornham Hall, for Queen Emma Melon; to Mr. W. Paul for a large collection of Apples; to the Rev. C. Ellison for Veitch's Autumn Giant Cauliflower; and to Mr. G. W. Pragnell, Sherbourne, for a magnificent collection of Onions. Messrs. Carter offered Prizes for the best collection of Onions; the first was taken by Mr. E. Farndell, the second by Mr. J. Baverstock, gardener to W. Hope, Esq., and the third by Mr. Miles, gardener to Lord Carrington.

GENERAL MEETING.

Major Trevor Clarke in the Chair.

The Chairman said that the most interesting feature of the Meeting was the extraordinary display of Onions which had been brought together after many years of selection and cultivation. He had obtained many interesting seedlings by planting different kinds close together. One great merit of some of the new Onions is the extraordinary mildness, far exceeding that of imported Spanish Onions.

FLORAL COMMITTEE.

September 20, 1871.

W. Marshall, Esq., took his seat for the first time as the newly elected Chairman, when a resolution was passed unanimously expressing the regret of the Committee at the loss which it had experienced in the death of Mr. Dix.

First-class Certificates were awarded to Mr. Green for *Hechtia argentea*; to Messrs. Veitch for *Vriesia brachystachys* and *Agave rotundifolia*; to Mr. Denning for *Pescatorea Wallisii*; to Mr. Knight, Hailsham, for a new climbing Perpetual Rose, of a pinkish blush (Princess Louise); to Mr. Parker for Fancy Dahlia Admiration, of a creamy yellow, striped with purplish crimson; to Mr. Turner for Dahlias Mrs. Waite, Yellow Standard, and Livonia; to Mr. Eckford, gardener to Lord Radnor, for Verbenas Lady Gertrude, Mauve Queen, and Lady Braybrooke.

Second-class Certificates were voted to Mr. Turner for Dahlias Ranunculus, Master M'Grath, and Bucks Lass; to Mr. G. Rawlings for Dahlias Mrs. Bennett, Lilac Rose, and Golden Beauty; and to Mr. G. Parker for Dahlia John Batten, deep maroon.

Special certificates were given to Mr. W. Paul for cut Roses; to Messrs. Veitch for Orchids and *Lasiandra macrantha floribunda*; and to Mr. Denning for Orchids.

The Committee recommended the award of a Medal to Mr. Russell, Falkirk, for one of the finest spikes that has ever been seen of *Saccolabium Blumei Dayanum*.

FRUIT COMMITTEE.

Special Certificates were awarded to Mr. Fenn for his wonderful collection of Potatos; to Messrs. Lee for a smaller, but very interesting, collection; to Messrs. Sutton for ditto; to Mr. J. May, Hayling Island, for Shallots, twelve of which weighed four pounds; to M. Piccirillo for two fine specimens of Giant White Tripoli Onions weighing 7 pounds, and four immense heads of Garlic from the neighbourhood of Naples, weighing 2 pounds 6 ounces; and to Messrs. Rivers for a collection of small pyramidal Plum-trees laden with fruit.

GENERAL MEETING.

W. Marshall, Esq., in the Chair.

Mr. Berkeley stated that he had seen a small luxuriant crop of Messrs. Carter's Trifolium, which is *Trigonella cærulea* of DeCandolle's 'Prodromus.'

He announced that in competition for the prizes for Fungi offered at the next Meeting the poisonous and edible Fungi were to be arranged in separate groups.

FLORAL COMMITTEE.

October 4, 1871.

First-class Certificates were awarded to Mr. Bull for *Desmodium penduliflorum*, and to Mr. B. S. Williams for *Macrozamia spiralis*.

A Special Certificate was awarded to Mr. Green for an interesting group of terrestrial Orchids from Trinidad, St. Catherine's, New Granada, and Rio Janeiro, and the fine plant of *Shiltonia Morelliana*.

Several miscellaneous collections were sent in connexion with the International Fruit Show, to most of which Extra Prizes were awarded.

FRUIT COMMITTEE.

Special Certificates were given to Mr. Cox for Rivers's Victoria Nectarine, and to Mr. Carr, gardener to P. L. Hinds, Esq., for Avocado Pear, *Persea gratissima.* Messrs. Carter's Prizes for six varieties of American Potatos were taken by Mr. Frisby, gardener to H. Chaplin, Esq., and Mr. J. Garland, Killerton.

The exhibition of Fungi was extraordinarily good; but unfortunately the principal awards were not confirmed, in consequence of the subjects not having been properly entered. The most interesting species perhaps was *Agaricus clavipes* from Mr. W. G. Smith, which, though not new, has been confounded hitherto with *A. elixus,* Sow. Mr. Beech sent from Castle Ashby excellent specimens of the Geaster which had been exhibited before. A splendid specimen of *Thelephora multizonata* came from Mr. Smith, of Epping, together with *Polyporus Schweinitzii. Polyporus intybaceus* and *P. frondosus* were well represented. *Agaricus porrigens* from Inverary appeared in great perfection, and some beautiful specimens of *Clavaria formosa* from Mr. Broome. Mr. Michael Terry sent a great many interesting species. Mr. W. G. Smith sent cultivated specimens of *Coprinus atramentarius.* The whole was a great success; but it was unfortunate that there was a mistake about the entering, in consequence of which the Prizes were carried off by very good, but still inferior collections.

The International Fruit Show was also a great success, nothing like it having been seen in London since 1862. All our best fruit-growers sent immense collections; and the foreign element was well represented by M. Baltet, of Troyes.

GENERAL MEETING.

Major Trevor Clarke, in the Chair.

MM. André, Gillekens, and Spruyt, delegates from France and Belgium, were present.

Mr. Berkeley called attention to the two varieties of Avocado Pear which exactly accorded with the two figures in the 'Botanical Register and Magazine,' where it is stated that the fruit is deleterious except when ripe.

The large Gourd sent as a sort of Vegetable Marrow was in fact a Bottle Gourd, a very dangerous esculent, if the intense bitterness would allow it to be eaten.

He then commented upon the Fungi exhibited, and gave a lecture on the Potato-disease, calling especial attention to recent observations on the resting-spores of *Peronospora.*

Major Clarke then pointed out a splendid scarlet-flowered hybrid which he had produced from *Begonia Pearcei* and *B. cinnabarina.*

FLORAL COMMITTEE.

November 1, 1871.

First-class Certificates were awarded to Messrs. E. G. Henderson and Son for *Sedum acre elegans*, to Mr. Green for *Lomatophyllum Saundersii* and *Billbergia chlorosticta.*

Special Certificates were awarded to Mr. Chaff, gardener to A. Smee, Esq., for *Pteris scaberula*; to Messrs. Standish and Co. for seedling Gladioli, the result of crossing with *G. cruentus*, one of which (Alice Wilson) is wonderfully distinct in shape, the flowers resembling those of a Lily more than of a Gladiolus; and to Messrs. E. G. Henderson and Son for Alpine plants, including many species and varieties of Saxifrage. The season was unfortunately too early for Chrysanthemums, in consequence of which few good flowers were staged.

FRUIT COMMITTEE.

A special Certificate was awarded to Messrs. Carter for a large collection; to Mr. C. Lidgard for Knight's new White Grove Celery; to Mr. Ford, gardener to W. S. Hubbard, Esq., for a collection of fruit which included *Pinus Webbiana*, *Cydonia japonica*, Siberian Crabs, and the Yellow Wax Apple; to Mr. J. Gavill Daventry for a splendid specimen of *Gloria mundi*, grown in California; to Mr. Chaff for Apples; to Mr. Wells for Grapes grown in ground vineries; to Mr. Rose, Frogmore, for smooth-leaved Cayenne Pine; to Mr. Jacques, gardener to J. C. P. Cunlliffe, Esq., for a fruit of *Musa sapientum* cut from a plant with sixty-two of similar size; to Mr. G. Sage, gardener to Lord Brownlow, for a fruit of *Musa Cavendishii*, weighing 46 pounds; and Mr. Johnston, gardener to Lord Strathmore, for Muscat of

Alexandria Grapes. Mr. Fowle, gardener to Sir H. Mildmay, Mr. Garland, gardener to Sir T. Dyke Acland, and Mr. Stephenson, gardener to C. F. Barker, Esq., were the successful competitors for Pears. Mr. J. Norris and Mr. J. Tranter received Mr. Kemp's Prizes for Grapes grown in the open air without any protection.

SCIENTIFIC COMMITTEE.

A. MURRAY, Esq., F.L.S., in the Chair.

The Secretary brought a branch of an Apple-tree from Blackheath perforated by the larva of some moth, probably *Zenzera æsculi*, the bore in some cases coming so near the surface that the bark had fallen in. He also brought from Messrs. Dickson, of Chester, a fasciated branch springing from the root of *Myrica cerifera.*

A communication was read from Mr. Baird respecting a disease in *Wigandia* very similar to that which is so common in bedding Verbenas. The specimens, however, had for the most part outgrown the disease. Mr. Baird had applied slaked lime, as also to some Bouvardias, and attributed the improved condition of the plants to this application. He suggested that it should be tried in the Potato-disease.

Messrs. Henderson sent specimens of Coleus showing various sports; also Coleus Emperor Napoleon, a hybrid between *Coleus Berkeleii* and *Plectranthus fruticosus*, the object of the cross being to obtain a more hardy habit and suffruticose growth; some plants showed a partial return to either parent.

Mr. Munby brought a seedling Pelargonium in which the thalamus of the flower was prolonged and bore a number of scales and petal-like bodies, quite altering the character of the plant.

The Chairman brought specimens of *Atropos saltatorius* which had occurred in abundance in Assam Tea. It was doubtful to what cause their extreme abundance was attributable.

Dr. Welwitsch brought a Beetle with jointed, shining, hairy processes on the body, resembling some incipient coralline. He believed that they were the eggs of some Crustacean.

The Chairman exhibited some pretty pink galls on a spray of Oak from Guatemala.

He also brought specimens of a canker on Ash which is very common in some parts of England, and truncheons of Larch which were distorted, probably from the roots being obstructed by some impervious substratum. Mr. Berkeley observed that in such cases specimens of *Peziza calycina* were almost always present on the diseased part.

A branch of some tree from Guatemala was also laid on the table, with a curious radiated cup-like depression, caused by some parasite, similar to those which are produced by *Myzodendron*.

Dr. Masters showed male and female cones on the Deodar.

Specimens of a minute insect were sent from Chiswick on *Poinciana*, the nature of which was not determined, some thinking it a young active state of some Coccus, while others regarded it as a condition of some Aphis.

The Meeting then adjourned.

GENERAL MEETING.

J. Russell Reeves, Esq., in the Chair.

Mr. Berkeley recommended *Polystichum angulare*, var. *proliferum*, to the artificial flower-makers as forming one of the most elegant materials for a wreath.

Some doubt having been expressed as to Mr. Standish's Lily of the Valley being a distinct variety, from the information he had received it appeared to him quite distinct and a valuable acquisition.

A letter was read from A. Trollope, Esq., as to the great productiveness of the Royal Ascot Grape.

Major Trevor Clarke had brought a seedling plant of the common edging Box in fruit, a doubt having been expressed whether it ever fruited.

Mr. Berkeley then made some remarks on the red, brown, and violet spots which frequently occur on Fungi, which are due to some rudimentary mould of the same nature as what Dr. Montagne called *Palmella prodigiosa.* He had propagated the latter on Rice paste, where it grew with great rapidity.

FLORAL COMMITTEE.

December 6, 1871.

First-class Certificates were awarded to Mr. Green for *Argy-*

roxiphium Douglasii, lately introduced by Mr. Saunders from the Sandwich Isles; and to Mr. Goddard for *Cyclamen persicum*, Queen of the crimsons.

A Special Certificate was awarded to Mr. B. S. Williams for improved hybrid Solanums; also to Messrs. Jackson for Chrysanthemums.

Messrs. Standish gained the First Prize for berry-bearing Evergreens, and also hardy Evergreens of the Yew and Cypress type, amongst which was *Taxus fastigiata aurea*, which came up some ten or twelve years before in a batch of seedlings of Irish Yew. The First Prizes for Japanese and late-flowering Chrysanthemum were taken by Mr. E. Rowe, of Roehampton; the Second by Mr. Douglas.

FRUIT COMMITTEE.

A Special Certificate was awarded to Messrs. Lane for a collection of Grapes; and to Mr. G. Johnstone, Glamis Castle, for Cayenne Pines.

A First-class Certificate was given to Mr. W. Robinson for a new winter Radish from California, good specimens of which were sent from Chiswick by Mr. Barron. Mr. Trigg, of Hayling Island, sent thirteen Shallots which weighed 6 pounds 6 ounces; and Messrs. Sutton the new Orange Naples Garlic. The Committee desired that further examples might be submitted to them.

The First Carter Prize was awarded to Mr. Pragnell, gardener to G. D. W. Digby, Esq., for a fine display of vegetables.

SCIENTIFIC COMMITTEE.

A. Grote, Esq., in the Chair.

The Secretary read a letter from Mr. Anderson Henry relating to a new hybrid Begonia, which is given below*. Dr. Masters

* "I have this season flowered a seedling Begonia, the produce of *B. Pearcii* ×*B. boliviensis* again crossed with *B. Veitchii*, the seed-bearing parent being a hybrid of my own of 1869. Before operating upon it I divested the female flower of two of the three lobes of its stigma, securing it from all other influences save that of *B. Veitchii*, as well after as before crossing. The produce of this double hybrid, double at least on one side, is a plant of almost specific distinctness, but bearing only female flowers—a diœcious plant, wholly unlike any

stated that a similar change in sexuality had been observed in a new hybrid Begonia raised in France, and that the origin of *Begonia frigida,* which bears hermaphrodite flowers, is unknown.

Mr. Berkeley brought a leaf of *Ficus reticulata* given him by Dr. Carter, with supplementary leaves springing from the under sur-surface. He also brought from his garden succulent stolons from *Mimulus moschatus* which appear not to have been previously observed.

Leaves of a beech with galls were sent, which have since been ascertained to be the produce of *Cecidomyia fagi.*

Mr. Blenkins brought specimens of *Cynosmorium coccineum.*

Mr. A. Murray exhibited specimens of a Lady-bird belonging to the genus *Epilachna* sent to Mr. Masters by M. Naudin from Collioure; also a Coccus from Guatemala used to colour wood of a grey-rose colour.

Dr. Moore sent a Teazle from Glasnevin, with a spirally coiled stem, the leaves being alternate instead of opposite.

Dr. Masters brought a Report of the observations on the action of manure at Chiswick in 1871, which will be published in the Journal.

The Meeting then adjourned.

GENERAL MEETING.

James Bateman, Esq., F.R.S., in the Chair.

Mr. Berkeley, commenting on a fine cone-bearing branch of

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of its parent species, which are all monœcious. I have succeeded in preserving one plant only of this cross. I have somewhat analogous experiments among the above tribes yet waiting to be tested.

"One other thing I wish to refer to is a singular tendency I have observed in some plants (creepers) to repel or withdraw from the contact of others. I have an *Ampelopsis Veitchii* running up a tower, apparently to avoid a Pyracantha running up alongside of it. The natural tendency of the former (both on a west aspect) I thought should have been to the sun; whereas, as if to escape the latter, it tends to the north. I pointed it out to my neighbour, Col. Ranken, to-day; and he said he had heard something of the same kind as regards the Ash tree, and that certain other trees grew away from, as if repelled by it. On the other hand, I have on a wall adjoining the tower Ivies running up, which, where originally apart, seem, as the shoots grow up, to attract each other. Has any such law as that of attraction and repulsion been observed in plants? Can there be any such law?"

Picea nobilis before him, remarked that many conifers which do not usually bear fruit had cones this year, in consequence, he supposed, of the wood being so well ripened during the late hot and dry season.

The Osage Orange, of which the ripe fruit from Parma was exhibited, was recommended by Dr. Lindley as a good hedge-plant; but though it was hardy in the south of England, as at Margate and Folkestone, it was not so everywhere.

It had lately been asked whether the use of manure was not the cause of the delicacy of the Hop-plant. No manure was used in the College Hop-ground at Maidstone beyond the old bine cut into chaff; but then the soil itself was rich in phosphates.

Mr. Bateman said that he could not get the Osage Orange either to flower or fruit; but he believed that it had borne fruit at Falmouth.

He then directed attention to a collection of models of tropical fruit which had been shown at the late International Exhibition by the India Office, who had presented them to the Society.

In conclusion, he alluded to the loss which the Society had sustained in the death of Sir R. Murchison, Mr. W. Baxter, and Mr. Bellenden Ker.

PENTSTEMONS GROWN AT CHISWICK, 1872.

By Thomas Moore, F.L.S. Floral Director.

A considerable period having elapsed since a former trial of these useful border flowers took place, and a large number of novelties having been raised in the interim, it was determined that another trial should be made this season. The varieties grown were contributed by Messrs. Downie, Laird, and Laing; they bloomed satisfactorily; and several awards equivalent to First-class Certificates (indicated by the mark §) were made by the Floral Committee. For the selection given at the end of this Report, I am indebted to Mr. Spinks, foreman at Chiswick, who has had the plants under observation during the whole of the blooming-season. The varieties are classified according to the colour of their flowers.

Flowers nearly white.

1. *Bridesmaid* (§). Nearly pure white, free and good habit.
2. *Lady Coutts Lindsay.* Creamy white, robust but tall; fine flower.
3. *Delicatum.* Nearly white, shaded with rose; throat white; rather small flower, free.
4. *Augier.* Nearly white, shaded with pale rose; throat large, creamy white; of a pleasing shade; free.
5. *George Bruant.* White, shaded with very pale purplish rose; throat large, open, pure white; free.
6. *Snowdrop.* White, free-flowering, and good.

Flowers rose-coloured.

7. *Queen Victoria.* Tube rose and white, clear rose segments; throat white; showy, free.
8. *Leah.* Rose, large.
9. *Monarch.* Rose; throat white, with heavy crimson pencillings.
10. *Flower of the Day.* Very pale rose, washy; white throat; not desirable.
11. *John Pow* (§). Rose-colour; throat white, with dark red stripes on the lower part; free, compact, and good.
12. *Mrs. A. Sterry.* Pale rose, with white throat; free-flowering and pretty, but small.
13. *Lady Boswell.* Very large pale rose; throat large, open, white; free-flowering and distinct.
14. *Pauline Dumont.* Rose-colour, with pure white throat; free.
15. *Bessie Anderson.* Clear pale rose, the throat very pure white; of good shape; tall and straggling, otherwise good.

Flowers bright pink or carmine.

