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ORCHIDS:

THEIR

STRUCTURE, HISTORY, & CULTURE

(ILLUSTRATED).

BY

LEWIS CASTLE.



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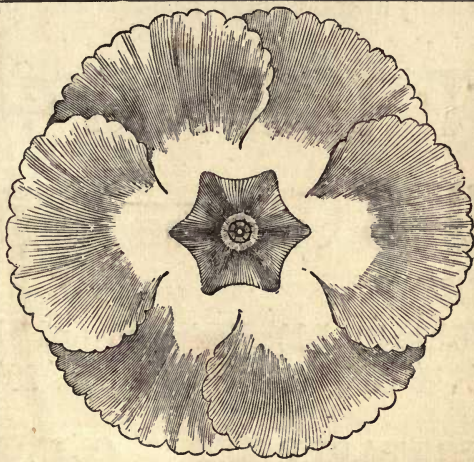
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Orchids

THEIR STRUCTURE
HISTORY
& CULTURE
(ILLUSTRATED)

By

LEWIS CASTLE

FORMERLY of THE
Royal Gardens KEW.

Author of

"Cactaceous Plants"

London.

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PREFACE.



THE First Edition of this Treatise was issued as a Review of the Structure and History of Orchids, and was very favourably received; but, in compliance with the wishes of many friends and correspondents, a section in the present Edition has been devoted to the Culture of Orchids, giving an epitome of many years' observations. Several other Chapters have also been added that are likely to be useful or interesting.

For the majority of the Illustrations I am indebted to Dr. Robert Hogg, and the Portrait of Sir Trevor Lawrence, Bart., has been kindly supplied by Dr. M. T. Masters, Editor of the *Gardeners' Chronicle*.

L. C.

171, FLEET STREET, E.C.,
May 3rd, 1886.

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A

FLORAL FASHION.

FASHION is proverbially variable, and its dictates always influence a large proportion of a community, particularly in regard to the ordinary customs of life; the fashion of dress is all important, but there is also a fashion in walking, talking, and writing, that varies with the age and gives distinctive characters to every generation. It is not, however, to these matters alone that fashion is confined, for it has in modern times extended its influence to the plant world, and the floral favourites of one period have been proportionately neglected at another, being superseded by some in which more pleasing qualities have been discovered or imagined. The changeability has not been so great or so frequent in the latter case as in the former, but it has in several instances been equally unreasonable. Who has not heard of the notorious Tulip mania, which caused thousands of persons in Holland under the influence of a speculative madness to risk all their possessions in the purchase of bulbs that had acquired a grossly fictitious value? Like other bubbles of a similar character, it burst at last and ruined innumerable homes, but this was a strikingly exceptional case, and happily we have had nothing of the same nature in the plant world since. Many families of plants have risen successively in favour, but never to such an absurd and injurious height as the Tulips; and though surprisingly high prices have been obtained for popular or rare plants, there has, with few exceptions, been more commercial solidity and less gambling attending the transactions.

Heaths, for instance, some years ago held an important position amongst the most appreciated plants, rare species and beautiful varieties realising prices that would now be thought ridiculous; but their descent from general favour was very gradual, and except in the case of dealers who retained large stocks in expectation of a return to the former demand, little loss was occasioned. Hard-wooded plants, including many of extreme beauty from the Southern Hemisphere, have similarly been petted and neglected; the Proteas and Banksias were at one time the wonders of many plant stoves, and Cactuses have also had a

large share of popularity. Some of these have been set aside to make room for more quickly and easily grown plants, in accordance with the changing fashion of the day, or with the increasing utilitarianism which will tolerate the beautiful only upon the most economical terms. Carnations, Picotees, and Dahlias have enjoyed a steadily sustained popularity during a long period, while the acknowledged Queen of Flowers, the Rose, retains her sway over an increasing number of subjects.

In what may be termed groups of plants, we have an example of long-continued, and still advancing favour, in the hardy herbaceous plants whose claims have most deservedly received powerful support in recent years. Many could be named that are still favourites, but which have never been regarded as "fashionable flowers," and, therefore, have not attained to the commercial importance of some families; and still others could be mentioned to prove the fluctuations that have taken place, but sufficient have been enumerated to illustrate the changeableness of popular taste with regard to plants generally.

Turning to the special objects of this treatise—the Orchids—we have a most remarkable example of a gradually obtained and substantial popularity amongst the wealthy patrons of horticulture. In this respect orchids are unique, for no other family has ever evoked so much genuine enthusiasm, or caused such a large expenditure of money in their collection, purchase, and culture, as these. During the early part of the past half century they steadily advanced in importance, but within the last twenty years their progress has been most rapid; and now they occupy an extraordinary position in plant collections, not only of Britain, but of Europe and America. Nor is this popularity of an unstable character, for there are evident signs of its long continuance, and of an extension amongst a class of cultivators whose purses are not so long as were those of what may be termed the inaugurators of the Orchid fashion. There is, indeed, a great future yet for numerous members of the Orchid family. The times are changed considerably since the "Tulip madness" raged; people are now too practical to encourage dangerous speculations, and we must, therefore, look for some substantial causes of the Orchid enthusiasm, which has been described by an eminent botanist as "an absolute passion." They are, however, easily found in the floral beauty, structural peculiarities, and scientific interest that distinguish these plants, above all others, in one natural order. Beautiful flowers from all climes adorn our houses and gardens, all imaginable colours are represented, the richest and most delicate fragrances delight us, but in the Orchid there is a mysterious attraction—a something more than mere beauty of form, with such evident adaptations for particular purposes, that we appear to be in the presence of a form of life approximating to

the Animal Kingdom. Distinct, too, in floral structure from other plants, there is yet what Mr. Dresser would term a "unity in variety," so patent that any novice recognises an Orchid at a glance. These characters first brought the plants under the notice of the learned and wealthy, but another important quality gained for them a second set of admirers. Many of the species are useful garden plants, flowering profusely, bright and varied in colours, and lasting, in some cases, for months—indeed, longer than any other known flowers.

When these facts are considered, it is not surprising that Orchids have become of vast pecuniary importance, one of the chief departments of the horticultural trade in regard to ornamental plants being that occupied in their culture and distribution. Hitherto, it is true, Orchids have been chiefly confined to the gardens of the wealthy; but they are now finding their way into those of the middle classes, and it is by no means uncommon to see in suburban gardens the one house the occupier can afford devoted to "cool orchids." These are rapidly advancing in popularity, and as their prices become moderate the increase will be still greater. Even now, plants may be purchased for a few shillings which ten years ago would have cost as many pounds; but the downward tendency in large prices will be amply compensated for by the extended sale of cheaper plants. People begin to understand that Orchids are easily grown, so easily, in fact, that any ordinarily intelligent person can grow them satisfactorily; and this removal of a long-prevalent erroneous impression respecting the difficulties attending their cultivation has contributed, in a great measure, to the increase of their admirers. When first attracting attention, innumerable plants were killed by excessive heat and insufficient moisture, but under the direction of such experienced growers as Mr. B. S. Williams (who has given the pith of Orchid Culture in his valuable "Manual"), methods have been so simplified that none need hesitate now to undertake the culture of the majority of Orchids, including all the most useful species.

{ The following brief review of the Orchid family is intended to convey some idea of the peculiarities and recommendations possessed by these remarkable plants, dealing first with their structure, then with the history of their advance in this country, noting those who have given most prominent assistance in the work, and finally with an outline of their culture. | Amateurs, or others whose knowledge of the plants is rudimentary, may possibly be induced to take still farther interest in one of the most extraordinary forms of vegetation of the present period, and the pleasure of contemplating such beautiful flowers can only be increased by understanding something of their structure.

Where fuller information is required, it can be gained by con-

sulting the various works enumerated in another portion of this treatise, though, unfortunately, the best of them are too expensive to be included in many private libraries.

ORCHID LIFE.

PLANT-LIFE in all its forms is invested with a remarkable interest, and none can undertake the study of a small family, or even a genus, without becoming fully conscious that there are "more wonders in heaven and earth than are dreamt of in our philosophy." Perhaps no natural order could be selected to illustrate this better than the Orchids, and none can investigate their wonders so briefly or imperfectly that they will fail to be impressed with its truth. Descriptions are, however, comparatively useless without an examination of living specimens, and all who may peruse the following notes with the desire of clearly understanding Orchid structure should closely observe the plants and flowers in a living state.

Flowering Plants are divided into two large classes, distinguished by well marked characters, and with a few exceptions it is not difficult to determine in which a plant should be included. These are termed respectively (1) Dicotyledons or Exogens, and (2) Monocotyledons or Endogens; the first is broadly distinguished by the production of two or more seed leaves in germination; the formation of young wood on the outer part of the stem under the bark; the possession of leaves with netted veins and flowers with sepals, petals, and stamens in fours or fives, or some multiple of these numbers. The second class is denoted by the production of only one seed leaf, by a very different mode of growth, the additions being first made in the centre of the stem, and then passing outwards; the absence of a true bark, the leaves having the veins parallel except in one group, and the flowers have their parts arranged in threes. To the latter (the Monocotyledons) the Orchid family is assigned, but a person who had never seen an Orchid flower before, and was unacquainted with its characters, would find great difficulty in deciding its proper position in the vegetable kingdom. The large and beautiful family of the Irises, the Amaryllises, and the Lilies would be much more easily recognised in this respect, for such great changes have been effected in the floral structure of the Orchids that the

family appears to be isolated and to claim no relationship with the vegetation surrounding it. The most elementary student of botany is familiar with the stamens and pistils that are usually so prominent in flowers, though frequently more or less combined amongst themselves. In the Orchids we get a remarkable departure from this character, the stamens and pistils being combined in one body, the column, quite unlike either. The sepals and petals are usually both present, three of each; but one of the latter (the labellum) assumes a great variety of shapes, frequently becomes much larger than the other parts, and is



FIG. 2.—ODONTOGLOSSUM ALEXANDRÆ (*O. CRISPUM*).

generally the most prominent portion of the flower. In the Dicotyledons we get some approach to both these conditions in several families. The *Asclepias* and its relatives present, at first glance, some resemblance to the column of the Orchids in the staminal crown, but there is no direct cohesion between the

stamens and the pistils, though the former are united in a tube closely surrounding it. The corolla in the Mint family (*Labiatae*) is often formed with a prominently projecting lobe, similar to the lip of the Orchids, and it seems to serve a similar purpose, namely, as an attraction and landing-place for insects; but the Orchid labellum is different in its origin, and is much more highly developed, or modified. The resemblances pointed out are nothing more, for the nearest relations of the Orchids are found in the Iris and Ginger families; but further reference will be made to this in the course of the following descriptive notes of the principal organs.

THE ROOTS.—The popular designation of “Air Plants” that was long applied to orchids, and which still survives in the name of the genus *Aerides*, indicates a character distinguishing a large number of species, namely, all those which, in a state of nature, grow upon trees or other plants living upon the moisture in the air, and having no communication with the earth by means of roots, as in ordinary plants. These were at one time regarded as parasites, but, as they do not derive any of their support from the substance of their host, the term was inaccurate, and epiphyte, meaning simply a plant which grows upon another, was applied to orchids and others of like habit. The epiphytes comprise a large proportion of the tropical orchids which luxuriate in warm, moist climates, and clothe living and dead trees with fresh green leaves and beautiful flowers, loading the air with the most exquisite perfume, or rendering it nauseous with the most fetid odours. Another large group of species, including those of temperate climates, such as we are familiar with in Britain, are termed terrestrial, from their growing in soil like most plants. These two groups naturally differ considerably in their roots, as they have very different functions to perform. In the former the roots are mostly thick and fleshy, often green, like the leaves and stem, but sometimes white or ash coloured, cylindrical or flat, varying in size from about half an inch in diameter to the most slender fibres, and in length from a few inches to two or three feet. The roots of most epiphytal orchids appear to prefer growing in the air, to being surrounded by any moisture holding substance, and in cultivated plants this is especially notable, much injury being often done by burying the roots deeply. The roots of such genera as the Moth Orchids (*Phalænopsis*) are very strange, flat, and of an ashy or leaden colour. These cling closely to the wooden blocks or baskets in which the plants are grown, and often present an appearance almost suggestive of diminutive snakes.