16. *James Rothschild* (§). Rosy crimson, striped and shaded with purplish crimson; good habit and free.
17. *Dr. Hogg.* Bright rose; white throat striped with crimson, upper segments shaded with lake; fine, free, and good habit.
18. *Christine Nillson.* Bright reddish carmine; white throat; dwarf, but rather weak in habit.
19. *Colin Bell.* Bright rose; throat shaded purple, with dark maroon stripes; very free, and good habit; distinct.

20. *Grandis.* Large, rose; throat white in the upper part, thickly striped and shaded crimson-purple below; fine.
21. *Alfred Pillen.* Very bright carmine, the throat shaded with dark maroon, and striped on the lower half.
22. *Apollon.* Very bright carmine; the throat pure white, with a few purplish-crimson stripes; late, and fine habit.
23. *A. Sainte-Claire* (§). Dull rose; throat large, white, very heavily shaded and striped with crimson; of good form, very free, and good.
24. *Polly King* (§). Bright rosy carmine; throat white, striped with dark carmine; free and good habit.

FLOWERS RED.

25. *John Morris.* Red tube and limb, the three lower segments large, upper ones small; throat white, heavily shaded and with a few stripes of dark maroon; slender growth.
26. *Elegans.* Red, with small tube and narrow segments; dull white throat with crimson stripes; not desirable.
27. *Mrs. R. Clark.* Dull red; the throat white, with a few dark stripes; small, with narrow segments, but free.
28. *Floribunda.* Bright carmine red, of fine form; throat white thickly striped with crimson, shaded with lake; dwarf and good.
29. *M. Moxton* (§). Bright scarlet, very free, and of good habit; a fine variety.
30. *Henry King.* Brilliant carmine-scarlet; throat very large, white, striped and shaded with crimson; fine variety, free.
31. *Miss Baillie.* Flower long, brilliant scarlet, the throat creamy white with a few crimson stripes; fine shape, free and good.
32. *Surpasse Victor Hugo* (§). Bright red, large, and finely formed; throat nearly pure white; good habit; very free.
33. *Royal Scarlet.* Good bright red, with striped throat; free and good.
34. *Bons Villageois* (§). Very large, with broad smooth segments; bright red, the throat striped with a darker colour; exceedingly free; one of the best.
35. *Stanstead Rival* (§). Large, crimson-scarlet; throat white, with a few crimson stripes, the edge of the upper segments shaded with mauve; very robust, free-flowering, and late; a grand variety.

36. *M. Lemoinier* (§). Tube dark purplish red, segments red; throat pure white, very heavily striped with dark maroon on the lower part, slightly striped above, shaded on the margin of the throat with bright lake; very fine form, and distinct; good habit, and free. The finest for individual beauty of all Pentstemons.

Flowers rosy purple.

37. *Le Conquérant.* Pale rosy purple; throat large, white, with few stripes; very free.
38. *Sunrise* (§). Purplish rose; throat white, with dark stripes on lower segments, shaded with purple; distinct and good.
39. *Rosy Gem.* Pale purplish rose, throat pure white; rather washy.
40. *Agnes Laing.* Very clear pale rosy purple, of good form; throat pure white; good, distinct, and free.
41. *Mrs. Cator* (§). Pale rosy purple; throat large and white; very free, good foliage, and robust.
42. *Mrs. Moon.* Pale purplish rose, very clear throat; fine form, robust, tall, and distinct.
43. *James Adams* (§). Clear rosy magenta, of fine form; throat pure white, with few stripes; excellent, distinct, and free.
44. *Le Khédive* (§). Dark purplish rose, heavily shaded and striped with maroon; free, distinct, and good.

Flowers pale purple.

45. *Mrs. McHardy.* Pale lavender; white throat, with few stripes; rather washy.
46. *John McPherson* (§). Bright mauve; throat nearly white, with a few purple stripes; very pretty, free-flowering, but of weak habit.
47. *James Forrest.* Pale shaded mauve, laced and striped with a darker colour; ill-shaped and small.
48. *Richard Lenoir.* Like Mrs. McHardy in general appearance and colour, but with a purer white throat; free.
49. *Lovely.* Lilac, with pure white throat; rather small, free.
50. *Georges Sand* (§). Bright lilac tube and segments; throat white, with few stripes; very free, showy, late.
51. *Candidate.* Pale washy purple; a small ill-shaped flower, not desirable.
52. *Gustave Lambert.* Clear pale purple, large, and of good

form; throat large, white, peculiarly shaded on lower segments; distinct and good; an improvement on Georges Sand.

53. *Bourbaki.* Pale clear purple; white throat, with few stripes; very robust, free.

54. *W. M. Alexander* (§). Fine purple; throat white, with a few stripes; very large and well formed, free, robust, and good.

55. *Marie Held.* Clear pale purple-shaded on white; throat shaded, large, striped with the same colour; free, and compact.

56. *Madame Louis Schmitzer.* Pale magenta, throat white; a badly shaped flower; not good.

57. *Champion.* Large pale magenta; throat large, pure white, with dark purple stripes; very free, good habit, and pleasing.

58. *Petruchio.* Pale mauve; throat shaded and striped with dark purple maroon; small flowers, but free.

Flowers dark purple.

59. *Magenta.* Fine clear purple; throat of the purest white; fine form, robust, excellent in habit; the best of the colour.

60. *Regalia.* Purple, the throat white, with few stripes; rather a weak grower.

61. *M. E. Wynne.* Clear purple, throat white, with few purple stripes; very badly shaped.

62. *Stanstead Surprise.* Dark purple tube and segments; throat pure white; free, and good.

63. *Victor.* Dark purple; throat white, shaded on the upper part with purple, on the lower part marked with a few darker stripes; free, and good.

64. *W. E. Gumbleton.* Clear true purple, throat white; a bold flower, free and good.

65. *Czar.* Very clear bright purple; throat white, with dark purple stripes; compact habit, and free-flowering.

66. *Mulberry Superb.* Dull dark purple, with brighter segments; throat white, slightly striped on the lower part; free.

67. *Robert Fenn.* Dull maroon-purple, small; throat heavily striped with dark maroon; good.

68. *Attraction.* Very dark purple, throat white, with broad dark maroon stripes; free-flowering.

69. *Black Knight.* Dark purple, with white throat.

Flowers dark maroon-purple.

70. *De Saint-Paul* (§). A large cupped flower, dark maroon-purple;

throat white, with dark stripes on lower part; a fine, showy, free, robust, late variety.

71. *Col. Long* (§). The counterpart of the last variety in general colour, but with whiter throat, better-shaped flowers, and not so late; fine and good.
72. *Emile Chaté.* Purplish crimson; throat white shaded and striped dark crimson; flowers of good shape; habit compact.
73. *Arthur Sterry.* Small rosy purple; throat white, with few stripes; not very good.
74. *George Arner.* Very dark dull purple; throat heavily striped and shaded with dull maroon on lower half, white on the upper half; habit robust, very free, and late; a fine variety.
75. *Black Prince.* Intensely dark purple, with very large and broad segments of the same colour; throat shaded and striped heavily with a darker colour; a very bold and desirable variety, of the darkest type; good.

A Selection of Twenty of the Best Pentstemons.

1. A. Sainte-Claire (23).
2. Bessie Anderson (15).
3. Black Prince (75).
4. Bons Villageois (34).
5. Bridesmaid (1).
6. Colin Bell (19).
7. Col. Long (71).
8. De Saint-Paul (70).
9. George Arner (74).
10. Georges Sand (50).
11. James Adams (43).
12. Lady Boswell (13).
13. Lady Coutts Lindsay (2).
14. Le Khédive (44).
15. Magenta (59).
16. M. Lemoinier (36).
17. Queen Victoria (7).
18. Stanstead Rival (35).
19. Victor (63).
20. W. M. Alexander (54).

FUCHSIAS GROWN FOR TRIAL AT CHISWICK, 1872.

By Thomas Moore, F.L.S., Floral Director, R.H.S.

The following notes on Fuchsias were made on a collection of young plants, flowered in comparatively small pots, and fairly showing the natural habit and peculiarities of the several varieties. At the time they were examined by the Floral Committee they were in a free healthy condition of growth and abundantly flowered, so that it may be presumed a fair estimate of their respective merits was arrived at. In the accompanying Report an attempt has been made to group them in such a manner as to convey a tolerably accurate notion of their colours. The plants were presented to the Society for trial by Messrs. Veitch and Sons, W. Bull, F. and A. Smith, W. Knight, H. Cannell, Downie and Co., and Mr. Jervis, of Harleston. The mark *** indicates the highest degree of excellence.

§ 1. WHITE CALYX, ROSY-PURPLE COROLLA.

Fairest of the Fair ***. Habit free, dwarf, and drooping. Flowers medium size; tube $\frac{5}{8}$ in. long, bulged; sepals $\frac{7}{8}$ in. long, recurved, green at the tip; corolla $\frac{3}{4}$ in. long, clear rosy-purple, paler at the base.

Rose of Castile **. Habit stiff, compact, profuse-flowering. Flowers medium size; tube $\frac{1}{2}$ in. long, bulged; sepals $\frac{7}{8}$ in. long, spreading, green at the tip; corolla $\frac{3}{4}$ in. long, clear rosy purple, with white feather at base. Still a good and useful decorative variety.

Schiller. Habit loose. Flowers large; tube $\frac{1}{2}$ in. long; sepals 1 in. long, broad, spreading, green at the tip; corolla $\frac{7}{8}$ in. long, clear rosy purple, with white feather at base.

§ 2. WHITE CALYX, LAKE COROLLA.

Delight ***. Habit drooping, free. Flowers medium size; tube scarcely $\frac{1}{2}$ in., bulged; sepals $1\frac{1}{4}$ in., spreading; corolla $\frac{7}{8}$ in., conical, deep lake, with whitish base. An improvement on Duchess of Lancaster.

Lady Heytesbury ***. Habit free and good. Flowers medium size; tube $\frac{5}{8}$ in., slender, tapered downwards; sepals 1 in., somewhat reflexed; corolla $\frac{7}{8}$ in., deep lake, with white feather at base.

Starlight ***. Habit good, free-blooming. Flowers medium size; tube $\frac{3}{4}$ in., thickest upwards; sepals $\frac{7}{8}$ in., spreading, faintly blushed, green at the tip; corolla $\frac{7}{8}$ in., very clear and pure lake. An excellent sort.

Arabella improved. Habit coarse. Flowers very large; tube $1\frac{1}{4}$ in.; sepals $1\frac{1}{8}$ in., spreading, very fleshy, almost pure; corolla $\frac{7}{8}$ in., bright lake flushed with carmine. In the way of *Mrs. Marshall*, but a month later.

Beauty of Clapham. Flowers large; tube $\frac{7}{8}$ in., blush; sepals spreading, blush; corolla 1 in., lake, with white feather at base.

Elegance. Habit loose, but free. Flowers medium size; tube $\frac{1}{2}$ in., enlarged at the base; tapering downwards; sepals $1\frac{1}{4}$ in., green at the tip; corolla $\frac{7}{8}$ in., rather spreading.

Master Longfield. Habit coarse. Flowers medium size; tube $\frac{7}{8}$ in., enlarged at the base; sepals 1 in., flesh-coloured, green at the tip; corolla $\frac{3}{4}$ in., loose, lake, paler at the base.

May Queen. Habit stiff, erect. Flowers large; tube 1 in.; sepals $\frac{7}{8}$ in., scarcely spreading, green-tipped; corolla 1 inch, conical.

Queen of Summer. Habit neat. Flowers medium size; tube $\frac{5}{8}$ in., bulged; sepals $1\frac{1}{8}$ in., recurved, stout; corolla $\frac{3}{4}$ in., spreading, lake, paler at the base.

§ 3. White calyx, rosy-carmine corolla.

Anne Boleyn ***. Habit dwarf, free, drooping. Flowers medium size; tube $\frac{5}{8}$ in., very thick, and bulged at the base; sepals somewhat spreading, blush, green at the tip; corolla $\frac{7}{8}$ in., full, deep rosy-carmine, with paler flame at the base. A very elegant variety.

Arabella ** (*Attraction, Mrs. Marshall*). Habit free. Flowers medium size; tube 1 in.; sepals $1\frac{1}{8}$ in. spreading; corolla $\frac{7}{8}$ in., compact, deep rosy carmine. The varieties grown under the names given as synonyms were considered to be identical with this, which is superior to Arabella Improved, the latter being coarser in habit. A good market-flower.

Annie. Flowers medium size; tube $\frac{5}{8}$ in., very thick, and bulged at the base; sepals 1 in., spreading, stout; corolla 1 in., full, deep rosy carmine, paler at the base. Resembling but not so good as Anne Boleyn.

Nardy Frères. Habit loose. Flowers large; tube $1\frac{1}{8}$ in., slender; sepals 1 in., spreading; corolla $\frac{7}{8}$ in., the petals folded. Inferior.

No. 135. Habit good. Flowers medium size; tube 1 in., slender; sepals $1\frac{1}{4}$ in., spreading, green at the tip; corolla $\frac{7}{8}$ in., clear bright rosy carmine, very showy. Near *Starlight*, but the flowers have a longer tube.

§ 4. White calyx, bright red corolla.

Cherub **. Habit good, free-blooming. Flowers medium size; tube $\frac{7}{8}$ in.; sepals 1 in., pale blush, spreading; corolla $\frac{5}{8}$ in., compact, bright red. A useful variety.

Josephine *. Habit dwarf and free. Flowers medium size; tube $\frac{7}{8}$ in., bulged; sepals $\frac{3}{4}$ in., blush, green-tipped; corolla $\frac{5}{8}$ in., spreading, carmine-red. A showy decorative plant.

Catherine Parr. Habit drooping. Flowers medium size; tube

$\frac{3}{4}$ in., rather bulged; sepals $\frac{7}{8}$ in., spreading, blush, faintly tipped with green; corolla $\frac{5}{8}$ in., compact, bright carmine-red, small. A very pretty variety.

Innocence. Flowers medium size; tube $\frac{7}{8}$ in.; sepals $\frac{7}{8}$ in., blush, recurved; corolla $\frac{5}{8}$ in., compact, deep red, paler at the base. Very much like *Lustre,* if not identical with it.

Lustre. Habit not free. Flowers medium size; tube $\frac{7}{8}$ in.; sepals $\frac{3}{4}$ in., blush, recurved; corolla $\frac{5}{8}$ in., compact, deep red, paler at the base. Inferior.

Striata perfecta. Flowers large; tube $\frac{7}{8}$ in., greenish; sepals $1\frac{3}{8}$ in., spreading, strongly tipped with green; corolla 1 in., bright red with median flame of white, crumpled and folded, inside pinkish edged with red. An inferior sort.

§ 5. White calyx, rosy pink corolla.

Rose of Denmark. Habit free. Flowers medium size; tube $\frac{3}{4}$ in., white, tapered upwards; sepals $\frac{7}{8}$ in., recurved, tinged with pink; corolla $\frac{3}{4}$ in., full, rather spreading, lively rose-pink. A pretty variety.

§ 6. Scarlet calyx, double white corolla.

Enchantress ***. Habit good. Flowers medium size; tube $\frac{1}{2}$ in., slender; sepals $\frac{7}{8}$ in., broad, somewhat deflexed; corolla full and even, pure white. Bold and very handsome.

Vainqueur de Puebla **. A model as to habit. Flowers medium size; tube $\frac{3}{4}$ in., slender; sepals $\frac{7}{8}$ in., broad; corolla white, veined with red, full. A fine decorative variety.

L'Empereur. Flowers medium size; tube $\frac{3}{8}$ in., slender, bright scarlet; sepals 1 in., broad, spreading, bright scarlet; corolla white, with rosy veins.

No. 121. Flowers medium size; tube $\frac{3}{8}$ in., slender; sepals $\frac{7}{8}$ in., broad, reflexed; corolla white, full, somewhat irregular.

§ 7. Scarlet calyx, single white corolla.

Conspicua ***. Habit stiff. Flowers large; tube rather over $\frac{3}{8}$ in., bulged; sepals $1\frac{1}{8}$ in., spreading, broadish; corolla $\frac{7}{8}$ in., somewhat expanded, white, with scarlet feather at the base.

Puritani ***. Habit dwarf, drooping, and elegant. Flowers medium size; tube $\frac{3}{8}$ in., bulged; sepals $\frac{7}{8}$ in., spreading; corolla $\frac{3}{4}$ in., full, even, white, with rosy-scarlet feathery veins. A fine variety.

Pursuit ***. Habit free and elegant. Flowers medium size; tube scarcely $\frac{3}{8}$ in.; sepals 1 in., scarcely spreading; corolla $\frac{5}{8}$ in., somewhat expanded, white, with conspicuous rosy-scarlet veins. One of the best.

Alexandrina. Habit free and drooping. Flowers medium size; tube $\frac{3}{8}$ in.; sepals $\frac{7}{8}$ in., bright scarlet; corolla $\frac{5}{8}$ in., compact, white, veined and flushed with rose at the base. A pretty variety, but the corolla too much stained.

Maid of Honour. Flowers of medium size; tube nearly $\frac{3}{4}$ in., slender; sepals about 1 in., spreading or somewhat reflexed, rosy scarlet; corolla $\frac{7}{8}$ in., white, streaked and flushed at the base with rosy red. The rosy tint predominates.

Marmion. Flowers medium size; tube $\frac{3}{8}$ in.; sepals scarcely 1 in., broad; corolla $\frac{3}{4}$ in., full, white, with rosy-scarlet veins. Similar to, but not equalling *Pursuit.*

Vesta. Flowers medium size; tube nearly $\frac{1}{2}$ in.; sepals about 1 in., scarcely spreading; corolla $\frac{3}{4}$ in., white, with rosy-scarlet veins, and having small petals in the interior. The tube and sepals too pale in colour to be effective.

§ 8. Scarlet calyx, reddish plum-coloured double corolla.

Giant. Flowers very large; tube $\frac{1}{2}$ in., slender; sepals $1\frac{1}{2}$ in. long, and fully $\frac{1}{2}$ in. broad, spreading; corolla $1\frac{1}{4}$ in., reddish plum, passing to coral-red at the base, coarse and irregular. Wanting in contrast between the sepals and petals.

§ 9. Scarlet calyx, double purple corolla.

Avalanche ***. Habit good and free. Flowers large; tube $\frac{3}{8}$ in., tapered from the base, slender; sepals $\frac{7}{8}$ in. long, $\frac{1}{2}$ in. broad, deflexed; corolla $\frac{3}{4}$ in., deep, full and even, dark violet-purple. A fine bold variety.

Marksman ***. Habit dwarf and free. Flowers medium size; tube $\frac{5}{8}$ in., slender; sepals $\frac{3}{4}$ in., broad, spreading; corolla $\frac{5}{8}$ in., spreading, regular, violet-purple, reddish towards the base. A most useful market sort, which never seeds.