One peculiarity in the case of some *Phalænopsis* is that the roots, if injured or broken, occasionally produce young plants at that part, and thus afford a means of propagation, which has not yet been fully appreciated. A good example of this was recently

observed at Selborne, Streatham, where a plant of *P. Stuartiana* had a small portion of a root severed from the main part, clinging to the wood, and remained alive for several weeks without any apparent change. Then at the extremity of the small root fragment a projection was noticed, which subsequently developed a diminutive leaf. The root then commenced growth again, and when I saw it, it was a quarter of an inch beyond the plantlet. Similar occurrences have been observed in a few other species. Most of the taller epiphytes appear to produce their roots from any portion of their stem, as in the *Vandas* and the *Dendrobiums*, which also affords a means of propagation, or of lowering plants that have become too tall.

Terrestrial Orchids produce fleshy and fibrous roots that are confined to the soil, and partake more of the nature of ordinary roots. As many of these plants are however deciduous, losing their leaves in the autumn, and as many do not produce perennial stems, they obviously need some store of strength for another season. This is provided by the tubers, which numbers of our British species produce, such as the familiar *Orchis mascula*, and the principal economic value of the family depends upon the starch or gum (*Bassorine*) abundantly stored in their tubers. They are sometimes in pairs, or in bunches of several, and the true roots are usually produced from just above them. Some peculiarities occur in certain genera, as in the Bird's Nest Orchid (*Neottia Nidus Avis*), which has numerous interlacing fibres like a bird's nest, or in the Coral Root (*Corallorhiza*), and the *Epipogium* (*E. Gmelini*), which have curiously twisted tubers resembling Coral. Some member of the three latter genera live in partially decayed vegetable matter, apparently assimilating their food without the aid of green colouring matter (*chlorophyll*), or true roots, and are termed *Saprophytes*, being similar to the peculiar *Broomrape* (*Orobanche*), and *Toothwort* (*Lathræa*).

THE STEMS.—The Orchids, which possess true stems, are chiefly those of the *Vanda*, *Aerides*, *Saccolabium*, and *Angræcum* type, in which the leaves are produced in a two ranked (*distichous*) manner on opposite sides of the stem, and produce their flowers from the axils of the leaves. Some of these attain a height of twelve feet or more, and are the giants of the Orchid family, if we except the strange *Javan Galeola altissima*, which is said to reach 120 feet or more, most others are either very short, as in the tropical *Cypripediums*; are pseudo-bulbous, as in the *Dendrobiums*, or are of annual duration only, as in the North American terrestrial *Ladies' Slipper* (*Cypripedium spectabile*). After a careful study of the vegetative organs of the Orchids at Kew, Dr. Pfitzer, of Heidelberg, has founded a system of classification upon them, particularly upon the stems, and the mode of growth that is detailed in full in the "Gardener's

Chronicle," page 750, December 11th, 1880. An outline of the method may, however, be given here. The whole family is divided into two groups, distinguished by their respective habits of growth, and comprises the "Monopodial" Orchids, or those in which the "main axis," that is, the stem, grows indefinitely, producing its flowers from the sides. This includes *Vanda*, *Aerides*, *Angraecum*, *Saccolabium*, *Aeranthus*, and *Vanilla*; two contain the "Sympodial" Orchids, in which each axis is definite, *i.e.*, the stems finish their growth each season, and after the period of rest fresh growth is produced from the side of the base of the proceeding year's stem or pseudo-bulb. To this belongs the great bulk of the exotic Orchids, of which only *Dendrobium*, *Oncidium*, *Odontoglossum*, *Epidendrum*, *Masdevallia*, and *Cattleya* need be named. These two large groups are subdivided into a number of small ones, the characters of which are founded upon the development of the leaves in the bud, and a variety of peculiarities possessed by them, the stems, and the pseudo-bulbs. The Author admits that the scheme is not complete, but it is important, as in the classification of Orchids almost exclusive attention had hitherto been given to the floral organs.

THE PSEUDO-BULB.—To the swollen base of the stem, which in many orchids assumes an ovoid form a few inches high, and in others becomes cylindrical and stem-like several feet in length, the name pseudo-bulb is given, and though very different in appearance, it is practically a tuber above ground, and appears to serve in a similar way as a store house of nutriment, to be subsequently used by the plant. All growers thoroughly understand this, and know that unless large, well-ripened pseudo-bulbs are obtained, good flowers cannot be expected, and as the former improve year by year, so do the flowers advance and their strength increase. In the case of imported plants, such as the *Odontoglossums*, the pseudo-bulbs produced each year will often, under good culture, become considerably larger than that formed in its native country, and it is then the magnificent racemes are produced which are occasionally seen at exhibitions. Some *Oncidiums* and *Epidendrums* produce a kind of stem, and the pseudo-bulbs are formed along this, giving the plant a very curious appearance. In the *Dendrobiums* the pseudo-bulb becomes quite stem-like, either erect or drooping, cylindrical and several feet long, bearing the flowers at the nodes over the whole length. In most of the others the growth of one season forms the bulb of the following one, producing its flowers from the top or base. One remarkable pseudo-bulb deserves special notice, namely, that of the Trumpet or Cow-horn Orchid, *Schomburgkia Tibicinis*, which attains the length of about two feet in its native home of Honduras. is hollow inside, and somewhat conical in form. These



FIG. 3—ORCHID FLOWERS.

1. *Oncidium raniferum* (Frog Orchid).
 2. *Peristeria elata* (Spirito Santo of Panama).
 3. *Prescottia colorans*. 4. *Gongora fulva*.
 5. *Cirrhaea tristis*. 6. *Cynoches ventricosus* (Swan Orchid).
 7. *Oncidium pulvinatum*. 8. *Bolbophyllum barbigerum*.
 9. *Catasetum viride*. 10. *Peristeria cerina*.

are used as horns by the natives, and are said to form a favourite plaything for the children. At the base of the pseudo-bulbs is a small hole, and taking advantage of this entrance, the large and ferocious ants of the district make it their home, swarming out in thousands when disturbed.

LEAVES.—With the exception of one beautiful group, there is nothing of an especially remarkable character in the leaves of orchids; they are usually narrow and strap-like (*Odontoglossum*), elliptical or oblong (*Cattleya*), with many intermediate forms, and they vary greatly in the firmness of their substance, some being almost as hard as leather, as in the last named genus, while others are as soft as velvet, and of a most delicate texture. They usually clasp the stem at their base, and have not a distinctly marked stalk and blade as in the leaves of Dicotyledonous plants. The exceptional group referred to comprises those exquisite gems, the *Anæctochilus* and *Goodyera*, which in delicacy and beauty of leaf colouration cannot be equalled in the whole vegetable world. They are samples of Nature's most artistic work, and would excite the admiration of all who can appreciate beauty of form or colouring. The leaves are velvet-like in appearance, and have a ground tint of light or dark green, ranging to deep bronze, and upon this is traced an elegant network of silver or gold veins, which contrasts charmingly with the rich ground colour. *Anæctochilus Lowii* (also known as *Dossinia* or *Macodes marmorata*), is a perfect gem, the rich green and bronze leaves being finely veined with gold, and several others are scarcely less charming. In some of the *Phalænopses*, particularly in *P. Schilleriana*, the foliage is also handsomely marbled, and the same occurs in the *Cypripediums*, *C. Hookeræ* and others being distinctly and beautifully variegated, while in *Phaius maculatus* we have a green leaf boldly spotted with white or yellow.



ORCHID FLOWERS.

IN Nature's laboratory many wonderful transmutations are effected, beside which the supposed powers of the Philosopher's Stone are insignificant, and the most fertile imagination could not conceive anything more marvellous than is taking place around us every day unnoticed. Who, for instance, that thoughtfully observes the surprising beauty and curious structure of a Moth Orchid (*Phalænopsis*), growing probably upon a block of wood, and gaining all its support from the moisture in the air or the wood, can help wondering at the power which transforms such

meagre fare into broad substantial leaves and handsome flowers. Truly this is natural magic. All the orchids are most delicate and temperate in their fare. They are the Blue Ribbonists of the plant world, and seem, except in a few instances, to have little inclination for "stimulants" of an ammoniacal character. Yet what a diversity of floral forms is produced! What numbers of brilliant colours, and what delicate but durable structures! From a barrowful of peat and charcoal, and a few gallons of water, we obtain through the medium of these plants a wealth of glorious blossoms—the rich gold and purple Dendrobes, the bright yellow *Oncidiums*, the gorgeous crimson *Cattleyas*, and the delicate, pure and wax-like *Odontoglossums*. It is remarkable, too, that the epiphytal orchids, which are most refined in their food demands, also produce the most handsome flowers.

One of the characters which especially impresses a student of the great orchid family is the surprising range of floral variation, yet within such definite limits that an orchid flower is usually easily recognised. In the majority we find three outer divisions—the sepals—and within these three other divisions alternate with the sepals, two—the petals—being more or less similar to them in form, though frequently differing in colour, while the lower one (in a few cases this is uppermost)—the labellum or lip—is strangely metamorphosed, sometimes excessively large, at others very small, of the most peculiar forms, mimicking insects and birds, or extraordinarily and indescribably grotesque. It is this which gives the prevailing character to orchid flowers, and it is so important an organ that it must be referred to at greater length in another paragraph. In the centre of the flower we find no stamens or pistil, such as we are familiar with in other flowers, but a compound body, the Column (*gynostegium*), which faces the labellum, and bears on that surface a hollow glutinous cavity—the stigma—and has at the summit a box-like depression, covered with a lid, the anther-case (*clinandrium*), in which are situated the Pollen-masses (*pollinia*), consisting of grains of pollen, connected into various forms by a web-like or glutinous substance. Beneath the flower is the ovary, termed from its position inferior, and this, when cut across, is found to be one-celled, with three rows of seeds extending down the inner surface of the walls. They are mostly very minute, very numerous, and covered with a loose skin (*testa*).

These are the prevailing characters of the family. There are, however, some exceptional cases, and some details which will be referred to presently. For instance, an orchid flower is usually very irregular, owing to the development of the labellum; yet in a few genera, as the *Thelymitra*, *Hexisea*, and *Paxtonia*, the parts of the flowers are nearly all equal, as is shown in Fig. 4, which represents a flower of *Paxtonia rosea*.

In this the lip is the same size as the petals and sepals, and could scarcely be thought to be the same organ as the lip in the Ladies' Slipper (*Cypripedium*). Through these regular-flowered Orchids Lindley traced the relationship to the Iris family, especially to *Sisyrinchium*; and we obtain a chain of forms, varying in the modification their flowers have undergone, from these to the strangest and most mechanical flowers imaginable.



FIG. 4.—PAXTONIA ROSEA.