Purple Prince ***. Habit dwarf and free. Flowers large; tube $\frac{1}{2}$ in., bulged; sepals $\frac{3}{4}$ in., concave and deflexed as in *Globosa*; corolla $\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, shallow, but much expanded, regular, reddish violet. A large showy but rough flower, good for decorative purposes.

Alliance **. Habit neat and dwarf. Flowers large; tube fully $\frac{3}{8}$ in.; sepals 1 in., reflexed; corolla $\frac{7}{8}$ in., compact, full, light reddish violet, with a red base. A very neat flower.

Extraordinary **. Habit very free. Flowers small; tube $\frac{3}{8}$ in., tapered upwards; sepals $\frac{5}{8}$ in., close, concave, deflexed; corolla about $\frac{1}{2}$ in., compact, deep violet-purple. Like a double form of *Globosa.*

Bird of Passage. Habit good and free. Flowers medium size; tube $\frac{1}{2}$ in., bulged; sepals $\frac{7}{8}$ in., concave, deflexed; corolla $\frac{5}{8}$ in., loose, reddish purple. Too dull in colour.

Dreadnought. Flowers rather large; tube $\frac{1}{2}$ in., bulged; sepals $\frac{7}{8}$ in., concave, deflexed; corolla $\frac{5}{8}$ in., loose, spreading, reddish purple. A coarse and inferior variety.

François Havry. Flowers large; tube $\frac{1}{2}$ in., slender; sepals about 1 in., tipped with green, washy in colour; corolla $\frac{3}{4}$ in., loose, irregular, reddish purple. Inferior.

Hercules. Habit good. Flowers medium size; tube $\frac{5}{8}$ in., slender; sepals $\frac{3}{4}$ in., broad, spreading; corolla $\frac{3}{4}$ in., compact, reddish purple. In the way of *Sir Colin Campbell*, but different.

Hogarth. Flowers medium size; tube $\frac{3}{4}$ in., slender; sepals about 1 in.; corolla $\frac{5}{8}$ in., reddish purple. An ill-shaped and inferior flower.

Lady Charlotte Denison. Habit weakly. Flowers medium size; tube nearly $\frac{1}{2}$ in., slender; sepals $\frac{7}{8}$ in.; corolla $\frac{3}{4}$ in., purple. Inferior.

Prince Frederick William. Flowers medium size; tube $\frac{3}{8}$ in.; sepals about 1 in., broad; corolla $\frac{3}{4}$ in., uneven, reddish purple. Inferior.

Tower of London. Flowers large; tube $\frac{5}{8}$ in., slender; sepals about 1 in., concave, deflexed; corolla $\frac{3}{4}$ in., irregular, reddish purple. An inferior sort with crumpled flowers.

Troubadour. Flowers elongated; tube nearly $\frac{1}{2}$ in., slender; sepals $\frac{7}{8}$ in., corolla $\frac{7}{8}$ in., compact, reddish purple. A coarse and inferior variety.

§ 10. Scarlet calyx, maroon corolla.

Noblesse ***. Habit good and free. Flowers medium size; tube about $\frac{1}{2}$ in., slender; sepals $\frac{3}{4}$ in., spreading, bright crimson-scarlet; corolla $\frac{7}{8}$ in., prominent, rich maroon, flushed and veined towards the base with red. A very fine Fuchsia.

§ 11. Scarlet calyx, light violet corolla.

Herald. Habit dwarf and free. Flowers small; tube nearly $\frac{3}{8}$ in.; sepals $\frac{3}{4}$ in., pale red; corolla $\frac{3}{4}$ in., rather spreading, of a light reddish violet, veined at the base, and having a tendency to become double.

§ 12. Scarlet calyx, dark violet-purple corolla.

Weeping Beauty ***. Habit dwarf, free, and good. Flowers medium size; tube nearly $\frac{3}{8}$ in., rather bulged; sepals 1 in., broadish, bright crimson-scarlet; corolla $\frac{5}{8}$ in., moderately expanded, rich deep purple. A very fine Fuchsia.

Crown Prince of Prussia **. Habit dwarf and free. Flowers rather large; tube $\frac{5}{8}$ in., bulged; sepals $\frac{7}{8}$ in., broad; corolla $\frac{5}{8}$ in., prominent, dark purple, reddish at the base.

Inimitable **. Habit dwarf and free. Flowers medium size; tube $\frac{3}{8}$ in.; sepals 1 in., spreading: corolla $\frac{3}{4}$ in., somewhat expanded, violet-purple, reddish at the base. A good useful variety.

Corallina. Habit free. Flowers small; tube $\frac{1}{2}$ in.; sepals 1 in., narrow, deflexed; corolla $\frac{5}{8}$ in., small, deep purple. A fine old hardy variety, well adapted for walls and conservatories.

Improvement. Habit dwarf. Flowers full medium size; tube $\frac{1}{2}$ in., stoutish and tapered; sepals $1\frac{1}{8}$ in., stout, spreading, bright crimson-scarlet; corolla $\frac{7}{8}$ in., prominent, blackish violet, veined with red at the base. A coarse and inferior variety.

Little Bo-peep. Habit dwarf and graceful. Flowers rather small; tube scarcely $\frac{3}{8}$ in.; sepals $\frac{7}{8}$ in., spreading; corolla $\frac{5}{8}$ in., moderately expanded, violet-purple, red at the base. A pretty variety.

Neptune. Habit dwarf and free. Flowers medium size; tube $\frac{1}{2}$ in.; sepals 1 in., spreading; corolla $\frac{7}{8}$ in., expanded, violet-purple, reddish at the base. Inferior.

Prince Leopold. Habit free. Flowers large; tube $\frac{1}{2}$ in., slender, tapered; sepals $1\frac{1}{4}$ in., spreading; corolla 1 in., conically expanded, violet-purple, reddish towards the base.

Profusa. Habit neat, dwarf, and free. Flowers rather small; tube $\frac{3}{8}$ in.; sepals $\frac{1}{2}$ in., spreading; corolla $\frac{3}{4}$ in., prominent, purple, reddish at the base.

§ 13. Scarlet calyx, reddish-purple corolla.

King of the Fuchsias ***. Neat and dwarf in habit, and a free bloomer. Flowers medium size; tube $\frac{3}{8}$ in., stoutish; sepals 1 in., broad, spreading; corolla $\frac{3}{4}$ in., prominent, rather spreading, reddish purple. A distinct-looking and desirable variety.

First of the day **. Dwarf, neat, and free-blooming. Flowers medium size; tube scarcely $\frac{3}{8}$ in.; sepals $\frac{3}{4}$ in., reflexed; corolla $\frac{3}{4}$ in., light reddish purple, redder towards the base. A good variety for growing in the form of small plants.

Ambassador. Flowers medium size; tube $\frac{1}{2}$ in., slender; sepals about 1 in., narrow; corolla nearly $\frac{7}{8}$ in., rather expanded, with a tendency to duplication, whence some resemblance to *Sir Colin Campbell.* Discarded.

Bacchus. Flowers medium size; tube $\frac{3}{8}$ in., slender; sepals 1 in., spreading; corolla $\frac{3}{4}$ in., prominent, reddish purple, darker at the edges.

Sensation. Flower small; tube $\frac{3}{8}$ in., stout; sepals $\frac{5}{8}$ in., reflexed; corolla $\frac{5}{8}$ in., expanded, reddish purple, with red flame. Poor and undesirable.

Souvenir de Chiswick. A good old well-known sort. Flowers medium size: tube $\frac{5}{8}$ in.; sepals $1\frac{1}{8}$ in., reflexed; corolla $\frac{3}{4}$ in., prominent, reddish purple.

Wave of Life. Flowers medium size; tube $\frac{1}{2}$ in., tapered; sepals 1 in., reflexed, bright-coloured; corolla $\frac{7}{8}$ in., prominent, reddish purple, stained with red at the base.

§ 14. Scarlet calyx, lake-red corolla.

Commander ***. Habit good. Flowers large; tube $\frac{5}{8}$ in., stoutish; sepals $1\frac{1}{8}$ in., spreading; corolla about 1 in., conical, light lake-red. A bold handsome flower, and showy as a pot-plant.

Brigand. Habit loose. Flowers large; in size, form, and colour similar to *Monarch*; but the sepals are of a somewhat more rosy tint.

Empress of Germany. Dwarf and free in habit. Flowers rather small; tube scarcely $\frac{3}{8}$ in.; sepals $\frac{7}{8}$ in., spreading or reflexed corolla $\frac{3}{4}$ in., deep dull lake-red, in shape between conical and expanded. Not a desirable variety.

General Grant. Habit good. Flowers medium size; tube $\frac{5}{8}$ in., tapered, pinkish red: sepals $\frac{7}{8}$ in., spreading, pinkish red, green at the tips; corolla fully $\frac{3}{4}$ in., deep lake-red.

Monarch. Habit loose. Flowers large; tube $\frac{7}{8}$ in., tapered, rather slender; sepals $1\frac{1}{2}$ in., spreading; corolla $1\frac{1}{4}$ in., conical, light lake-red, showing scarcely any contrast with the sepals.

Nabob. Dwarf, free, and of good habit. Flowers medium size; tube $\frac{1}{2}$ in.; sepals $1\frac{1}{2}$ in., spreading; corolla $\frac{7}{8}$ in., rather expanded, dark dull lake-red.

REPORT ON BEDDING PELARGONIUMS.

By Thomas Moore, F.L.S., Floral Director.

In the trial of Pelargoniums, which took place at Chiswick in 1872, the Floral Committee, as on previous occasions, reviewed the entire collection, which was an extensive one, and, as before, discarded certain varieties which were considered by them to be superseded by better sorts. In the following notes, which indicate the general behaviour of the several sorts throughout the season, these discarded varieties are indicated, as also those to which marks of merit were awarded. These marks have the same value as in former Reports; that is, *** is equal to a First-class Certificate, and a smaller number indicates proportionate inferiority. The varieties are arranged in series distinguished first by the leaves, and then by the colours of their flowers, those falling under the respective subdivisions being arranged alphabetically. The name following that of the variety is that of the donor, not in all cases the raiser.

Series I. Plain green-leaved.

§ 1. *Flowers scarlet.*

1. *Ascendant* (Bull). Bright scarlet; free-flowering, and a good grower.
2. *Commodore Nutt.* Very intense scarlet, the darkest of all; compact, dwarf, and free; trusses and flowers small, but of good substance. Worth growing.
3. *Eleanor* (Bull). Pale scarlet; very free and good. *Previously certificated* (***).
4. *Prosperine* (W. Paul). Crimson-lake, very bright, shaded with vermilion on the lower part of top petals; very free and compact. Not a good bedder, but fine for pots; worth growing for colour.
5. *Punch* (Fraser). A fine old well-known variety, now superseded by No. 6. *Previously certificated* (***).

6. *Warrior* *** (G. Smith). The best in this class; extra fine scarlet; good and robust habit; large trusses of large flowers, freely produced. *Previously certificated* (***).

§ 2. *Flowers cerise or rosy scarlet.*

7. *Lady Middleton* (Taylor). Bright rose; a good well-known variety; very free-flowering, but bearing seedy trusses. *Previously certificated* (***)

§ 3. *Flowers rose-pink.*

8. *Advancer* (Bull). Bright rosy pink, self-coloured; dwarf and free-blooming. *Previously certificated* (***).
9. *Christine.* Pink; small trusses and small flowers, but very free; habit compact; a good old variety. *Previously certificated* (***).
10. *Christine Surpasse* (Chater). Clear pink; large flowers and moderate trusses; very free-flowering; good grower. *Previously certificated* (***).
11. *Cleopatra* (Barratt). Very bright pink, tinged with magenta; small trusses, but very free-flowering; habit compact and good. *Previously certificated* (**).
12. *Maia* *** (Rawson). New; very bright magenta-pink; small trusses, but very free-flowering. A real acquisition.
13. *Mdlle. Renault* (Barillet). A little brighter than *Christine*; small truss of flowers. *Discarded.*
14. *Mrs. Pottle* *** (George). Bright pink, colour of *Cleopatra*; small trusses, freely produced; good; closely resembles No. 8.
15. *Rose Queen* (Osborn). Pale pink; top petals white at the base; very free-flowering, but seeds too freely. *Previously certificated* (***), now *Discarded.*

Series II. Zonate- or Horseshoe-leaved.

§ 1. *Flowers scarlet.*

16. *Annihilator* (George). Pale scarlet; large, and of fine form; truss small; not very free for bedding, good for pots.
17. *Amabilis* (Mann). Bright scarlet; fine large flowers truss good; free and fine; dark-zoned leaf; good.
18. *Archevêque de Paris.* Scarlet, with light eye, large and of good form; not free-flowering in the open ground, but grand for pots; dark-zoned foliage.

19. *Augustine Rouger* (Downie and Co.). Scarlet; small trusses of small flowers, freely produced; runs quickly to seed. *Previously certificated* (**), now *Discarded.*

20. *Aurora* (Laxton). Cerise-scarlet, in the same style as *Excellent*, but not so good. *Previously certificated* (***).

21. *Boule de Feu.* Orange-scarlet, with white eye; good flower; small trusses, very freely produced; habit dwarf and compact; a good useful variety.

22. *Chieftain* (G. Smith). Pale scarlet; large freely-formed flower; truss large, but seedy; a strong grower. *Discarded.*

23. *Coleshill* (Veitch). Cerise-scarlet; good truss and flower, very freely produced; habit free and robust, good. *Discarded.*

24. *Commissioner* (Bull). Pale scarlet; flowers small, but in large trusses, freely produced; good habit; free and useful. *Previously certificated* (**).

25. *Conflagration* (Veitch). Orange-scarlet; flowers of good shape, large, and freely produced; a strong grower. *Discarded.*

26. *Corsair* (Pearson). Orange-scarlet; very finely formed large flowers; habit strong and robust; not so good for bedding, but grand for pots.

27. *Diana* (W. Paul). Intense crimson-scarlet, like *Commodore Nutt*, but large finely formed flowers; trusses small, very freely produced; a really fine variety.

28. *Dreadnought* (Mann). Clear scarlet, recurved flowers, not very freely produced; a strong grower; very dark broad-zoned foliage. *Discarded.*

29. *Dr. Lindley* (Bull). Pale scarlet, with white eye; very free-flowering; good compact habit; a first-rate variety. *Previously certificated* (***).

30. *Eclipse* (Mann). Fine clear scarlet, with white eye; good trusses and flowers, freely produced; habit strong and robust.

31. *Emily Morland* (Tirebuck). Light scarlet, with pale eye; good flower and trusses, very free; dark-zoned leaf; a useful variety. *Previously certificated* (**).

32. *Emperor of the French.* Scarlet; good truss, but poor flowers; habit strong and rambling; foliage with narrow dark zone. *Previously certificated* (**).

33. *Etna* (F. and A. Smith). Good, free-flowering, scarlet; large flowers in fine trusses; habit excellent and free; a desirable variety. *Previously certificated* (***).

34. *Excellent* (Carter and Co.). Fine cerise-scarlet; good trusses

and flowers very freely produced; a really first-class variety. *Previously certificated* (***).

35. *Fiery Star* (Chater). Clear scarlet, with white eye; trusses small; flowers good.

36. *General* (Bull). Paler scarlet than *Archbishop of Paris*, but of the same type, white eye; good compact habit.

37. *George Peabody* *** (Veitch). Extra fine bright scarlet; fine trusses and large well-formed flowers, freely produced, well up above the foliage; pale-zoned leaf; compact habit; one of the best bedding-varieties known.

38. *Harold* (Cannell). Pale scarlet, free-flowering; a robust grower; pale zonate leaf; very free, but not desirable. *Discarded.*

39. *Jean Sisley* (Cannell). Very bright clear scarlet, with pure white eye; finely shaped flower, in small trusses; good compact habit and very telling; the best of the white-eyed class.

40. *Juno* (Mann). Pale scarlet, large, and of fine form; moderate truss, very free-flowering; good habit and robust; a good variety.

41. *Jupiter* (Veitch). Pale orange-scarlet; trusses small, but freely produced; good free robust habit, yet superseded. *Discarded.*

42. *Lady Derby* (Crocker). Pale scarlet; flowers large, trusses small; habit free and compact; very pale-zoned leaves; a good variety.

43. *Landers* *** (Charlton). An improved *Vesuvius* in every respect, as to growth, habit, and flowering.

44. *Le Zouave.* Bright scarlet; very free-flowering; pale zonate foliage; habit free and good; a desirable variety.

45. *Lord Falkland* (W. Paul). Scarlet; a good flower, with fine truss, and free-flowering; good compact habit; useful.

46. *Lord Stanley* (F. and A. Smith). Very bright scarlet, with white eye; well-formed flowers, but rather small, freely produced; a free grower.

47. *Magnet* (Mann). Pale scarlet; style of *Dr. Lindley*, but no improvement upon it, and not so compact in growth.

48. *Maréchal M'Mahon.* Pale scarlet, with light eye; very large good-shaped flowers, but small trusses; strong grower; finer for pots.

49. *Mons. Gallande.* Scarlet, with small flowers in large trusses, but seedy; not good.

50. *Mrs. A. Pirie* (Crocker). Intense scarlet, large, finely formed flower; habit free and compact; one of the most beautiful for pot-culture; a really grand variety, and distinct.

51. *Payne's Perpetual* (Payne). Pale scarlet; exceedingly free-flowering, though the trusses are small; very dwarf and compact; a fine bedder for small beds or front lines.

52. *Resplendent* (Bull). Pale scarlet; a large flower and free, but superseded. *Discarded.*

53. *Rev. J. Dix* (R.H.S.). Bright scarlet; flowers small, but the trusses large; very free-flowering, but soon running to seed; first-rate for early work; good habit. *Previously certificated* (***).

54. *Sambo* (Downie and Co.). Intense scarlet; good habit; very free and useful, but superseded by No. 50. *Previously certificated* (***).

55. *Sir Robert Napier* (Mann). Pale scarlet; large trusses and flowers, but not free-flowering; a strong grower.

56. *Sir Robert Peel.* Clear scarlet; large finely formed flower; good habit and free-flowering, but *Discarded.*

57. *Solfatara.* Bright scarlet, with white eye; large flower, but small truss; very free, and of good habit.

58. *Startler* (Mann). Vivid scarlet, with pale centre; large good-shaped flower; good truss and habit; very free; one of the best of its class.

59. *Sydney Turner* *** (Downie and Co.). Bright scarlet, with pale eye; small truss, but finely formed flower; free and good habit; good of the type.