The colours also differ considerably; yellows are very abundant; orange and scarlet are well represented; crimsons and purples numerous; white flowered Orchids are not very common, and blue is particularly scarce in the family, only a few examples, as *Vandas cœrulea* and *cœrulescens* and *Herschelia cœlestis* occurring, to which perhaps *Oncidium Phalænopsis* may be added. There is, however, a large number of dingy, dull indescribable hues, and that very rare colour in flowers, green, is found in many orchids, some of our British species affording good examples of this. Almost every graduation is represented from the most brilliant to the dullest and most displeasing tints, and their effect is often still farther increased by curious contrasts in the same flowers, the colouring being disposed in blocks, bars, or spots, of diverse sizes.

A similar variability is observable in the odours of the flowers, from some of the sweetest perfumes and most exquisite fragrances to fetid and disgusting odours similar to the carrion flowers (*Stapelias*). Some are spice-like in their fragrance, and nearly every Orchid flower seems to possess a scent resembling something else. Thus we have a primrose-like perfume in the graceful *Lælia albida*; the charming odour of the musk is

reproduced in *Dendrobium moschatum*; of wallflowers in *Acropera Loddigesii*; of Cinnamon in *Maxillaria aromatica*; and of violets in *Maxillaria atropurpurea*; while that of the well known *Oncidium ornithorynchum* is suggestive of new mown hay. The flowers of *Dendrobium macrophyllum* possess an odour closely resembling officinal Rhubarb, and *Stanhopea grandiflora* has a powerful and peculiar odour which has been compared to a "chemist's shop." Many of the *Angræcums*, the

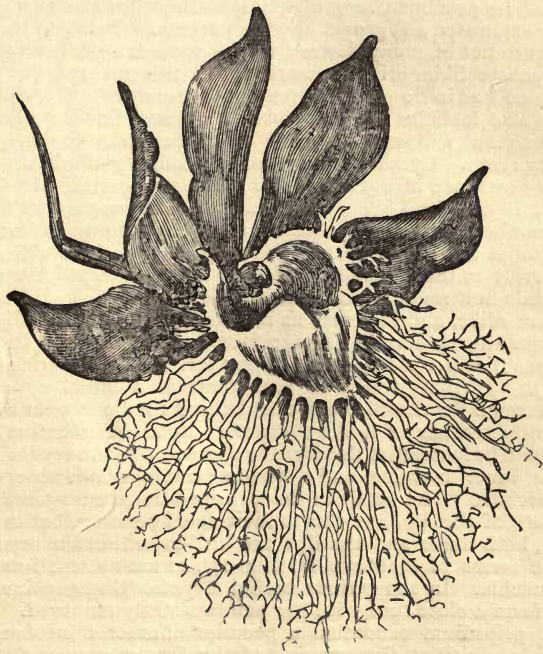


FIG. 5.—*DENDROBIUM BRYMERIANUM*.

Aerides, and other tropical Orchids have exquisitely perfumed flowers, and the charming *Dendrochilum glumaceum* is most powerfully scented, a small plant bearing a few spikes of flowers filling a large house with its fragrance. The intensity and the character of the odours of some Orchids vary at different periods of the day, and this is especially notable in some of our British species and the well-known *Dendrobium nobile*, the flowers of

the last named having a most agreeable perfume in the morning, but less pleasant towards evening.

The flowers are borne in spikes, racemes, or panicles, and are sometimes produced singly on a stem, arising from the roots or pseudo-bulb. In the spike the flowers are disposed along a main stalk, and have no secondary support; in the racemes, the flowers are furnished with small stalks (pedicels), and the panicle is simply a branched raceme. *Phalænopsis Luddemanniana* and a few others produce young plants upon their flower stems, which may be separated and grown like the parents. Owing to the wax-like substance of many flowers, they last an extremely long time, and *Lycaste Skinneri* is remarkable in this respect, for plants have been had in flower for three or four months. *Cypripedium insigne* also lasts for a considerable time, and flowers when cut from the plant will continue fresh for three weeks or more in an ordinary room. *Cymbidium Lowianum* similarly affords an extraordinary instance of durability, for a fine specimen in Mr. Cobb's garden, Silverdale Lodge, Sydenham, in 1883, opened its flowers on December 26th, and the same plant was shown in excellent condition at the Royal Botanic Society's Show, June 18th, 1884.

Referring to the parts of the flowers more in detail, the sepals and petals first require a few words of description. In most cases these are alike, and in some, as in *Oncidium tigrinum* (Fig. 10), they are quite similar in form, colour, and markings. In other instances they are more or less dissimilar, as in the *Cypripedium* (Fig. 1). In that, it will be seen there is a broad uppermost organ termed the dorsal sepal, and behind the lip is seen what is apparently another of a like character; upon examination, however, it will be found that this is really composed of two sepals united by their inner margins, and a similar combination is observed in other orchids. The petals in the *Cypripedium* are disposed upon each side of the lip, and this is their usual position, but in a few genera, both these and the lips are hidden within the sepals, as in some forms of *Masdevallia* (Fig. 11), or are so small as to be unnoticeable. In one curious orchid, *Cryptostylis sanguinea*, the sepals form a close tube with the points slightly recurved.

In *Cypripedium caudatum* a peculiar character is observed; the petals, which at the opening of the flowers are small, gradually lengthen until they are sometimes more than two feet long, and pendulous, like narrow ribbons. This was first observed by Mrs. Lawrence, who examined the flowers carefully, each day measuring the petals as they grew, with the following result: when the flower opened they were $\frac{3}{4}$ in. long, on the second day they grew $3\frac{1}{4}$ in., on the third day, 4 in., on the fourth day, $4\frac{1}{2}$ in., and on the fifth day, $5\frac{1}{2}$ in., the total length attained in four days being thus $17\frac{1}{4}$ in. In *Cypripedium caricinum* and *Uropedium Lindeni* a somewhat similar growth has been also observed. The

functions of the sepals and petals are undoubtedly chiefly protective, preserving the essential organs from injury, but in some species they also serve as attractions to insects that assist in the fertilisation.