60. *Tyersal Rival* (Downie and Co.). Clear scarlet, with white eye; well-formed flower, but small truss; free and of compact habit.

61. *Vesuvius* (F. and A. Smith). Scarlet, of one of the best types; grown by all market-gardeners round London for cut flowers and as a pot-plant. *Previously certificated* (***).

62. *William Hill* (Pearson). Pale scarlet; large flower, but small truss; good free habit; grand in pots.

63. *William Underwood* (Davie). Pale scarlet, the top petals shaded; free-flowering, and of good habit, but superseded. *Previously certificated* (***), but *Discarded.*

64. *Victor* (Mann). Scarlet-cerise; good truss; free-flowering; a pleasing colour; pale-zoned leaf; good habit.

§ 2. *Flowers cerise or rosy scarlet.*

65. *Alfred* (Pearson). Bright carmine; good truss and flower;

very free habit, and free-flowering; a good variety. *Previously certificated* (***).

66. *Cecilia.* Pale cerise; a good flower, but small truss; habit dwarf and compact; very free-flowering.

67. *Charles Dickens* *** (Bell and Thorpe). Bright carmine, with cerise-scarlet edge; very distinct; truss moderate, flowers rather small, but freely produced; habit dwarf; a new and pleasing variety.

68. *Claudius* (Veitch). Clear rose, deeper at the edge; large flower, but small truss; habit and general appearance like the last, but differing in its shades of colour; novel.

69. *Countess of Derby* (Mann). Carmine-cerise; good truss and flower, freely produced; habit compact and good; pale zone; a useful variety, but *Discarded.*

70. *Crystal Palace Gem* (Carter and Co.). Clear rosy cerise; very free flowering, but rather seedy; fine habit and a first-rate bedder. *Previously certificated* (***).

71. *Forester* (Carter and Co.). Pale rose; good flower, but small truss; very free-flowering; strong grower; a useful shade of colour. *Previously certificated* (***).

72. *Glory* (Fraser). Bright cerise; good flower and truss, and very free-flowering; moderate habit; really good. *Previously certificated* (***).

73. *Hector* (Bull). Bright carmine-rose; good flower and truss; very free-flowering; compact grower; dark-zoned foliage; distinct and good.

74. *Herald of Spring* (Turner). Same colour as *Nora*, but not so free; of straggling habit. *Previously certificated* (***), but *Discarded.*

75. *Ianthe* *** (W. Paul). Beautiful rose shaded with carmine and magenta; quite novel; dwarf habit; flowers good in shape, but the trusses small.

76. *Les Foules* (Fraser). Bright rose; good truss and flower; free-flowering; good habit; dark-zoned foliage.

77. *Lucifer* (Bull). Pale rose; good flower and truss; compact habit; pale-zoned foliage.

78. *Lucius* *** (Bull). Very bright cerise; a fine flower and good truss; a strong grower and very free bloomer; stands sun, wind, and rain better than any other of the same class; useful and first-class. *Previously certificated* (***).

79. *Mrs. Menzies* (Downie and Co.). Pale rose; good truss and flower; free and good habit. *Previously certificated* (**).

80. *Nora* (Bull). Bright rose; large trusses; a very strong grower and free flowerer; good for back rows. *Previously certificated* (***).

81. *Princess of Wales* *** (Mews). Clear rose; very large truss and good flower; dwarf and compact habit; an excellent and first-class variety for bedding or pots.

82. *Regalia* *** (Turner). Bright carmine-rose of a beautiful shade; flowers large, trusses small, but very freely produced; dwarf and compact habit; a fine variety. *Previously certificated* (***).

83. *Serviceable* (Bull). Bright rosy cerise; large truss and flower, but not very good form; a strong grower; not desirable.

84. *The Champion* (Poole). Rosy cerise-scarlet; large truss, well-formed flowers; free-flowering; a strong grower; good. *Previously certificated* (**).

85. *Tintoret*. Same colour as *Forester*, but long and straggling in growth; not good. *Discarded.*

86. *Valiant* (Mann). Very bright cerise, suffused with lake; dwarf compact habit; free-flowering. *Discarded.*

87. *Victoire de Puebla* (Low). Pale rose; large trusses and flowers; long straggling growth; not good.

§ 3. *Flowers rose-pink.*

88. *Blue Bell* (W. Paul). Magenta-pink, very bright, white on the upper petals; good flower and truss; free and good habit; a fine variety. *Previously certificated* (***).

89. *Beauty of Lee* *** (Toole). Very bright carmine-rose, white on the top petals; small flowers and truss; exceedingly pretty and compact in habit; pale-zoned foliage. *Previously certificated* (***).

90. *Evans's Seedling* (Evans). Beautiful bright pink, with pure white on top petals; good flower and truss; habit very dwarf; a good bedder, and first-class pot-plant.

91. *Forget-me-not* (E. G. Henderson). Good pink, in the style of *Evans's Seedling*, but not so bright, and a stronger grower, though compact; a useful variety. *Discarded.*

92. *Heather Bell* (Crocker). Brighter than *Blue Bell*, but of very strong straggling growth, and not free-flowering.

93. *Mrs. Upton* *** (Dodds). Fine bright pink, white on the upper petals; compact and very free-flowering habit; an excellent variety.

94. *Penelope* (W. Paul). A little paler than *Forget-me-not*, with larger flowers and stronger habit; not so good as *Mrs. Upton* for effect. *Previously certificated* (***).

95. *Plutarch* (Osborn). Pale pink; very large flower and truss; a strong grower, and free-flowering, but too pale in colour. *Discarded.*

96. *Serena* (W. Paul). Pale pink, paler than *Plutarch*; large flower and truss; strong grower; free-flowering.

97. *Surpasse Beauté de Suresnes* (Low). Bright rosy pink without purple, and with white on the top petals; very large flowers, of fine substance, borne on stout footstalks in immense trusses, when grown in pots, but not good for bedding. *Previously certificated* (***).

§ 4. *Flowers salmon-coloured or flesh-coloured.*

98. *Baron Haussman.* Bright salmon; good flower and truss, very free; good habit; small foliage as compared with others, and of slender growth.

99. *Bella* (Mann). Pale salmon; good truss and flower, very free-flowering; dwarf and free habit.

100. *Cherub.* Bright salmon; good flower and truss; strong grower.

101. *Dunkeld* (Charlton). New; bright salmon; compact in habit, but not better than some older varieties.

102. *Emile Licau.* Very bright deep salmon; free, and of good habit; one of the best.

103. *Hogarth.* Very bright salmon, with a shade of lake; large flower and truss; good grower; the best of the class.

104. *Jean Valjeans* (E. G. Henderson). Bright salmon; good truss and flower; strong grower, and free. *Previously certificated* (***).

105. *La Fontaine* (Low). Bright salmon, with a little white; strong grower.

106. *Mons. Barre.* Salmon shaded; very free and good; a strong grower. *Previously certificated* (***).

107. *Renown* (Bull). Very similar to *La Fontaine* in colour, but much dwarfer.

108. *Seraph* (Downie and Co.). Clear salmon, with white eye; free-flowering; dwarf and compact; quite distinct. *Previously certificated* (***).

§ 5. *Flowers light, with deep salmon or rose centre**.

109. *Acme* (F. and A. Smith). White, shaded with rose; large flower and truss; good and free habit; dark-zoned foliage. *Previously certificated* (**).

110. *Amelina Grisau* (Salter). Pure white, with very bright salmon eye, clearly defined; dwarf, compact, free-flowering, and distinct. *Previously certificated* (***).

111. *Arlequin* (Cannell). White, striped with salmon; novel and distinct; free-flowering, and of good habit.

112. *Baron Rothschild.* White, shaded with salmon, and deep salmon eye; a strong straggling grower.

113. *Emilie Carré.* White, shaded with salmon, and salmon eye; very free-flowering; good habit.

114. *Eugénie* (Mann). A rose-tinted flower with no eye; strong coarse grower; not good.

115. *Eugénie Mézard* (Salter). White, shaded with salmon, and deep eye; very free-flowering; dwarf and compact; one of the best. *Previously certificated* (***).

116. *Le Prophète* (Fraser). White, shaded with rose; very poor grower; superseded.

117. *Madame Lemoine.* White, with salmon eye, and shaded with the same; free and good; very dark-zoned foliage. *Previously certificated* (**).

118. *Madame Rudolphe Abel.* White, tinted with rose; good flowers in small trusses; moderately vigorous habit, but not so good as some others.

119. *Madame Van Houtte* (Low). A rose-tinted flower, and a very indifferent grower.

120. *Madame Werlê* (W. Paul). Pure white, with delicate pink eye; good flower, but small truss; very free-flowering, but not good for bedding; fine in pots, and distinct. *Previously certificated* (***).

121. *Miss Louisa Pyne* (Windebank). White, shaded with rose, rosy eye; a strong grower, but not a free flowerer.

122. *Princess Mary.* White, with salmon eye, and shaded; good grower; very dark-zoned foliage.

123. *Queen of Beauties* (F. and A. Smith). Pure white, with salmon eye; good dwarf habit; dark-zoned foliage; one of the best.

124. *Rosebud* ***. White, with deep salmon eye; very free-flowering, distinct, free and good; dark-zoned foliage; one of the best.

* The varieties in this group in future to be shown as pot-plants.

125. *Vestal* ***. Very similar to the last, but the zone on the leaves not so dark; good.
126. *Wilhelmine Weick* (W. Paul). White, with salmon eye; good and free; strong grower.

§ 6. *Flowers white.*

127. *E. G. Henderson.* White; dwarf and compact in habit, but not free-flowering.
128. *Madame Martha Vincent.* White; tall and free-growing, with good truss of fine flowers; free-blooming; style of *White Perfection. Previously certificated* (***).
129. *Purity* *** (Bull). The purest white; flowers fine, in good trusses; compact and robust-growing; the best of all. *Previously certificated* (***).
130. *The Bride.* French white; very large flowers, freely produced; dark zonate shining foliage; dwarf and compact habit; very distinct.
131. *Virgo Maria* (Fraser). Like No. 127 in appearance, but more free-flowering; good and useful.
132. *White Perfection* (J. F. Chater). Pure white; tall, free-growing and free-flowering; a good useful variety. *Previously certificated* (***).
133. *White Swan.* New, white; a compact grower, but not so good as existing varieties.

Series III. Marbled Zonate Pelargoniums.

§ 1. *Flowers scarlet.*

134. *Sheen Rival* (Kinghorn). Scarlet; flowers and trusses small; habit strong and robust; very free-flowering, but not good. *Previously certificated* (***), but *Discarded.*
135. *Kentish Fire.* Brilliant cerise-scarlet; trusses large and thick, freely produced on long pale footstalks; free; the best of its class.
136. *American Flag* (Scott). Orange-scarlet; trusses small; habit very free, growth slender; foliage small, marbled, but not zonate. *Discarded.*

§ 2. *Flowers cerise.*

137. *Dr. Newham* (Henderson). Rosy cerise; trusses small; habit very dwarf and compact, but robust; distinct. *Previously certificated* (**).

§ 3. *Flowers white.*

138. *Miss Collingwood* (Charlton). White, with medium truss strong robust grower, but not free-flowering; new.

Series IV. NOSEGAY AND HYBRID NOSEGAY PELARGONIUMS.

§ 1. *Leaves plain.*

* *Flowers scarlet.*

139. *Harkaway.* Orange-scarlet; small flowers and trusses; slender growth, dwarf, and very free. *Discarded.*
140. *Orange Nosegay* (W. Paul). Bright orange-scarlet; small truss and flowers; tall slender growth, very free; foliage small and distinct. *Previously certificated* (***), but *Discarded.*
141. *Vulcan* (Chater). Crimson-scarlet; good truss and flowers; very free and hardy; strong growth. *Previously certificated* (***).
142. *Waltham Nosegay* (W. Paul). Orange-scarlet, small flowers; free slender growth; not desirable.

** *Flowers pink.*

143. *Friedrich Lehnbauer* (Cannell). Rose, with white on the upper petals; a good grower, but not a free bloomer.
144. *Mr. Newland* (Cannell). Rose-magenta; very small nosegay-flowers; habit very dwarf, but considered useless.

§ 2. *Leaves zonate.*

* *Flowers crimson and scarlet.*

145. *A. Barrow* (Veitch). Crimson, extra large; finely shaped flower and large truss, but very shy, and of a bad habit.
146. *Acquisition* (Bull). Fine scarlet; very free and grand; good truss, and compact habit.
147. *Bayard* (Pearson). Fine crimson; small flowers, but good trusses, very freely produced; good compact habit; a first-class bedder. *Previously certificated* (***).
148. *Charlie Casbon* (Casbon). Brilliant scarlet; a very fine, free, dwarf variety, and a first-class bedder. *Previously certificated* (***).
149. *Col. Holden* (Pearson). Very bright crimson-scarlet; large trusses; good free habit; pale-zoned leaves.

150. *Concord* (Bull). Scarlet; free-flowering; of compact and good habit.

151. *Constance Nivelet* ** (Veitch). Pale orange-scarlet; very free-flowering; good compact habit.

152. *Countess of Strathmore* (Downie and Co). Bright scarlet; small trusses, but free-flowering; very pale-zoned leaves; good habit. *Previously certificated* (***).

153. *Crimson Queen* (W. Paul). Fine crimson; tall slender growth; superseded.

154. *Cybister* (Carter). Orange-scarlet; strong slender grower, and very free-flowering; a first-rate bedder. *Previously certificated* (***).

155. *David Garrick* *** (Bell and Thorpe). Crimson-scarlet; large flowers in moderate trusses; free-flowering, and of good habit.

156. *Douglas Pearson* (Pearson). Bright crimson; moderate trusses; free, and of good habit.

157. *Dr. Hornby* (Veitch). Pale scarlet; moderate, compact, slender growth; free-flowering, but the flowers small. *Discarded.*

158. *Dr. Tait* (Pearson). Crimson-carmine; large flowers and truss; good and free; pale-zoned leaves.

159. *Duke of Devonshire* *** (Pearson). Very bright crimson-scarlet; very large trusses of large well-formed flowers; strong, compact, good habit; very free-flowering. A really grand thing, and fine for pots.

160. *Gazelle* (Bull). Pale crimson-scarlet; flowers small; weak slender habit, and a poor grower. *Discarded.*

161. *Gorgeous* (Bull). Good scarlet; free-flowering; moderate habit.

162. *Grand Duke* (G. Smith). Vermilion-scarlet, shaded with lake; fine truss and flower, and very free-flowering; moderately compact in habit, good; a fine bedder. *Previously certificated* (***).

163. *Harry Hieover.* Exceedingly dwarf; pale scarlet; small truss and flower, but very freely produced; a first-rate bedder for front edging. *Previously certificated* (***).

164. *H. M. Stanley* *** (George). Vivid crimson-scarlet; large flowers and very large trusses produced on long footstalks; good strong compact habit; a new variety, in every way first class.

165. *Hon. Gathorne Hardy* (Downie and Co.). Pale crimson;

moderate habit; free-flowering, but superseded. *Previously certificated* (***), but *Discarded.*

166. *International* (Turner). Pale crimson; small truss; compact habit, but not very free-flowering. *Discarded.*

167. *Kingcraft* (Veitch). Dark carmine-scarlet; dwarf compact habit, and free-flowering. *Discarded.*

168. *King of Nosegays* ***. Fine crimson-scarlet; good trusses; moderately compact in growth, and very free-flowering; good.

169. *Lady Constance Grosvenor* (Turner). Fine orange-scarlet; small flowers, but good trusses; very free-flowering; dwarf flat growth; very effective. *Previously certificated* (***).

170. *Le Grand* (G. Smith). Soft crimson-scarlet; good flower and truss; very free-flowering; compact good habit; a fine bedder. *Previously certificated* (***).

171. *Lizzy* (G. Smith). Crimson-carmine; small trusses and flowers; free-flowering; dwarf and compact habit. *Discarded.*

172. *Lord Belper* (Pearson). Very brilliant crimson-lake; the top petals darkly veined; good flowers in smallish trusses, but very free and good.

173. *Louis Veuillot* (Low). Crimson-scarlet; very free-flowering; dwarf and good. *Previously certificated* (***).

174. *Milton* *** (Pearson). Crimson, extra large; immense trusses on long footstalks; good-formed flower; a very telling variety; fine for pots, but straggling as a bedder.

175. *Miss Sanders* (Pearson). Very fine crimson-lake; good flowers and large trusses; free-flowering and good.

176. *Morning Star* (B. S. Williams). Light crimson-scarlet; small flowers in good trusses; a moderate grower. *Discarded.*

177. *Mr. Gladstone* (Veitch). Rich crimson-scarlet; large trusses of fine flowers; strong grower, and very free-flowering; good.

178. *Mrs. Mellow* *** (Pearson). Brilliant crimson, dazzling; good flowers and trusses freely produced; moderate habit; fine for pots; first class. *Previously certificated* (***).

179. *Mrs. Vincent* *** (Pearson). Very fine crimson-scarlet; good trusses and flowers; very free and good; pale-zoned foliage.

180. *Murillo* (W. Paul). Very brilliant crimson; small trusses and flowers, but exceedingly free-flowering; a first-class bedder, and distinct. *Previously certificated* (**).

181. *Orange Bouquet.* Pale orange-scarlet; small flowers and trusses, but very freely produced; rather straggling habit.

182. *Orange Gem* (George). Crimson rose; dwarf habit, and free-flowering.
183. *Othello* (Veitch). In flower and truss this closely resembles *Milton*, but it is a stronger grower.
184. *Pride of Osberton* ** (B. S. Williams), Brilliant scarlet; dwarfy compact habit; free-flowering and good.
185. *Rev. T. F. Fenn* (Pearson). Pale crimson; large flowers and trusses; good strong grower, but not very compact.
186. *Rev. John Woolley* (Pearson). Orange-flushed crimson scarlet; very large flowers and trusses; free strong grower; fine for pots.
187. *Robert Bowley* *** (Downie & Co.). Bright crimson scarlet; fine flowers and trusses; very free-flowering; good habit; a first-class variety. *Previously certificated* (***).
188. *Shakespeare* (Pearson). Crimson scarlet, bright; good flowers in small trusses; free-flowering; good habit; pale-zoned leaves.
189. *Soleil* *** (Veitch). Brilliant orange-scarlet; flowers small, but the trusses immense; a strong grower and very free flowerer; a first-class bedder. The best of its colour for bedding.
190. *Stanstead Rival* *** (Downie & Co.). Light crimson shaded with lake; large flowers in small trusses; very free-flowering; dwarf, moderately vigorous habit; a first-rate bedder. *Previously certificated* (***).
191. *Sultan* (Downie & Co.). Pale scarlet; large flowers in moderate trusses; dwarf and compact habit. *Previously certificated* (***).
192. *The Baron* (Mann). Bright crimson scarlet; of compact slender growth; very free-flowering, but not desirable. *Discarded.*
193. *Thomas Adams* (Pearson). Bright carmine scarlet; large flowers, but small trusses; free and good habit.
194. *Thomas Speed* *** (Pearson). Crimson lake; small flowers in large trusses; moderately compact habit; free and first-rate.
195. *Triomphe de Stella* *** (Garaway). Orange scarlet; very dwarf habit; good flowers in small trusses; very compact, and very free-flowering; a first-class bedder. *Previously certificated* (**).
196. *Vesta* *** (W. Paul). Very brilliant crimson scarlet; small

flowers in good-sized trusses; very free compact habit; a really first-class bedder, one of the best, and remarkably effective.