THE LABELLUM.

To describe the various forms which this organ assumes would alone require a volume, for not only do the genera differ widely in the lip character, but even the species in one genus are found with such different formations that they often appear totally distinct from their nearest relatives. The simplest form is that of *Paxtonia rosea*, already noticed, and, starting from that, we get innumerable variations, gradually advancing in peculiarity of structure, in every conceivable direction. *Dendrobium Brymerianum* (Fig. 5) affords an instance of a most strangely divided lip, the substance very deeply cut into fine segments, giving a broad fringe of twisted filaments of a most striking appearance. *Oncidium tigrinum* (Fig. 10) has a large but simple lip, while in *Cypripedium* the lip is curiously infolded into a slipper-like form, presenting a wide contrast with the preceding. Frequently the lip is partly divided into three lobes—a large central one, and two smaller ones at the side—or by contraction it appears to be composed of three distinct parts, the lower termed the hypochilium, the middle the mesochilium, and the upper one the epichilium, which are sometimes shortened in descriptions to hypochil, &c. Several curious forms of lips are shown in Fig. 3. Thus *Prescottia colorans* and *Catasetum viride*, as in several other species, have the labellum shaped like hoods. *Oncidium raniferum* has it formed like a frog, and in *Ophrys muscifera*, *O. apifera*, with *O. aranifera*, the lip bears some resemblance to the fly, a bee, and a spider respectively.

Scores of equally strange formations could be named, but there is another respect in which the lip of Orchids is remarkable, namely, its irritability, which appears to be one of the many contrivances to effect cross fertilisation. The genera *Megacalinium*, *Bolbophyllum*, *Pterostylis* and *Caleana* yield several examples of this phenomenon. *Caleana nigrita* has been thus described:—"The column is a boat-shaped box resembling a lower lip, the labellum forms a lid that exactly fits it, and is hinged on a claw, which reaches the middle of the column. When the flower opens the labellum turns round and falls back, so that the flower being inverted, it stands fairly over the column. The moment a small insect touches its point, the labellum makes a sudden revolution, brings the point to the bottom of the column, passing the anther on its way, and thus makes prisoner any insect which the box will hold. When it catches an insect it remains shut while its prey continues to move about, but if no capture is made, the lid soon recovers its position." The lip of

Bolbophyllum barbigerum (Fig. 3) is remarkably interesting, and has been described by Dr. Lindley as follows:—"The lip is one of the most extraordinary organs known, even amongst orchidaceous plants. It is a long, narrow, flexuose, sharp-pointed body, closely covered with a yellow felt; just within its point is a deep purple beard of exceedingly fine hairs; on the under side, at a little distance from the point of the lip, is another such beard; and besides these there is, at the end of the lip, a brush, consisting of very long purple threads, so exceedingly delicate that the slightest disturbance of the air sets them in motion, when they wave gently to and fro, like a tuft of threads cut from a spider's web. Some are of the same thickness throughout, others terminate in an oblong club, so that when the hairs are waving in the air (and I do not know that they are ever entirely at rest) a part floats gracefully and slowly, while others are compelled by the weight of the glandular extremities to a more rapid oscillation. Nor is this all. The lip itself is articulated with the column by such a very slight joint that to breathe upon it is sufficient to produce a rocking movement so conspicuous and protracted that one is really tempted to believe that there must be something of an animal nature infused into this most unplant-like production." *Megaclinium falcatum* and *M. maximum* have curiously rolled-up lips, which oscillate in front of the column, but the movement is more marked in the former of the two species. In the southern genus *Pterostylis*, several species, such as *P. longifolia*, have sensitive labellums, which, when touched by an insect, spring up to the column, temporarily imprisoning the visitor, and compelling it, in effecting its escape, to carry off the pollinia. These contrivances are all connected with the fertilisation of the flower, and in addition to the colours, fragrances, and various mechanical attractions, an inducement is offered to many insects in certain projections upon the labellum. These, insects, chiefly bees, have been seen to gnaw in some species of *Catasetum*, *Gongora*, *Coryanthes*, and *Oncidium*, while no doubt many others offer a similar temptation to various insects. These projections are occasionally very prominent, and, as seen in *Zygopetalum maxillare*, resemble the jaws of some animals, while in *Phalænopsis grandiflora* it has been compared to an anvil. The lip is often hinged to the base of the column, swinging up and down at the slightest touch, as seen in the *Masdevallias*, some of the *Batemanias*, and others.

The colouring upon the labellum is frequently disposed in lines or bands, which seem to serve as a means of directing insects to the column, and the lip is, in the majority of cases, so placed that it is a most convenient landing-stage for any that are disposed to visit the flowers, and whatever its form or appearance the attraction of these creatures is evidently its chief function. To aid in

this purpose the lip is commonly in the front of the flower, directed downwards and outwards, which position is caused by a remarkable twisting of the ovary at the time the flower is opening. It is thus turned half round, and the lip, which should occupy the back and uppermost part of the flower, becomes the lowest—a very remarkable arrangement, when it is considered in conjunction with the many other marvellous adaptations of the lip to favour insect visitors. *Malaxis paludosa* is an extraordinary exception; for in this the flower is twisted wholly round, and the lip thus assumes its normal position. In some other exceptions the lip is uppermost, as in *Disa grandiflora* and certain of the *Angræcums*, particularly *A. eburneum*.

The lip is often prolonged at the base into a spur or nectary of various lengths, from slight depressions, as seen in the *Dendrobiums* and others, to the wonderful Madagascar orchid, *Angræcum sesquipedale*, with a spur frequently exceeding a foot in length. So commonly does the nectary of orchids appear to offer temptations to insects, that Mr. Darwin ventured to suggest the probability some moth, or similar creature, being concerned in its fertilisation, and possessing for the purpose a proboscis of sufficient length to reach the nectar at the lower part of the spur. As no insect was known at the time with a trunk of such length, the opinion was received rather incredulously, but since it first appeared a moth has been found in Brazil with a proboscis over roin. long, so that it does not now appear so unlikely to be correct. Nectar is secreted in considerable quantities by some orchids, but, in referring to this matter, this author just named has observed that, "Although the secretion of nectar is of the highest importance to orchids by attracting insects, which are indispensable to the fertilisation of most of the species, yet good reasons can be assigned for the belief that nectar was aboriginally an excretion for the sake of getting rid of superfluous matter during the chemical changes which go on in the tissues of plants, especially whilst the sun shines." The reason assigned is the production of nectar by parts of the flower which have no influence upon the fertilisation.

THE COLUMN AND POLLEN MASSES,

As already remarked, the column in orchids is a very peculiar organ, and well deserves the attention of all who are interested in the wonderful structure of the vegetable kingdom. It is a combination of stamens and pistil, quite distinct from what occurs in any other family of plants, though an approximation to it is seen in the Birthwort, *Aristolochia Clematitis*, but in that the anthers, with their pollen, are of the usual character, and are equally disposed round the top of the column. In the orchids the column is a more or less fleshy body, from very minute proportions to

several inches in length, generally channelled on its front surface, and occasionally furnished with projecting wings at the sides, or with peculiar sensitive antennæ, of which an extraordinary example occurs in *Catasetum saccatum*, so ably described by Mr. C. Darwin. Near the top of the column the stigma is usually found, a depression in the surface of varying depth, and containing

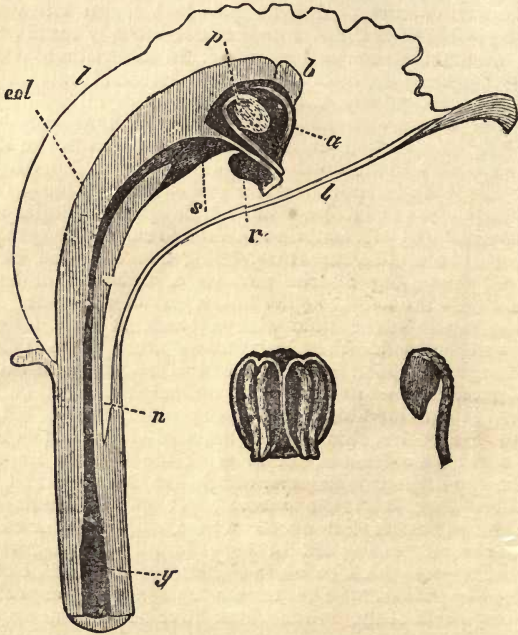


FIG. 6.

- Section and lateral view of *Cattleya* flower, with all the sepals and petals removed, except the bisected labellum shown only in outline. *a*, anther; *b*, spring at the top of the column; *p*, pollen-masses; *r*, rostellum; *s*, stigma; *col*, column; *l*, labellum; *n*, nectary; *y*, ovary.

a viscid matter, which serves to retain the pollen masses when deposited upon it. At the summit in most orchids is the anther case (clinandrium), which is commonly 2-celled, but occasionally 4-celled, or with only one. This contains the pollen, which is agglomerated into small masses, varying in number from 2 to 8, globular, elliptical, or club-shaped, and with or without a stalk

(caudicle), which sometimes terminates in a small flat circular plate, termed the viscid disc, near a small projection in the front of the column and the base of the anther-cell termed the rostellum, or little beak. All these parts are well shown in Fig. 6., representing a section of a *Cattleya* column. To this normal arrangement there is a curious exception in the genus *Cypripedium*, where the part usually occupied by the anther case is transformed into a shield-like plate, the staminode (see Fig. 1), and the true anthers, of which there are two, one on each side of this, and

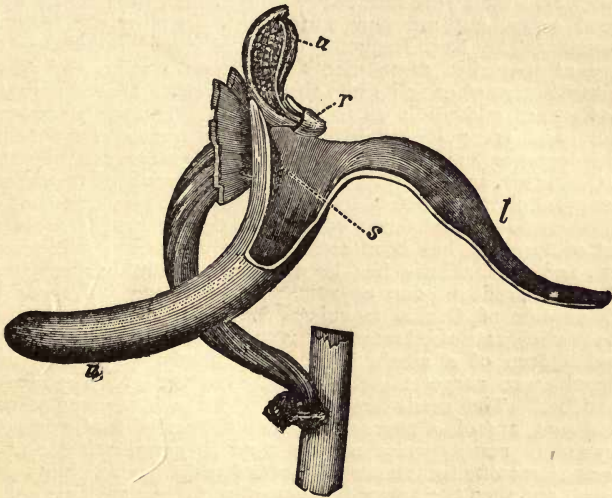


FIG. 7.

Side view of *Orchis mascula* flower, with all the petals and sepals cut off except the labellum, of which the near half is cut away, as well as the upper portion of the near side of the nectary. *a*, anther, consisting of two cells; *r*, rostellum; *s*, stigma; *l*, labellum; *n*, nectary.

partly covered by it, the stigma being beneath the staminode. In some orchids the pollinia is in wax-like masses, as already noted. In others it is powdery, but this character is employed in the classification to be referred to later on. In the production of waxy masses of pollen the orchids are not alone, for the milkweeds (*Asclepias*) have their pollen in very similar form. The general structure of the column and position of the parts will be readily understood from an inspection of the two sections (figs. 6-7) from Mr. Darwin's "Fertilisation of Orchids," which Mr. John

Murray has kindly given me permission to use). In Fig. 6 it will be noticed that the pollinia are also shown separately.

OVARY FRUIT SEEDS.