197. *Waltham Seedling* (W. Paul). Bright crimson; small flowers, but good trusses; very free-flowering; habit long and slender; a fine bedder. *Previously certificated* (***).

198. *Wellington* *** (W. Paul). Magnificent, very rich deep crimson-shaded; flowers very large, in immense trusses; strong dwarf grower, free-flowering. In nosegays, the gem of the season.

199. *William Thomson* (Pearson). Dark crimson; free and compact habit; good flowers and trusses; fine in pots.

** *Flowers distinctly shaded with magenta.*

200. *Enchantress* (Chater). Purplish crimson, shaded with lake; good-shaped flowers in good trusses; free and moderate growth; very pale-zoned leaves; a grand sort for pot-culture.

201. *Claude Lorraine* (W. Paul). Colour like *Enchantress*, with more magenta; flowers rather loose; a free grower, but not a very free bloomer as a bedder; fine for pot-culture; it has darker-zoned foliage than *Enchantress*.

202. *Robinson Crusoe* (W. Paul). Same colour as the two last, but scarcely so free in growth and flowering; foliage nearly plain green.

*** *Flowers cerise or rosy scarlet.*

203. *Amy Hogg* (W. Paul). Magenta rose; good flowers and trusses; very free-flowering, good habit, and free; a first-rate bedder. *Previously certificated* (***).

204. *Arthur Pearson* (Pearson). Magenta rose shaded; moderate grower; good flowers in moderate trusses; free and good; fine for pots. *Previously certificated* (**).

205. *Chilwell Beauty* (Pearson). Magenta rose; moderate habit, and free-flowering; a good bedder. Very similar to *Amy Hogg*. *Previously certificated* (***).

206. *Clio*. Magenta crimson with white eye; fine flowers, and good trusses; compact habit, and very free-flowering. One of the very best for pot-culture, and distinct. *Previously certificated* (***).

207. *Demosthenes* (W. Paul). Purplish rose shaded; a finely

shaped large flower, but not a free flowerer as a bedder; good in pots. *Previously certificated* (**).

208. *Dr. Hogg* (W. Paul). Very similar to *Amy Hogg*; a good grower, and a fine bedder.

209. *Forest-Hill Nosegay* (Downie & Co.). Salmony cerise; large flowers and trusses; dwarf and compact habit; very free-flowering; a new and promising variety.

210. *Indian Yellow* (W. Paul). Yellowish salmon, distinct; good flowers in small trusses but very free-flowering; good habit; a first-class bedding variety. *Previously certificated* (***).

211. *Lady Kirkland* *** (Downie & Co.). Bright purplish rose; large flowers in immense trusses; very free-flowering; fine compact strong habit; the best bedder of its colour and class. *Previously certificated* (***).

212. *Lady Palmerston* (Veitch). Rosy purple, small miffy flowers; free and compact habit.

213. *Laurence Heywood* (Pearson). Bright purplish rose; large well-formed flowers and trusses; a fine showy variety, the habit strong yet compact. *Previously certificated* (***).

214. *Marathon* (W. Paul). Purplish rose; very small flowers and trusses: free-flowering and dwarf in habit, but not desirable. *Discarded.*

215. *Masterpiece* *** (G. Smith). Cerise shaded magenta; large flowers and immense trusses; a strong good grower, and very free-flowering.

216. *Merrimac* (Major Clarke). Cerise magenta; compact and a good grower; large flowers and very large trusses; a first-rate bedder.

217. *Nicolas Boulanger* (Low). Cerise lake; large flowers; free, but not desirable.

218. *Sydney Durston* (George). Magenta rose; very poor flowers and trusses; dwarfy, but not desirable. *Discarded.*

219. *Violet-Hill Nosegay* *** (E. G. Henderson). Lake rose; good flowers in small trusses, but very freely produced; dwarf and compact habit, in every way first-class as a bedder. The model of a bedding variety. *Previously certificated* (***).

**** *Flowers rose-pink.*

220. *Amaranth* *** (Pearson). Bright rosy amaranth, quite a

new colour; free-flowering; moderate habit; nearly plain foliage.

221. *Cannell's Pink* (Cannell). Bright pink, but mop-headed; flowers small; free-flowering and a strong grower, not better than *Mdlle. Nilsson*, which latter is discarded.

222. *Countess of Rosslyn* (Downie & Co.). Pink shaded mauve; a flimsy flower, of dwarf habit; useless. *Discarded.*

223. *Father Hyacinthe* (Cannell). Very bright carmine rose, with white on top petals; a compact grower and very free bloomer.

224. *Florence Durand* *** (Pearson). Very bright magenta; large flowers but of little substance; exceedingly free-flowering, and of good habit; a promising variety.

225. *Mdlle. Nilsson* (Low). Bright pink, mop-headed; very free-flowering and good habit, yet not desirable. *Previously certified* (**) but *Discarded.*

226. *Mrs. E. J. Lowe* (Pearson). Pink, with white on top petals; good trusses; free-flowering; pale-zoned leaves.

227. *Pink May Queen* *** (Downie & Co.). Very bright carmine; good flowers in immense trusses; very free-flowering, and strong compact habit; a first-class variety for bedding-purposes or for growing in pots.

228. *Profusion* (George). Rose-colour; small trusses and flowers; compact and dwarf habit; foliage pale-zoned.

229. *Rose Bradwardine* (Pearson). Magenta rose; small trusses; free-flowering and good; moderate habit.

230. *Welbeck Nosegay* *** (Tillery). Very bright carmine; very free-flowering; dwarf and compact habit; a good bedder, and very pretty.

Series V. Ivy-leaved Pelargoniums.

§ 1. *Leaves green.*

231. *Crimson Ivy-leaved.* Pale crimson; flowers small; free trailing habit; shining foliage.

232. *White Ivy-leaved.* White tinged with rose; very large flower; very free; bright green shining foliage.

233. *Willsii* (Wills). Pale rose; free-flowering; half trailing habit; distinct and good.

234. *Willsii roseum* *** (Wills). Bright magenta-rose; very free-flowering; dwarf compact habit; makes a very distinct feature amongst bedding Pelargoniums.

235. *Peltatum elegans.* Pale purple flowers; free trailing habit; very pretty.

§ 2. *Leaves variegated.*

236. *Duke of Edinburgh.* Pale rose flowers; yellowish white shining foliage; slender trailing habit.

237. *L'Elégante* ***. White, very large flowers; foliage pale green, edged with white, changing to a beautiful rose in autumn; free trailing habit.

Series VI. Gold and Bronze Pelargoniums.

238. *Admiral Inglefield* (E. G. Henderson). Pale scarlet flowers of good form; good broad bronze zone; compact habit.

239. *Admiration* (Wimsett). Rosy orange flowers; strong growth; and very large foliage, with dark broad zone on dull ground.

240. *Anthony* (Carter and Co.). Pale salmon flowers; dwarf, moderately free growth; good colour, pale zone.

241. *Beauty* (Wells). Carmine-rose flowers, very pretty; bright and effective; of moderate growth.

242. *Beauty of Calderdale* (Wimsett). Pale scarlet flowers, very freely produced; good robust habit; broad dark zone. *Previously certificated* (***).

243. *Beauty of Wolverstone* *** (Wimsett). Vivid scarlet flowers; large foliage, of the brightest yellow, narrow dark zone; very effective and distinct; strong, but compact growth.

244. *Black Douglas* *** (Downie and Co.). Salmon flowers, freely produced; a good grower, robust and dwarf; fine dark broad zone, with very narrow yellow edge; first class. *Previously certificated* (***).

245. *Black Prince* *** (Carter and Co.). Good scarlet flowers; large foliage, with broad bold zone; very free-growing; first-rate.

246. *Bronze Banner* (Downie and Co.). Orange-scarlet flowers; good even foliage, with rather a narrow dark zone; free and compact habit.

247. *Cedo nulli* *** (E. G. Henderson). Pale salmon flowers,

with deeper centre; good broad bright zone; robust, yet compact in habit; good.

248. *Cleopatra* *** (Carter and Co.). Flowers scarlet, of good form; bright red broad zone; free and good.

249. *Criterion* (F. and A. Smith). Scarlet flower; bright yellow leaves, with broad, very regular and smooth red zone; a good grower and a first-class variety.

250. *Columbine* (R. H. S.). Bright scarlet flowers; large foliage, with bright red narrow shaded zone, distinct; good habit.

251. *Crimson-crowned Canary* (E. G. Henderson). Crimson-lake nosegay flowers; olive-green foliage, with narrow dark zone; small wood; large leaves; dwarf and compact.

252. *Earl of Rosslyn* (Downie and Co.). Scarlet flowers; good-sized perfect leaves, yellow ground, with broad zone; dwarf and compact in habit.

253. *Emperor of Brazil* *** (Downie and Co.). Salmon flowers; a facsimile of *Black Douglas*, and, if different, not so good.

254. *Gold Button* (E. G. Henderson). Pale scarlet flowers; moderately vigorous grower, with broad dark zone on clear yellow ground.

255. *Goldfinder* (F. and A. Smith). Carmine flowers; bright foliage—but washy, pale zone; very compact growth. *Previously certificated* (***).

256. *Golden Superb Nosegay* (Sampson). Purplish crimson nosegay-flowers; dwarf spreading habit; a free grower and free flowerer; bright yellow foliage, with very pale zone; A 1. *Previously certificated* (***).

257. *Harold* (Downie and Co.). Scarlet flowers; golden leaf, with dark maroon-red zone; good grower.

258. *High Admiral* *** (E. G. Henderson). Pale scarlet flowers; dark broad zone; a good grower, and first-rate.

259. *James Richards* (R. H. S.). Bright scarlet flowers of good form, very free-flowering; style of *Beauty of Calderdale*, but neater and more evenly marked; first-class. *Previously certificated* (***).

260. *King of Bronzes* (Osborn). Pale scarlet flowers; shaded uneven very bright zone; good compact habit; a telling variety.

261. *Kentish Hero* *** (Downie and Co.). Rosy orange flowers; bright yellow dark-shaded zoned foliage; a good grower; one of the best. *Previously certificated* (***).

262. *Lady Fuller* (Myers). Orange-scarlet flowers; very dwarf habit, but useless; small foliage.

263. *Maréchal M'Mahon* *** (Downie and Co.). Scarlet flowers; without doubt the *very* best bronze zonal amongst the new varieties; very dark, broad, and very even zone; flat leaf; good, robust, compact habit; A 1.

264. *Maid of Honour* (E. G. Henderson). Bright scarlet flowers; very broad rich bronze zone; good habit.

265. *Master Leonard* (R. H. S.). Bright scarlet flowers; narrow bright zone; distinct and pretty. *Previously certificated* (***).

266. *Miss Beatrice* (E. G. Henderson). Pale scarlet flowers; pale-zoned foliage; a good grower, but not desirable.

267. *Model* (Wimsett). Indian yellow flowers; exceedingly free-flowering; foliage greenish yellow, with narrow zone; a very compact grower; distinct. *Previously certificated* (**).

268. *Mrs. Elliott* *** (Downie and Co.). Scarlet flowers; bright reddish maroon zone; good habit and free; first-rate.

269. *Mrs. Reid* (Downie and Co.). Bright red zone, very effective; dwarf and compact habit.

270. *Northern Star* (E. G. Henderson). Scarlet flowers; very bright broad zone; a good grower and free.

271. *Plutus* (F. and A. Smith). Bright salmon flowers; foliage lively yellow, with bright red zone; moderate grower, effective. *Previously certificated* (***).

272. *Reine Victoria* *** (Downie and Co.). Scarlet flowers; very large foliage, yellow ground, with bright broad zone; free; a first-class variety.

273. *Rev. C. P. Peach* (Downie and Co.). Pale scarlet flowers; large bright foliage, with broad dark zone; good robust compact grower; free.

274. *Rev. W. F. Radclyffe* (Windebank). Pale scarlet flowers; very dwarf flat habit; greenish yellow leaves, with narrow dark zone. *Previously certificated* (***).

275. *Royalty* (E. G. Henderson). Pale salmon flowers, with deep centre; pale yellow leaves, with broad bright zone; free and good.

276. *Silver Pheasant* (E. G. Henderson). Flowers white; a very strong grower; leaves olive-green, with broad pale zone; distinct and good.

277. *St. John's-Wood Star* (E. G. Henderson). Yellowish pink flowers; moderately dwarf habit; clear zone; free and good.

278. *Sybil* *** (F. and A. Smith). Pale scarlet flowers; very

dwarf and compact habit; very bright and broad zone; excellent; one of the best dwarf bedders.

279. *The Moor* (F. and A. Smith). Pale scarlet flowers; dwarf and compact habit; good foliage, with broad shaded red zone. *Previously certificated* (***).

Series VII. Variegated-leaved Pelargoniums.

§ 1. *Silver-variegated.*

* *White or creamy margin, not zonate.*

280. *Albion's Cliffs* *** (Chater). Scarlet flowers; white-variegated; the strongest grower of the section; first-rate for large beds. *Previously certificated* (***).

281. *Alma* (Turner). Pale scarlet flowers; good flat creamy foliage; free and good. *Previously certificated* (***).

282. *Brilliant.* Bright scarlet flowers; foliage greyish green, with very narrow broken white edge; free-flowering.

283. *Brilliant Superb* *** (Parsons). An improved form of the last, with better-defined variegation. *Previously certificated* (***).

284. *Flower of Spring* (Turner). Flowers rosy-tinted scarlet; good cream-coloured variegation; free-growing and compact; a first-rate bedder. *Previously certificated* (***).

285. *Little Dandy* (Major Clarke). Greyish green foliage, with very narrow variegation; small, compact, very dwarf growth; good for edgings if planted thick.

286. *Maître d'hôtel* (Major Clarke). A cream-edged variety; promising to be free and good, but too small this season to be judged.

287. *Miss Kingsbury* ***. Scarlet flowers; perhaps the best white-variegated variety grown for general purposes. *Previously certificated* (***).

288. *Mountain of Snow* (Fraser). Scarlet flowers; good white variegation; moderate grower and good; habit spreading. *Previously certificated* (***).

289. *Mrs. Lenox* (Taylor). Scarlet flowers; one of the best white-variegated varieties grown. *Previously certificated* (***).

290. *Pearl* (Pearson). Carmine flowers; free-flowering; white-margined foliage, with very pale zone; leaves convex and uneven; a compact grower, pretty.

291. *Princess Alexandra* (G. Smith). Scarlet flowers; white-

edged foliage; free-growing; dwarf and compact in habit, very good. *Previously certificated* (***).

292. *Queen of Queens* *** (Bull). Very bright scarlet flowers; exceedingly free-flowering, the trusses standing well up; large cream-edged foliage; very free, and first-class. *Previously certificated* (***).

293. *Silver Chain* (E. G. Henderson). Scarlet flowers; cream-margined foliage; free and compact habit; a first-rate variety. *Previously certificated* (***).

294. *Snowdrop* (Carter and Co.). Brilliant scarlet flowers in small trusses; compact and moderate grower, with cream-coloured variegation; very good and distinct. *Previously certificated* (***).

295. *Snowflake* (E. G. Henderson). Flowers light scarlet, in good trusses, free; foliage white-edged; habit free and good.

296. *Variegated Stella.* A sport from the *Nosegay Stella,* with flowers of the same colour, and with similarly shaped foliage, but variegated; very slow-growing, but pretty.

297. *Waltham Bride* (W. Paul). White flowers, with cream-edged foliage; a very slow grower, dwarf, and a moderately free flowerer.

298. *White Lady* (E. G. Henderson). White flowers, and white-edged foliage; a moderate grower; distinct and good of its class.

*** White or creamy margin, with red zone.*

299. *Baron Ricasoli* (Lee). Convex foliage with narrow dull zone, not good, though distinct.

300. *Glen-Eyre Beauty* (E. G. Henderson). Pale scarlet flowers; moderate grower, free and good; one of the very best; zone very bright. *Previously certificated* (***).

301. *Italia Unita* (E. G. Henderson). Scarlet flowers, freely produced; a moderate grower in its class, and still ranking amongst the first-class varieties. *Previously certificated* (***).

302. *Knight of the Garter.* Pale scarlet flowers; a weak-growing and useless variety.

303. *Mabel Morris* (Carter and Co.). Good bright-zoned foliage; very similar to the other, better varieties of this class.

304. *Miss Burdett-Coutts* (F. & A. Smith). Very closely resembling *Italia Unita.*

305. *Mrs. J. Clutton* (Lee). Scarlet flowers; foliage notched and crumpled, with pale zone; a free grower, but useless.

306. *Pet of the Flock* (Mann). Scarlet flowers; a little insignificant variety, which after two seasons' trial proves useless.

307. *Princess Beatrice* (Carter and Co.). Large flat foliage, with narrow bright zone and large centre; very distinct, free and good.

308. *Prince Silverwings* (W. Paul). Salmon-scarlet nosegay flowers on long footstalks; foliage slightly cupped, the centre shaded green, with pink zone, and yellow and white margin; very distinct; hardy, and a good compact free grower; first-rate for pots in autumn and winter.

§ 2. *Golden-variegated.*

* *Yellow margin, not zonate.*

309. *Crystal Palace Gem* ***. Carmine flowers, free-blooming; foliage yellow with green blotch near the base; a free compact grower; one of the best bedders. *Previously certificated* (***).

310. *Golden Chain* (Scott). An old favourite; foliage clear green, with broad margin of golden yellow; very bright; a slow grower, but still unsurpassed in its way. *Previously certificated* (***).

311. *Golden Fleece* (Scott). Bright scarlet flowers; foliage large, very bright yellow with small blotch of green on the lower part; a very dwarf and compact grower. *Previously certificated* (***).

** *Yellow margin with red zone.*

312. *Achievement* (F. & A. Smith). Scarlet flowers; large foliage with bright zone, and large centre; free and first-rate.

313. *Amy Richards* (R. H. S.). Scarlet flowers; good flat foliage with fine bright red zone; a good grower, free and first-rate; one of the very best. *Previously certificated* (***).

314. *Antagonist* (F. & A. Smith). Large foliage, the zone small and dull-coloured; habit free, but not desirable.

315. *Coronet* (F. & A. Smith), Good bright-zoned foliage; free and good.

316. *Crown Jewel.* Good grower; very bright narrow red zone; recommended by some cultivators as first-rate.

317. *Defiance* (F. & A. Smith). A first-rate bright red zoned variety; free and good.

318. *Emma Chater* (Chater). A sport from a seedling raised between *Golden Chain* and *Mrs. Pollock*; very pale zone, with broad yellow margin; does not seem to be a free grower.

319. *Florence* (Wimsett). Scarlet flowers; very dwarf and compact-growing; bright broad-zoned foliage; a first-rate bedder, and adapted for edgings. *Previously certificated* (**).

320. *Jetty Lacy* (F. & A. Smith). A very pretty and distinct variety, having a large zone, though narrow, of the brightest scarlet lake, very clear and even; not a strong grower.

321. *Julia* (Maule). Large dull narrow zone; a moderate grower, not particularly good.

322. *Lady Cullum* (E. G. Henderson). Scarlet flowers; a variety always good and effective, whether bedded out or in pots; zone broad, dark, on a flat leaf; a good grower; first-class. *Previously certificated* (***).

323. *Louisa Smith* (F. & A. Smith). Scarlet flowers; foliage very round, with narrow bright zone; free-growing, of good habit, and distinct. *Previously certificated* (***).

324. *Macbeth* *** (Bell & Thorpe). Decidedly the gem of the season in tricolors; a strong robust grower; large flat foliage, with a very dark broad zone; altogether a grand thing. *Previously certificated* (***).

325. *Miss Batters* (Shepard). Large centre, with bright red zone; free-growing. *Previously certificated* (**).

326. *Mrs. Dunnett* (Carter and Co.). In the same style as *Mrs. Turner*, but not better; free and good.

327. *Mrs. Pollock* ***. Still an old favourite amongst the free-growing bright-coloured tricolors; always effective. *Previously certificated* (***).

328. *Mrs. Turner* (Turner). Scarlet flowers; foliage flat, the centre small, the zone broad and brightly coloured; free-growing, compact, and good; distinct and worthy a place. *Previously certificated* (***).

329. *Plutarch* ** (W. Paul). Flowers scarlet; good foliage and good habit, the zone very bright and clear; first-rate.

330. *Queen of Tricolors* (Garaway). Free-growing; broad dull zone on large foliage; not effective, therefore not required.

331. *Queen Victoria* (Perkins). Pale scarlet flowers; broad leaf, with broad dark zone; a good grower and distinct. *Previously certificated* (***).

332. *Ruby King* (Carter and Co.). Very narrow zone, bright in colour, but not a good grower.

333. *Sir Robert Napier* (Carter and Co.). Flowers flesh-colour; very dark and very broad zone, shaded with bright red; a first-rate distinct variety. *Previously certificated* (***).

334. *Sophia Dumaresque* (E. G. Henderson). Zone very bright red, with clear yellow edge; free, and good habit.

335. *Sunray* (F. & A. Smith). Good foliage, small centre, broad yellow edge, and small brightly coloured zone; a good variety.

336. *Sunset* (E. G. Henderson). Distinct and pleasing foliage, but of very bad habit and constitution. *Previously certificated* (***), but *Discarded.*

There is a great deal of sameness amongst the varieties in this class of Pelargoniums; but the following may be recommended as really distinct varieties:—*Macbeth, Mrs. Pollock, Louisa Smith, Queen Victoria, Lady Cullum, Amy Richards, Florence,* and *Mrs. Turner.* These are all good growers and dissimilar.

*** *Yellow self-coloured.*

Those marked † are pretty, and good for pot-culture, to mix amongst flowering-plants and ferns.

337.† *Creed's Seedling* *** (Creed). Crimson; good flowers in small trusses, well up, and very freely produced; the foliage bright greenish yellow; very free and compact habit; *A* 1. *Previously certificated* (***)

338.† *Golden Superb Nosegay* (Sampson). This variety appears from a distance to come in this class, but upon closer examination is found to be zoned. See No. 256. *Previously certificated* (***).

339.† *Jason* (W. Paul). Scarlet flowers, but not very free-flowering; foliage bright soft yellow; dwarf, compact, and first-rate. *Previously certificated* (***).

340. *Robert Fish.* Pale orange-scarlet, very free-flowering; exceedingly dwarf habit, the foliage very small and of a bright yellow colour; a first-rate bedder for edgings.

341. *Yellow Christine* (F. & A. Smith). Pale pink flowers; foliage pale yellow; very pretty and distinct, but not a free grower.

342.† *Yellow Gem* (F. & A. Smith). Rosy carmine flowers; yellow foliage; good, but not very free in growth; a sport from the variety known as *Crystal-Palace Gem.*

REPORT ON PHLOXES GROWN AT CHISWICK, 1872.

By Thomas Moore, F.L.S., Floral Director R.H.S.

The following brief descriptive notes refer to a selection of the best varieties in the rather extensive collection of Phloxes grown for trial at Chiswick in 1872. The plants, which were contributed by Messrs. Downie Laird and Laing, Messrs. Veitch and Sons, Messrs. F. and A. Smith, and Mr. R. Parker, were all young and vigorous, and therefore fairly comparable as to the results of the season's growth. The advance as to quality observable in these very useful hardy summer flowers, since the last trial took place, was very striking. Those varieties to which the Floral Committee awarded marks of merit (indicated by asterisks, *** being the highest award), were conspicuous either for their bright and pure colours, the fine smooth even outline of the individual blossoms (pips), or the bold panicles in which the flowers were massed, all these desirable qualities being in most instances associated.

A. F. Barron *** (Downie & Co.). Rose, with bold deep crimson-eye; extra-fine. One of the best.

Borée *** (Downie & Co). Rich shaded rosy amaranth; fine.

Chanzy *** (Downie & Co.). Large, rosy purple, with deep crimson eye.

Deliverance *** (Downie & Co.). Pale rose, with purple-rose eye. In the way of *Madame Moisset*; but the eye is smaller than in that variety.

Edith *** (Parker). White, with rosy purple eye; dwarf habit.

Lothair *** (Downie & Co.). Bright deep salmon-rose, with bold rosy crimson eye; very fine. One of the best.

Madame la Comtesse de Turenne *** (Parker). White, with pale purple eye; a bold grand flower of very fine quality. One of the best in the collection, and the best of its class.

Madame Domage *** (Downie & Co.). Large, white, with very large deep rosy crimson shaded eye.

Madame Guillotteaux *** (Downie & Co.). Deep crimson-purple, with crimson eye.

Madame Moisset *** (Downie & Co.). Pale rose, with deep rosy crimson eye; fine.

Menottii *** (Downie & Co.). Lilac, with large white eye; very distinct and pretty.

Mons. Conrad *** (Downie & Co.). Deep bright salmony rose; fine.

Mons. Domage *** (Downie & Co.). White, with clouded purple eye.

Mons. Malet *** (Downie & Co.). Lilac, paler at the centre; very dwarf habit, and producing large compact panicles of flowers; a very fine variety. One of the best.

Mons. Rafarin *** (Downie & Co.). Bright salmon, with dark eye; small flowers in compact panicles.

Mons. Taillard *** (Veitch). Bright salmon-rose, with rich purple eye.

Mons. Thibaut *** (F. and A. Smith). White, with bold purple-crimson eye; a remarkably smooth and effective flower; extra fine. One of the best.

Queen of Whites *** (Downie & Co.). Large, finely shaped, pure white; in grand panicles.

Amabilis ** (Parker). Light salmon, with deep rosy crimson eye; good habit and free.

Duc de Plaisance ** (Downie & Co.). Large-flowered, rosy crimson.

Foudroyant ** (Downie & Co.). Bright deep crimson-purple.

Madame Barillet ** (Downie & Co.). Blush-white, with large bright-rose eye; small flowers in compact panicles.

Mr. Hugh Low ** (Veitch). Deep purple-crimson, with crimson eye.

Mrs. Dombrain ** (Downie & Co.). White with deep crimson eye; small flowers in compact panicles.

Roi des Roses ** (Veitch). Rosy salmon, with dark eye.

Venus ** (Downie & Co.). White, with rosy crimson eye, changing to purple.

Madame Caen * (Downie & Co.). Whitish, with large shaded deep rose centre.

Liervallii (Veitch). A well-known handsome variety, with striped rosy purple and white flowers.

Mons. Henry (Downie & Co.). Carmine-crimson; the highest- and brightest-coloured variety in the collection.

A large number of other varieties were grown; but as they were passed over by the Committee as inferior to the sorts named above, it is unnecessary to describe them. Some few sorts did not flower.

REPORT ON THE VARIETIES OF THE GARDEN-PEA GROWN AT CHISWICK DURING 1872.

By Dr. Hogg.

It is now twelve years since the last trial of peas was made by the Fruit and Vegetable Committee of the Society; and since then there have been many additional varieties introduced, some of which have been proved to be distinct, and some to be merely old varieties under new names.

What has been very observable in the trial of which this is the Report, is, the great degeneration in character and quality of some of the older varieties, which, in the trial of 1860, were the most choice. This is attributable to the varying tendency of peas, if the seed saved for the preservation of the variety is not very closely and very carefully selected. It is not, however, to be thought that these older and choice varieties have become extinct. They still exist under other names, which have been given to them by those who have bestowed upon them the care necessary to preserve their original character. But there is no reason why the old name should be abandoned in respect of these pure stocks. Much more reason is there that it should be so in regard to the spurious and degenerate sorts that are still permitted to be grown under the original name, and which have no semblance whatever to the true variety.

In the preparation of this Report this view of the subject has been followed, and those varieties which have been presented under new names, but which are merely pure stocks of an older variety, have been included as synonyms.

It has been considered unnecessary to repeat the descriptions and figures of those varieties already reported on in vol. i. of the Proceedings of the Society; but to show the corresponding and correlative dates of the various stages of growth of all the varieties grown in this trial, these only have been given, the descriptions and figures being found in the volume alluded to.

I. Frame Peas.

Ripe seed white, almost round, small, smooth, and occasionally pitted. Foliage pale green, not blotched.

1. *Dillistone's Early.*

Synonyms.—Carter's First Crop; Sutton's Ringleader; Clarke's Rapid Prolific.

Description.—See Proc. R. H. S. vol. i. 341.

Sown on February 23. The first flower opened May 10; and the plants were in full bloom on the 16th. Slats appeared May 24; and the pods were fit for use June 9.

2. *Sangster's No.* 1.

Synonyms.—Carter's First and Best; Daniel O'Rourke; Sutton's Improved Early Champion; Dickson's Climax; Early Caractacus; Washington; Taber's Perfection; Hooper's Early Rival.

Description.—See Proc. R. H. S. vol. i. 341.

Sown on February 23. The first flower opened May 12; and all were in bloom May 24. Slats appeared May 27; and the pods were ready for use June 12.

The varieties which appear as synonyms, exhibited slight variations as to character, some stocks being more pure and better-selected than others, thus presenting in the mass a different aspect from the others. Caractacus produced fully the largest pods, and had a distinctive look. Taber's Perfection was rather later and a little more robust. Daniel O'Rourke and Hooper's Early Rival were exceedingly strong in growth and very inferior stocks.

3. *Early Emperor.*

Synonym.—Morning Star.

Description.—See Proc. R. H. S. vol. i. 342.

The samples of Early Emperor grown this year in the garden were very inferior and degenerate stocks of the true variety, possessing more of the character of the Old Double-blossomed Frame, being even more robust in growth, and with smaller pods.

Sown February 23. The first flower opened May 21. In full bloom May 30. Slats appeared June 3; and the crop was fit for use on the 19th.

Ruelle Michaux, a variety from France, is an inferior form of Early Emperor. The same may be said of *Clamart*, which has also a near resemblance to Double-Blossomed Frame; it keeps on growing and podding, but is not a desirable variety to cultivate.

4. *Double-Blossomed Frame.*

Synonym.—Double Nimble.

Description.—See Proc. R. H. S. vol. i. 346.

Sown on February 23. The first flower appeared May 14. In full bloom on the 25th. Slats appeared May 28; and the crop was fit for use June 15.

5. *Girling's Danecroft.*

This variety has the peculiarity of being perfectly glabrous in all its parts, and destitute of the bloom to be found usually on peas. The plant is $3\frac{1}{2}$ to 4 feet high, producing from 12 to 14 pods on each stem. The pods contain seven small peas of poor quality.

Sown February 23. The first flower opened May 12. In full bloom May 19. Slats appeared on the 24th; and the crop was fit for use June 13. This is considered to be the same as Danecroft Rival.

6. *Sutton's First of All.*

This is similar to the preceding. It has smaller pods, and comes into flower two days earlier; but the pods are fit for use at the same time. It is four days later than Dillistone's Early.

7. *Beck's Gem.*

Synonyms.—Tom Thumb; De Grace.

Description.—See Proc. R. H. S. vol. i. 343.

Sown February 23. The first flower appeared May 19. In full bloom May 25. Slats appeared on the 28th; and the crop was fit for use on June 17.

8. *Sutton's Long-podded Tom Thumb.*

Plants stronger in growth than Tom Thumb, being two feet high, with longer and more curved pods, which are produced in pairs from ten to twelve on each stem.

Sown February 23. Flowers opened May 24. Was in full bloom on the 29th. Slats appeared June 1; and the crop was fit for use on the 20th.

The Committee considered this the same as Bishop's Early Dwarf.

9. *Early Ringwood.*

Synonyms.—Ringwood Marrow; Essex Rival.

Decription.—See Proc. R. H. S. vol. i. 344.

Sown February 23. The first flower opened May 23. Was in full bloom on the 30th. Slats appeared June 2; and the pods were ready to gather on the 17th.

Essex Rival, as grown in this trial, is an inferior stock of Early Ringwood, being later and with smaller pods.

10. *Auvergne.*

Description.—See Proc. R. H. S. vol. i. 348.

What was grown in the garden this year for Auvergne, was a spurious stock, and resembled, and seemed intermediate between that variety and Dickson's Favourite, and inferior to both. It was quite unworthy of the name of Auvergne.

Sown Feb. 23. The first flower appeared May 28. Was in full bloom June 8. Slats came June 11; and the crop was fit for use on the 21st.

11. *Glory of Cassel.*

An indifferent mixture of Auvergne and Dickson's Favourite, with smaller but well-filled pods. Pale green in colour. Plant less robust, and about two days earlier.

12. *Leopold II.*

Resembles Early Ringwood, the foliage and pods being of the peculiar pale green colour which that variety possesses. Pods long, narrow, nearly straight, very badly filled, the middle pea in each pod being wanting; quite worthless.

Sown February 23. First flower opened May 25. Was in full blossom May 30. First slats opened June 2, and were fit for use June 19.

13. *Bishop's Long-podded Dwarf.*

Plant robust, branching close to the ground, about $2\frac{1}{2}$ feet in height, producing from twelve to sixteen large broad pods of a pale green colour, which contain from seven to eight large peas. A fine-looking pea and a great cropper.

Sown February 23. First flower opened May 21. Was in full flower May 30. First slats opened June 3. Fit for use June 24.

14. *American Early Comet.*

A later and inferior variety of Bishop's Dwarf, or Sutto Long-podded Tom Thumb.

15. *Dwarf Waterloo Branching.*

Resembles in every respect Bishop's Long-podded Dwarf b two days earlier.

16. *Carter's Farmer's Prolific.*

Resembles Early Emperor in general appearance. It is very strong, robust, and wonderfully prolific, producing from fourteen to sixteen pods, generally in pairs, on each stem; pods narrow, very closely filled, containing about six or seven small peas. Height 5 to 6 feet.

Sown February 23. First flower appeared May 26. Was in full blossom June 3. First slats appeared June 5, and were fit for use June 20.

This is a distinct pea, more suited for the farm than the garden.

17. *Nabob* (Laxton's).

Cross between Little Gem and Laxton's Prolific Long-pod. Plant of strong and robust growth, with large deep-green foliage. Height 18 inches to 2 feet. Pods long, curved, well filled, of a deep green colour, containing from seven to nine medium-sized peas, of a pale green colour. The pods are produced in pairs from ten to twelve on each stem.

It is the largest and most handsome early dwarf round white pea, and very productive, most nearly resembling in appearance Dwarf Waterloo Branching, only with larger pods and dwarfer.

Sown February 23. First flowers opened May 27. Was in full bloom June 1. First slatted June 3. Fit for use June 24.

18. *Dwarf Dutch.*

Plant robust, in growth resembling White Prussian, about 3 feet in height, sometimes branching, and producing from twelve to sixteen pods on each, in pairs. The pods are small, narrow, but very closely filled, of a deep green colour, containing about seven small peas.

Sown February 23. First flower opened June 3; was in full flower June 11. First slats appeared June 15. Fit for use June 24.

19. *Peabody.*

Plant bushy, branching, very neat, and compact in growth, the leaves being rather small and numerous, of a bright green colour. Height about $2\frac{1}{2}$ feet. Pods rather narrow, small, but extremely well filled, of a fine deep green colour, containing from six to seven rather small peas of but poor quality. A very productive sort, standing the dry weather well.

This belongs to the white Prussian class.

Sown February 23. First flower opened June 12; was in full flower June 15. First slats appeared June 18. Fit for use June 29.

20. *Crown.*

Synonyms.—Bunch; Cluster.

This is a very distinct and singular pea in the appearance of its growth. The plant is $4\frac{1}{2}$ to five feet high, of moderately strong growth. The stem gradually increases in thickness from the root upwards, frequently to the thickness of one's thumb, when it becomes broadly fasciated, producing all the pods, twenty-four to thirty in number, in a bunch at the top of the stem. The pods are small, round, but well filled, in appearance like Emperor, containing from four to seven small peas. Ripe seed small, round, white.

Sown February 23. First flower opened June 16; was in full flower June 17. First slats appeared June 21. Fit for use July 1.

This is more curious than useful, being poor in quality. It is frequently called the Mummy pea.

II. Marrow Peas.

Ripe seed white, large, smooth, uneven, compressed, irregular or egg-shaped; skin thick. Foliage blotched.

1. *Paradise Marrow.*

Synonyms.—Paradise Early Marrow; Excelsior Marrow; Champion of Paris.

Description.—See Proc. R. H. S. vol. i. 350.

Sown February 23. First flower opened May 30; was in full flower June 7. First slats appeared June 11. Fit for use June 24.

2. *Dixon's Early Dwarf Paragon.*

Plant robust, from 2 to 2½ feet high, resembling Bishop's Dwarf. Stem branching, producing from sixteen to eighteen pods, which are generally borne in pairs; they are of a fine deep green colour, but fill badly, and contain from five to six medium-sized peas. Dried seed large, white, flattened, indented.

Sown February 23. First flower opened May 23; was in full flower May 30. First slats appeared June 2. Fit for use June 24.

3. *Harrison's Perfection.*

Description.—See Proc. R. H. S. vol. i. 352.

Sown February 23. First flowers opened May 16; was in full flower May 26. First slats appeared May 29. Fit for use June 20.

A very good cropping pea, but with indifferently filled pods. Has long since been superseded.

4. *Laxton's Prolific Long-pod.*

Synonym.—Laxton's Prolific selected.

Plant of a robust and vigorous habit of growth, having large pale-blotched foliage. Height from 5 to 7 feet, producing from twelve to fourteen pods on each stem in pairs. The pods are very large, of a pale green colour, broad, much curved, and pointed, containing from seven to nine medium-sized peas. Dried seed *white*, indented.

This resembles Prizetaker in general appearance, only being of a pale light green colour instead of dark. This is the true variety, although most rarely to be met with—the other and commoner variety being but a bad stock of Prizetaker Green Marrow, and with the mixed coloured seed of that variety.

Sown February 23. First flower opened June 1; was in full flower June 5. First slats appeared June 11. Fit for use June 25.

5. *Thurston's Reliance.*

Description.—See Proc. R. H. S. vol. i. 351.

What was grown in the garden this season for Thurston's Reliance, proved to be small-podded worthless stocks of Victoria Marrow.

6. *Victoria Marrow.*

Synonym.—Gibbs's Defiance.

Description.—See Proc. R. H. S. vol. i. 355.

Sown February 23. First flower opened June 8; was in full flower June 13. First slats appeared June 16. Fit for use June 29.

Extremely vigorous in growth, quite fresh and green when Dickson's Favorite was dead.

7. *Princess Royal.*

A very excellent cropper. Pods large, full, broad, pale green in colour and very handsome.

Sown February 23. First flower opened June 1; was in full flower June 6. First slats appeared June 9. Fit for use June 25.

It is very doubtful if this is the true Princess Royal of Dr. Maclean.

III. Green Marrows.

Ripe seed of a mixed white and olive colour, either small, round, and pitted, or large, irregular, and uneven. Foliage dark green and blotched. Pods dark bluish green, very glaucous.

1. *William the First.* (Laxton.)

A new hybrid raised by Mr. Laxton. The plant is from $4\frac{1}{2}$ to 5 feet high, somewhat slender in growth, like the Early Frame class. Stem simple, and producing from fourteen to sixteen pods generally single, but frequently in pairs. The pods are long and very handsome, of deep green colour, covered with a thick bloom like Prizetaker, much curved and pointed like the Auvergne, and contain from seven to eight good-sized peas of a deep green colour. The ripe seed is small, round, indented, of a mixed white and olive-green colour, like Prizetaker.

Sown February 23. First flower opened May 12; was in full flower May 22. Slats appeared May 24, and pods fit for use June 14—two days later than Sangster's No. 1, and nine days earlier than Prizetaker.

This is the earliest Green Marrow pea, and was awarded a *First-class Certificate.*

2. *Unique* (Laxton).

A cross between Laxton's Prolific and Little Gem. The plant has the habit of Tom Thumb and Little Gem, and is moderately robust, from 1 foot to $1\frac{1}{2}$ high, stem branching, producing from eight to ten pods on each, generally in pairs. The pods are rather long, broad, slightly curved and pointed, of the scimitar-shape, of a fine green colour, containing from six to eight bright green peas in each. Ripe seed particoloured.

Sown February 23. First flower opened May 15; was in full flower May 24. First slats appeared May 27. Fit for use June 19.

A fine long-podded and prolific early dwarf pea, which received a *First-class Certificate.*

3. *Prizetaker.*

Synonyms.—Bellamy's Early Green Marrow; Rising Sun; Prolific Long-pod (Green seed); Carter's Hundredfold. These are all forms one of another, without any marked distinction.

Description.—See Proc. R. H. S. vol. i. 355.

Sown February 23. First flower opened May 28; was in full flower June 3. First slats appeared June 8. Fit for use June 23.

4. *Laxton's Prolific.*

Synonym.—Leicester Defiance. (Mixed green and white seed.)

This consisted of mixed stocks of inferior Prizetaker, and Laxton's Prolific (true).

5. *Laxton's Supreme.*

Plant robust, in appearance and character like Prizetaker, but having the foliage and pods of a much paler green, which marks their distinction. Pods very large, long, broad, but scarcely so well filled as they appear, containing from seven to nine large peas. Olive-green, ripe seed indented.

A large and very handsome pea.

Sown February 23. First flower opened May 30; was in full flower June 5. First slats appeared June 9. Fit for use June 24.

6. *Superlative* (Laxton).

A cross between Ne Plus Ultra and a hybrid of Supreme.

Plant exceedingly strong and robust, having a strong succulent stem, from 7 to 8 feet high, and large broad pale green foliage. Stem generally simple, producing from fourteen to sixteen pods, mostly in pairs. The pods are very large, about 7 inches long, and somewhat irregular in form, broad, much curved and pointed, of a pale green colour, containing from seven to nine large peas of a pale green colour and of no particular flavour. Dried seed flattish, particoloured.

Sown February 23. First flower opened May 30; was in full flower June 5. First slats appeared June 10. Fit for use June 26.

The largest-podded pea, exceedingly handsome in appearance. The pods, however, do not fill to nearly their full extent, many of them being only half filled.

Received a *First-class Certificate.*

7. *Mossy-podded.*

Synonym.—Australian; Blankney Marrow.

Plant 6 to 7 feet high, of strong and vigorous habit of growth, with deep-green foliage, which is maintained healthy for a lengthened period. Stem generally simple, producing from twenty to twenty-four pods, mostly in pairs. The pods are long, slightly curved, full, and round in form, of a bright green colour, and frequently covered (especially where slightly shaded) with minute excrescences in appearance like moss, which give the pods a rough appearance; they contain from seven to eight medium-sized peas closely packed together, which are of a deep green colour, and of poor flavour. Dried seed particoloured, green half wrinkled.

Sown February 23. First flower opened June 18; was in full flower June 20. First slats appeared June 24. Fit for use July 3.

IV. Prussian Peas.

Ripe seed small, almost round and smooth, skin blue. Foliage dark green, blotched.

1. *Harbinger* (Laxton).

A cross between Dillistone's Early and Alpha.

The plant has the habit of Dillistone's Early. Stem from $2\frac{1}{2}$ to 3 feet, simple, producing from seven to eight pods singly. The pods are small, rounded in form, slightly curved, very tightly filled, of a light green colour, and contain about six fair-sized peas of a fine colour and good flavour. Ripe seed small, round, blue.

Sown February 23. First flower opened May 9; was in full flower May 15. Slats appeared May 21. Fit for use June 6.

The earliest pea in the collection, being three days earlier than Dillistone's Early, and six days earlier than Sangster's No. 1.

Received a *First-class Certificate.*

2. *Eastes's Kentish Invicta.*

The same as Harbinger in every other respect, but seven days later.

Sown February 23. First flower opened May 14; was in full flower May 25. Slats appeared May 27. Fit for use June 13.

3. *Carter's First Crop Blue.*

Has the habit of Burbidge's Eclipse, but dwarfer. Height 18 inches to 2 feet, robust, producing from eight to nine pods on each stem, single and in pairs The pods are rather short, but broad, very slightly curved and bluntly ended, of a light green colour. They contain from five to six peas of medium size, and do not fill out well at all times. Ripe seed large, round, blue.

Sown February 23. First flower opened May 22; was in full flower May 26. First slats appeared May 30. Fit for use June 19.

4. *Woodford Marrow.*

Description.—See Proc. R. H. S. vol. i. 359.

Sown February 23. First flower opened June 5; was in full flower June 13. First slats appeared June 16. Fit for use June 27.

5. *Green Noyon.*

The plant has the habit of Blue Prussian, having a stem about $2\frac{1}{2}$ feet high, with deep-green foliage. Pods small, round, very full, nearly straight, there being from eight to nine on each stem, generally in pairs, of a pale green colour, and containing from five to six small peas. Ripe seed round, light green, small, smooth. A worthless variety.

Sown February 23. First flower opened June 12; was in full flower June 14. First slats appeared June 16. Fit for use June 27.

6. *Blue Prussian.*

Description.—See Proc. R. H. S. vol. i. 360.

Sown February 23. First flower opened June 9; was in full flower June 13. First slats appeared June 16. Fit for use June 30.

7. *Evergreen* (Laxton).

Plant five to six feet high. Habit of growth like Auvergne, with rather small pale green foliage. Stems generally simple, producing from fourteen to sixteen pods in pairs. The pods are rather small, slightly curved, and bluntly pointed, very closely filled with from seven to eight medium-sized peas. The peas are of a bright green colour tinged with dark green. Flavour very inferior. Ripe seed of a deep green piebald colour.

Sown February 23. First flower opened June 2; was in full flower June 13. First slats appeared June 16. Fit for use July 1.

A very inferior pea.

8. *Nimrod* (Laxton).

Plant slender, in the habit of growth and general appearance like Alpha. The stem is simple, 3 to 4 feet high, producing from seven to eight pods singly, which contain from six to eight peas, each of a deep green colour. Pods round, full, much curved, of a very deep green colour, resembling William the First. Ripe seed round bluish green indented.

Sown February 23. First flower opened May 10; was in full flower May 21. First slats appeared May 26. Fit for use June 14.

9. *Blue Peter* (Carter).

The habit and growth are similar to that of Tom Thumb. Height from 1 foot to $1\frac{1}{2}$. Pods large, broad, of a fine green colour, from eight to ten being produced on each stem. They contain from five to six large peas generally; but they frequently fill badly. Ripe seed round, blue.

Sown February 23. First flower opened May 19; was in full flower May 27. First slats appeared May 29. Fit for use June 18.

A larger form of Tom Thumb, with round blue seed.

This received a *First-class Certificate.*

10. *Griffin* (Laxton).

Plant 3 to 4 feet high. Habit, form, and colour of the pods resembling those of the Frame class. Stem simple, producing from fourteen to sixteen pods, generally in pairs, containing from six to seven medium-sized peas, of a pale green colour, tinged with darker green, giving them a very peculiar appearance. Flavour very inferior. Ripe seed small, deep mottled green, indented.

Sown February 23. First flower opened May 16; was in full flower May 27. First slats appeared May 30. Fit for use June 21.

An inferior variety.

11. *Fairbeard's Surprise.*

Synonym.—Early Surprise.

Description.—See Proc. R. H. S. vol. 360.

Sown February 23. First flower opened June 1; was in full flower June 6. First slats appeared June 9. Fit for use June 24.

12. *Harrison's Glory.*

Description.—See Proc. R. H. S. vol. i. 362.

Sown February 23. First flower opened May 26; was in full flower June 5. First slats appeared June 8. Fit for use June 24.

13. *Harrison's Royal Blue.*

Plant resembling in its aspect Danecroft Rival, differing, however, from that variety in the stem, stipules, and the pods being devoid of glaucescence, the leaves having the usual glaucous hue. This peculiarity gives it a very singular appearance. The plant is moderately robust, about 3 feet high, producing from fourteen to sixteen pods on each stem. The pods are short, broad, slightly curved, very badly and irregularly filled, containing only from four to five peas in each, of very inferior quality. Ripe seed large, round, blue, flattened and indented.

Sown February 23. First flower opened May 21; was in full flower May 27. First slats appeared May 30. Fit for use June 26.

14. *Burbidge's Eclipse.*

Description.—See Proc. R. H. S. vol. i. 362.

Sown February 23. First flower opened June 2; was in full flower June 8. First slats appeared June 12. Fit for use June 25.

15. *Mogul* (Laxton).

A cross between Prolific Longpod and Little Gem.

Plant moderately robust, resembling Burbidge's Eclipse, and from 18 inches to 2 feet high. Stem branched, producing from eight to ten pods, generally in pairs. The pods are long, very full, rounded in form, much curved and pointed, of a beautiful green colour, containing from six to eight medium-sized peas. Extremely handsome, prolific but inferior. Dried seed large, round, blue, indented.

Sown February 23. First flower opened May 27; was in full flower June 1. First slats appeared June 4. Fit for use June 25.

16. *Fillbasket* (Laxton).

A cross between Laxton's Standard and Supreme.

Plant very robust and vigorous, growing to about 3 feet in height. Foliage large, pale green, of a very distinct character. Stem branching, producing from twelve to fourteen pods on each, generally in pairs. The pods are very long, curved, closely filled, rounded in form, of a fine bright green colour, containing from seven to nine good-sized peas of a fine green colour. Dried seed large, light green, flattened.

Sown February 23. First flower opened June 2; was in full flower June 8. First slats appeared June 11. Fit for use June 26.

A large, very handsome, and prolific pea, which received a *First-class Certificate.*

17. *Flack's Imperial.*

Description.—See Proc. R. H. S. vol. i. 362.

Sown February 23. First flower opened June 4; was in full flower June 10. First slats appeared June 14. Fit for use June 25.

18. *Bedman's Imperial.*

Bedman's Imperial was the first improvement on the Old Blue Imperial, but it has now been for many years superseded by Flack's Imperial.

Sown February 23. First flower opened June 3; was in full flower June 9. First slats appeared June 11. Fit for use June 26.

19. *Blue Scimitar.*

Description.—See Proc. R. H. S. vol. i. 363.

Sown February 23. First flower opened June 7; was in full flower June 14. First slats appeared June 14. Fit for use June 30.

20. *Supplanter* (Laxton).

A cross between Veitch's Perfection and Little Gem.

Plant very robust and vigorous. Height about 3 feet. Foliage deep green like the Woodford Marrow. Stem branching, producing from fourteen to sixteen pods on each, in pairs. Pods very large, broad, scimitar-shaped, of a deep green colour, and containing from seven to eight very large peas, which are of a deep green colour. Dried seed very large, bluish green, flattish, round, and sometimes indented.

Sown February 23. First flower opened May 26; was in full flower May 30. First slats appeared June 2. Fit for use July 1.

A large, handsome, and very prolific pea, which received a *First-class Certificate*.

V. Wrinkled White Marrows.

Ripe seed white, compressed and wrinkled. Foliage most frequently dark green and much blotched, but occasionally light green or not at all blotched.

1. *Pioneer* (Laxton).

A cross between Dillistone's Early and Little Gem.

Plant of the type of Sangster's No. 1, but with paler foliage, especially when in a young stage, which gives it a sickly appearance. Plant not so robust as Alexandra, from 3 to $3\frac{1}{2}$ feet high, producing from nine to ten pods on a stem, generally simple. The pods are of fine size, nearly straight, pale green, and contain from five to six rather small white wrinkled peas. Ripe seed rather small, wrinkled, white.

Sown February 23. First flower opened May 9; was in full bloom May 18. First slats appeared May 22. Fit for use June 13. One day later than Dillistone's Early.

The earliest white wrinkled Marrow, of fine quality, resembling Alpha, only differing in the colour of the *seed*.

2. *Alexandra* (Laxton).

A cross between Prolific Long-pod and Advancer.

Habit and general appearance of plant like the Frame class. Somewhat straggling, attaining a height of 4 to $4\frac{1}{2}$ feet. The pods are produced singly from ten to twelve on each stem; they are large, somewhat curved, and contain from eight to nine fair-sized peas in each, which are very closely packed. The colour of the plant throughout is a pale green. Ripe seed white, slightly wrinkled.

Sown February 23. First flower opened May 12; was in full flower May 16. First slats appeared May 24. Fit for use June 12. Of the same earliness as Sangster's No. 1.

A very early wrinkled pea, of excellent quality when cooked. The seed of a fine green colour.

3. *Nutting's No.* 1.

Synonym.—Carter's White Gem.

Plant very robust and vigorous, with pale green blotched foliage. Height 2 to $2\frac{1}{2}$ feet, stem branching, producing from eight to twelve pods in pairs on each, which are borne almost close on the ground. Pods short, well filled, rounded in form, slightly curved, and bluntly ended, of a pale green, almost whitish colour. They contain from six to seven large peas in each, of a whitish green colour. Exceedingly sweet and excellent. Dried seed large, white, wrinkled.

Sown February 23. First flower opened May 21; was in full flower May 28. First slats appeared May 30. Fit for use June 18.

A remarkably prolific and handsome dwarf pea, flowering at the same time as Alliance, but coming into use three days before that variety.

4. *Fairbeard's Nonpareil Marrow.*

Description.—See Proc. R. H. S. vol. i. 364.

Sown February 23. First flower opened June 3; was in full flower June 11. First slats appeared June 14. Fit for use June 25.

5. *Alliance.*

Synonym.—Evershed Early Prolific; Early White Wrinkled Marrow.

Description.—See Proc. R. H. S. vol. i. 367.

Sown February 23. First flower opened May 21; was in full flower May 27. First slats appeared June 1. Fit for use June 24.

6. *Rajah* (Laxton).

A cross between Little Gem and Laxton's Prolific Long-pod.

This is an intermediate form between Advancer and Little Gem. The plant has the appearance of the former, but is dwarfer. Height 18 inches to 2 feet. The pods are borne in pairs eight to ten on a plant. They are very long and much curved, very full, giving them a rounded form, and contain from eight to nine fair-sized peas in each. Dried seed white, wrinkled, flattened.

Sown February 23. First flower opened May 29; was in full flower June 4. First slats appeared June 7. Fit for use June 24.

7. *Prince of Wales.*

A finely selected stock of Alliance, a little later, and with better-filled pods.

Sown February 23. First flower opened June 1; was in full flower June 5. First slats appeared June 8. Fit for use June 24.

8. *Nelson's Vanguard.*

Resembles in its general characters Alliance, but dwarfer than that variety, and with broader pods. It flowered, slatted, and came into use at the same time.

9. *Dean's Dwarf Marrow.*

This somewhat resembles in its general appearance James's Prolific. It is, however, somewhat distinct from that variety, in the shape of the pods, they being more abrupt, and greener. The plant is also dwarfer, not much exceeding 2 feet in height. It is remarkably robust and upright in growth. Ripe seed large, green, wrinkled.

Sown February 23. First flower opened May 30; was in full flower June 4. First slats appeared June 6. Fit for use June 24.

10. *Standard* (Laxton).

A cross between Veitch's Perfection and Little Gem.

Plant robust, branching. Height 3 feet. Foliage light green. The pods are borne in pairs, from fourteen to sixteen on each stem. They are very long, much curved like Auvergne, and pointed, closely filled, showing the form of the peas through the pod, rounded in form, and of a light green colour. They contain from nine to eleven peas in each, of large size, of a fine deep green colour, and excellent in quality. Ripe seed white and green, wrinkled and flattened.

Sown February 23. First flower opened June 4; was in full flower June 9. First slats appeared June 12. Fit for use June 25.

A very handsome and prolific pea.

11. *Wonderful* (McLean's).

Plant resembling in its general character Alliance, but more even and regular, and the stem not so succulent. Height about 3 feet, producing from eleven to twelve pods on a plant, generally in pairs. The pods are large, very slightly curved and pointed, of a pale green colour. They are well filled, containing from six to seven large peas of a light green colour. Quality excellent. Dried seed rather small, very white, wrinkled.

Sown February 23. First flower opened June 2; was in full flower June 8. First slats appeared June 11. Fit for use June 26. Two days later than Alliance, and a much superior pea.

12. *Prolific* (McLean's).

Resembling Wonderful in its general characters, but having much larger pods. Height about 3 feet, of strong and robust growth, producing from twelve to fourteen pods on each plant. The pods are large, broad, slightly curved and bluntly pointed, and contain from six to seven large peas in each, which are unusually sweet and good.

Sown February 23. First flower opened June 3; was in full flower June 9. First slats appeared June 13. Fit for use June 28.

This variety keeps long in fit condition for use.

13. *British Queen.*

Synonyms.—Rollison's Victoria; Shanley Marrow; Hooper's Incomparable; Imperial Wonder (excellent stock); Carter's Leviathan (strong stock); McMillan's Queen of the Marrows; William's Emperor of the Marrows; Ward's Incomparable; Wonder of the World; Champion of Scotland; Queen of the Marrows.

These are all forms, more or less selected, of the British Queen and Tall White Mammoth.

Description.—See Proc. R. H. S. vol. i. 357.

Sown February 23. First flower opened June 12; was in full flower June 15. First slats appeared June 18. Fit for use June 30.

14. *The Prince.*

Intermediate form between Veitch's Perfection and Premier.

Plant robust and vigorous, much branched. Foliage rather small, deep green. The pods, which are produced in pairs, are smaller than Veitch's, of a pale green colour, showing the form of the peas through like Premier.

It flowered, slatted, and was fit for use the same time as Premier.

A very vigorous and prolific form of Veitch's Perfection, standing the dry weather well.

15. *Dwarf Canada.*

Synonym.—Evershed's Marrow.

A somewhat taller and stronger-growing form of The Prince, coming into use a day or two later, but otherwise not distinct.

16. *Premier* (McLean's).

Plant robust, but not producing so succulent a stem as Veitch's Perfection. Foliage smaller and deep green. Pods borne in pairs, from sixteen to eighteen on a stem. They are large, broad, pale green in colour, showing the form of the peas through the pods, and contain about six or seven very large peas of excellent quality. Dried seed small, green and white mixed.

Sown February 23. First flower opened June 5; was in full flower June 14. First slats appeared June 17. Fit for use June 30.

An excellent, somewhat earlier and hardier pea than Veitch's Perfection of the same class.

17. *Lincolnshire Defiance.*

Is very similar to Premier.

18. *Best of All.*

Resembling Premier, but with smaller pods, and not so strong a plant. Inferior. Comes into use at the same time.

19. *Cowle's Wrinkled Marrow.*

Plant robust, resembling Premier in general characters. Pods long, curved, rounded in form, of a light green colour, containing from six to seven large peas.

Sown March 1. First flower opened June 5; was in full flower June 11. First slats appeared June 19. Fit for use July 2.

20. *Lynn's Wrinkled Marrow.*

Sown February 23. First flower opened June 17; was in full flower June 19. First slats appeared June 21. Fit for use July 1.

21. *Knight's Tall White Marrow.*

Sown February 23. First flower opened June 11; was in full flower June 15. First slats appeared June 10. Fit for use July 3.

22. *James's Prolific* (James).

A selection from Wonderful. Plant robust. Height 3 feet. Stem strong and succulent, occasionally branched, producing from eight to ten pods on each, generally in pairs. Foliage large, pale green, and much blotched. Pods very large, broad, nearly straight and bluntly ended, of a very light green colour, similar in that respect to Excelsior Marrow. They contain from six to eight very large peas, of a pale green or whitish colour, of excellent quality. Ripe seed large, white and pale green, wrinkled.

Sown March 1. First flower opened June 13; was in full flower June 16. First slats appeared June 19. Fit for use July 14.

An extremely handsome pea when growing, of firm and erect growth, the pods being well sustained from the stem, and nearly all being fit for use at the same time.

This received a *First-class Certificate.*

VI. Wrinkled Green Marrows.

Ripe seed mixed white and olive; foliage dark green and blotched; pods dark dull green, very glaucous.

1. *Dr. Hogg* (Laxton).

A cross between Prolific Long-pod and Little Gem.

It has the habit and type of Sangster's No. 1. Stem simple, rather straggling. Height about $3\frac{1}{2}$ feet. Pods produced singly and in pairs, from ten to twelve on each stem. They are long, narrow, much curved and pointed, very well filled, of a beautiful deep green colour like William the First. They contain from seven to nine medium-sized peas, which are of a fine deep green colour, like Ne Plus Ultra. Very sweet and of excellent quality. Ripe seed green, much wrinkled.

Sown February 23. First flower opened May 15; was in full flower May 24. First slats appeared May 27. Fit for use June 16.

A very handsome pea, of excellent quality. The earliest green wrinkled marrow, only four days later than Dillistone's Early, and two days later than Alpha.

This received a *First-class Certificate.*

2. *Ne Plus Ultra.*

Synonyms.—Cullingford's Champion, Jeyes's Conqueror, Edwards's Invincible, Champion of the World, and Late Wrinkled Green are later and inferior forms of this.

Description.—See Proc. R. H. S. vol. i. 369.

Sown February 23. First flower opened June 6; was in full flower June 13. First slats appeared June 15. Fit for use June 29.

3. *Omega* (Laxton).

A cross between Veitch's Perfection and Ne Plus Ultra.

Plant robust, erect growth. Stem 2 feet 6 inches, branching. Foliage large, deep green. The pods are produced in pairs, from twenty to twenty-four on each plant. They are long, nearly straight, rounded in form, and very closely filled, showing the form of the peas through the pod, of a very deep grassy green colour, which is retained for a long time. They contain about eight very large peas, which are of a deep green colour like Ne Plus Ultra, and of excellent quality. Ripe seed large, deep green, compressed and wrinkled.

Sown February 23. First flower opened June 9; was in full bloom June 13. First slats appeared June 16. Fit for use June 30.

A very excellent, handsome, and prolific pea. Very distinct from all others. Keeps long in condition after being fit for use, and stands the dry weather well; would be most appropriately named a Dwarf Green Ne Plus Ultra.

Received a *First-class Certificate*.

4. *Progress* (Laxton).

A cross between Veitch's Perfection and Ne Plus Ultra.

Resembling Omega in every other respect, it is a day or so earlier and scarcely so large in pod.

5. *General Wyndham.*

Synonym.—Boyes's Masterpiece.

Description.—See Proc. R. H. S. vol. i. 370.

Sown March 16. First flower opened June 13; was in full flower June 17. First slats appeared June 19. Fit for use July 1.

6. *Munsted Marrow.*

Plant very robust, with broader and shorter pods than Ne Plus Ultra, containing from six to eight very large deep-green peas. Ripe seed very large, deep green. Distinct in character. Comes into use a few days later than Ne Plus Ultra, of which it is a broader and shorter-podded form.

7. *Sturdy* (Laxton).

A cross between Veitch's Perfection and Ne Plus Ultra.

Plant extremely robust and strong-growing. Stem 3 feet, branching very much, and flowering successionally. Foliage large, deep green, slightly blotched. The pods are produced in pairs, from twenty to twenty-four on a plant; they are long, nearly straight, resembling Omega, but broader than that variety, of a beautiful deep dark-green colour; they contain from six to eight large peas, which are of a fine dark-green colour, like Ne Plus Ultra. Ripe seed very large, deep green, compressed and wrinkled. Quality excellent.

Sown February 23. First flower opened June 13; was in full flower June 19. First slats appeared June 21. Fit for use July 9.

This is the latest pea, by several days, of any in cultivation; and by its habit of growing and flowering successionally a continuous supply of peas fit for use is maintained for a week or ten days later still.

VII. Wrinkled Blue Marrows.

Ripe seed blue and wrinkled. Foliage dark green, and much blotched.

1. *Laxton's No.* 1.

A cross between Dillistone's Early and Little Gem.

This resembles Alpha in the characters and general appearance of the plant, but having straight pods, the same as Pioneer (white seed). Ripe seed same as Alpha, small, light blue, wrinkled.

Sown February 23. First flower opened May 10. Full flower May 22. First slats appeared May 25. Fit for use June 12.

The earliest blue wrinkled Marrow, coming into use the same time as Dillistone's Early.

2. *Alpha* (Laxton).

Habit and general appearance of plant like the Frame class or Sangster's No. 1. Plant rather straggling, weak, and somewhat tender, from 3 to $3\frac{1}{2}$ feet high. Stem simple, with light or pale green foliage. The pods are produced singly, from seven to nine on a plant. They are long, rounded in form, narrow, much curved, and pointed, of a pale green colour, like Sangster's. They contain from seven to nine good-sized peas in each, of a fine colour and most excellent quality. Ripe seed small, light blue, much wrinkled.

Sowm February 23. First flower opened May 12 ; was in full flower May 23. First slats appeared May 26. Fit for use June 14.

A very early and excellent wrinkled Marrow pea, only two days later than Sangster's No. 1.

3. *Fertility* (Laxton).

A cross between Prolific Long-pod and Little Gem.

This is scarcely distinct from Alpha, only having the pods a little more curved and the dried seed a little more green. It flowered, slatted, and came into use at the same time.

4. *Little Gem* (M'Lean's).

Plant very dwarf, from 12 to 18 inches in height, but of robust and vigorous growth. Stem branching. Foliage dark green. The pods are produced in pairs, from seven to eight on a stem. They are of fair size, rather broad, nearly straight, very full, and contain from six to seven fair-sized peas of fine colour and excellent flavour. Ripe seed bluish white, wrinkled.

Sown February 23. First flower opened May 16 ; was in full bloom May 25. First slats appeared May 28. Fit for use June 16.

This is indeed a little gem amongst peas, very valuable for forcing or growing in pots from its extremely dwarf and prolific habit and its earliness, coming into use four days later than Sangster's No. 1.

5. *Early Emerald.*

Plant from 2 to 2½ feet high.

This closely resembles Little Gem. It may be termed a somewhat taller and stronger form of that variety. It comes into use a day or two later. The dried seed is small, green and white wrinkled.

6. *Multum in Parvo* (Nutting).

Plant robust, with large foliage, resembling Little Gem, but very distinct in the character of the pods. These are produced generally singly, and have very short peduncles. They are generally rather short and very broad, but well filled, containing from five to six large peas of excellent quality. Ripe seed large, mixed blue and white, wrinkled.

Sown February 23. First flower opened May 21; was in full flower May 27. First slats appeared May 29. Fit for use June 19.

7. *Stamford Marrow* (Laxton).

A cross between Supreme and Little Gem.

Plant of somewhat slender growth. Height 5 feet. Foliage pale green, blotched. The pods, which are produced in pairs from fourteen to sixteen on a plant, are very long, rounded, and full, rather narrow, but much curved, and pointed, of a pale green colour, like Alpha. They contain from nine to eleven medium-sized peas of a light green colour, very closely pressed, and excellent flavour. Ripe seed pale green or blue, wrinkled.

Sown February 23. First flower opened May 21; was in full flower May 28. First slats appeared June 2. Fit for use June 17.

8. *Advancer* (M'Lean).

Description.—See Proc. R. H. S. vol. i. 370.

Sown February 23. First flower opened May 25; was in full flower May 30. First slats appeared June 3. Fit for use June 21.

9. *Universal* (Laxton).

A cross between Little Gem and Laxton's Prolific.

This resembles Little Gem in every respect, but with much longer, more curved, and narrower pods. The pods contain from seven to eight peas, and in some cases nine, of fair size and excellent quality. Ripe seed blue, wrinkled, flattened.

Sown February 23. First flower opened May 24; was in full flower May 28. First slats appeared June 2. Fit for use June 21, five days later than Little Gem.

10. *Popular* (Laxton).

Plant of rather slender growth; 6 to 7 feet high. The pods, which are produced in pairs from twelve to fourteen on each plant, are long, narrow, very tightly filled and compressed, like Fairbeard's Nonpareil, much curved and pointed, of a light green colour. They contain from six to eight large peas in each, of excellent quality. Ripe seed pale green or blue, wrinkled.

Sown February 23. First flower opened May 24; was in full flower May 27. First slats appeared May 30. Fit for use June 21.

An excellent pea for a general crop.

11. *Epicurean* (M'Lean).

Plant robust, of full growth. Height 3 feet, having the habit of Nutting's No. 1, but inferior to that variety. The pods are borne in pairs, from ten to twelve on each stem. They are rather small and not very well filled, containing only from six to eight peas. Excellent quality. Ripe seed white and green, wrinkled.

Sown February 23. First flower opened May 27; was in full flower June 2. First slats appeared June 5. Fit for use June 21

12. *Climax.*

Synonyms.—The Claimant; Lucking's Queen of the Marrows.

Description.—See Proc. R. H. S. vol. i. 373.

13. *Champion of England.*

Description.—See Proc. R. H. S. vol. i. 371.

Sown February 23. First flower opened May 29; was in full flower June 9. First slats appeared June 12. Fit for use June 25.

14. *Fairbeard's Fortyfold.*

A selection of Champion of England, having large scimitar-shaped pods. Comes into use at the same time.

15. *Culverwell's Early Wrinkled Marrow.*

A fine form of Champion of England, with large broad pods and large peas. Ripe seed large bright green.

16. *Huntingdonian.*

A large-podded and very excellent form of Champion of England.

17. *Laxton's Quality.*

Plant resembling Champion of England in growth, but with larger foliage of a much paler green, and fully more robust. The flower is also large and handsome. The pods, which are produced in pairs from fourteen to sixteen on a plant, are very large, rounded in form, much curved and pointed, of a light or pale green colour.

They contain from seven to eight very large peas of a light green colour and of excellent flavour. Ripe seed pale green and white, wrinkled.

Sown February 23. First flower opened May 21; was in full flower May 27. First slats appeared May 30. Fit for use June 24.

18. *Laxton's Quantity.*

This, which originally was a round- white-seeded variety, proved in the trial to be now but a form of Laxton's Quality with straighter pods.

19. *Lord Palmerston.*

In the way of Veitch's Perfection, with broader pods, but not quite so long and somewhat paler in colour; very uniform. Comes into use with Hairs's Dwarf Mammoth.

20. *Knight's Tall Green Marrow.*

Synonym.—Cullingford's Champion.

Sown February 23. First flower opened May 29; was in full flower June 5. First slats appeared June 12. Fit for use June 25.

21. *Yorkshire Hero.*

Plant moderately robust. Height 3 feet. Stem simple, producing from twelve to fourteen pods on each, in pairs. The pods are short, broad, nearly straight, of a light-green colour, and do not fill well. They contain only from four to six fair-sized peas. Ripe seed light green, wrinkled.

Sown February 23. First flower opened May 27; was in full flower June 5. First slats appeared June 8. Fit for use June 25.

This very much resembles M'Lean's Prolific.

22. *Princess of Wales.*

In habit and general appearance this very closely resembles Advancer. It might, indeed, be termed a good selected late stock of that variety. The ripe seed is lighter in colour than that of Advancer.

Sown February 23. First flower opened May 30; was in full flower June 8. First slats appeared June 12. Fit for use June 27, six days later than Advancer.

23. *Conquest.*

Plant of slender growth. Height 5 to 6 feet. The pods are borne in pairs, from twenty-two to twenty-four on each plant. They are in appearance like the Early Emperor, small and narrow, containing from five to six small peas in each, particoloured, light and dark green, of poor quality. Ripe seed small, dull green, wrinkled.

Sown February 23. First flower opened June 3; was in full flower June 9. First slats appeared June 19. Fit for use June 27.

A worthless and undesirable pea.

24. *G. F. Wilson* (Carter).

Plant robust, having the same appearance as Veitch's Perfection. Height 4 feet. The pods are produced in pairs, from ten to fourteen on a plant. They are very large, of a light green colour, and contain from seven to eight very large peas in each, which are of a fine green colour. Ripe seed smaller than Veitch's Perfection, light green, wrinkled.

Sown February 23. First flower opened May 29; was in full flower June 4. First slats appeared June 7. Fit for use June 27.

This is an early form of Veitch's Perfection, coming into use seven days before that variety.

Received a *First-class Certificate.*

25. *Culverwell's Prolific Marrow.*

Resembling some of the forms of Tall Green Mammoth, of strong and robust growth. Pods short, straight, pale green, containing from five to six exceedingly large peas of excellent quality. Ripe seed very large, bright green, wrinkled, very distinct in appearance.

Sown February 23. First flower opened June 3; was in full flower June 12. First slats appeared June 16. Fit for use July 1.

26. *Tall Green Mammoth.*

Synonyms.—Green Tall Square Mammoth; Competitor; Epps's Monarch.

Description.—See Proc. R. H. S. vol. i. 375.

Sown February 23. First flower opened June 3; was in full flower June 15. First slats appeared June 19. Fit for use July 1.

Thorpe-Perrow Early Marrow is a few days earlier and with smaller and fully more pointed pods.

27. *General Havelock.*

Small-podded worthless form of the same.

28. *Veitch's Perfection.*

Description.—See Proc. R. H. S. vol. i. 375.

Sown February 23. First flower opened June 2; was in full flower June 9. First slats appeared June 15. Fit for use July 4.

29. *Mammoth Dwarf Marrow.*

Synonym.—Jersey Hero.

This is of the same type as Veitch's Perfection, but with rather smaller and more curved pods, of a deeper green, and a day or two later.

30. *Connoisseur* (Laxton).

A cross between Ne Plus Ultra and Evergreen.

Plant of somewhat straggling growth. Height 6 feet. Foliage dark green. Stem branching, producing from twenty to twenty-five pods, in pairs. The pods are long and nearly staight, well filled, of a deep green colour, like Ne Plus Ultra. They contain from six to seven peas each, which are particoloured, light and dark green, of very excellent quality. The ripe seed is small, very deep green, wrinkled.

Sown February 23. First flower opened June 14; was in full flower June 16. First slats appeared June 19. Fit for use July 7.

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