The ovary or seed vessel is, in the majority of orchids, one-celled, with three rows of seeds on the inner surface of the walls; in a few genera, however, as in the *Selenipedium* section of the Ladies' Slipper, *Cypripedium caudatum*, *C. caricinum*, &c., the ovary is three-celled, thus approaching a group of plants, the *Apostasias*, which were formerly separated from the Orchids as a natural order, but are now united with them by the leading botanists. The fruit frequently takes a considerable time to arrive at maturity, some months, or even a year, and when thoroughly ripe often splits into three divisions. It is sometimes very fragrant and edible as in the *Vanilla*. The seeds are very minute, and are produced in extraordinary numbers, and some very interesting calculations have been made respecting them by Mr. C. Darwin and others. Thus, a single capsule of *Cephalanthera grandiflora* has been found to contain 6,020 seeds, and one of *Orchis maculata* had 6,200, or 186,300 upon a plant. A single plant of *Acropera* has been estimated to produce 74 millions of seeds, and a *Maxillaria* has been stated to contain nearly two millions of seeds in one capsule. Allowing 400 bad seeds in each capsule of *Orchis maculata*, Mr. Darwin has estimated "the possible rate of increase of this species is such that the great grandchildren of a single plant would nearly clothe with one uniform green carpet the entire surface of the land throughout the globe." The seeds are covered with a loose, sometimes netted coat, and often appear very beautiful under a microscope. They are in many species a great time in germinating, and a year or 18 months sometimes elapses before the young plants can be seen, and then their growth is very slow for several succeeding years, so that it is not an uncommon thing to have to wait five to eight years before flowers are produced. This, however, specially refers to the exotic orchids cultivated under glass, as some germinate and flower much more quickly.



ORCHID MYSTERIES.

PERHAPS in no members of the vegetable kingdom is the remarkable phenomenon of heteromorphism, or the production of diversely formed flowers upon the same plant, more distinctly exhibited than in the two peculiar and interesting genera of Orchids, *Catasetum* and *Cycnoches*. Observers have from time to time recorded the appearance in some species (chiefly *Catasetums*) of certain strange departures from the typical structure of the floral organs accompanied by the normal flowers of the species and several intermediate forms, all of which were in some instances borne upon the same inflorescence. The first who recorded one of these extraordinary occurrences was Sir R. Schomburgk, who contributed to the Linnean Society a paper describing an orchid he had found in Demerara, which bore on one spike flowers of what had been supposed to be three distinct genera, viz., *Catasetum*, *Monachanthus*, and *Myanthus*. He farther observed that although the *Catasetum* produced seeds freely, the *Monachanthus* was uniformly sterile. This account was published in the Linnean Society's Transactions (vol. xvii.) and attracted the attention of botanists and naturalists generally, but from its singularity was received by many somewhat incredulously. However, in November, 1836, a plant of *Myanthus cristatus* in the garden of the Duke of Devonshire at Chatsworth, also produced flowers of *Monachanthus* and *Catasetum*, similar to the plant described by Sir R. Schomburgk. This specimen was figured in the Botanical Register (vol. xxiii.) and proved beyond all doubt the correctness of what had been previously written concerning the variability of the flowers. Dr. Lindley, in commenting upon the plant, mentions how he first assigned these forms to three genera, distinguishing *Myanthus* from *Catasetum* by the deeply fringed or crested labellum, and *Monachanthus* from both the others by the absence of cirrhi or feelers from the column, and he further remarks in extenuation of this decision, "Nor do I think that as a botanist I could be blamed for these errors, the genera being founded upon characters which no one could, *à priori*, have suspected could pass into each other in the manner that has now been seen." Many other similar specimens have since been noted, and the two pseudo-genera *Monachanthus* and *Myanthus* are now merged in *Catasetum*.

The other heteromorphic genus, *Cycnoches*, is similar in habit

to *Catasetum*, its most marked characteristic being the long, slender, and gracefully arched column which suggested the name, *Cycnoches*, signifying "swan-neck." Only two forms of flowers have been observed to occur on single plants of this genus, and these are usually borne upon two distinct racemes produced from opposite sides of the stem. In 1836 Dr. Lindley received from a gentleman in Birmingham a specimen of a *Cycnoches* which differed from the species then known, *C. Loddigesii*, in having a column dilated and hooded at the apex and in being quite devoid of scent. This he considered a distinct species, and accordingly named it *C. cucullata*, but very shortly afterwards he observed in the garden of the Royal Horticultural Society a plant bearing two racemes, "on one were the fragrant flowers of *C. Loddigesii*, and on the other the scentless flowers of *C. cucullata*."

Well indeed might the same author observe in the "Vegetable Kingdom," "Such cases shake to the foundation our ideas of the stability of genera and species, and prepare the mind for more startling discoveries than could have been otherwise anticipated."

Since that time about six or seven so-called species have been introduced from tropical America, in many of which a similar tendency to produce distinct forms of flowers on the same plant has been noticed, and it is thus extremely difficult to define the specific characters. *Cycnoches Warscewiczii* is one of the more recent introductions, and a specimen exhibited at one of the Royal Horticultural Society's meetings a few years ago showed the dimorphic character extremely well. On one side of the plant was a long drooping raceme of numerous small, dull yellow flowers, with reflexed sepals and petals, a peculiar fringed labellum supported on a stalk, and a slender arching column. Just above, upon the opposite side of the stem, was a short raceme of perhaps half-a-dozen flowers, considerably larger in size, of a greenish hue, and broad flat sepals and petals, a short thick column and a somewhat heart-shaped labellum. It appears probable that in this case the large flower (Fig. 8) is the seed-bearing form; for the other (Fig. 9) although it produces pollinia, seems imperfect in the ovary, and thus the different structures have some bearing upon the phenomenon of fertilisation, an approximation to the monœcious type. It is a curious fact that while the three species *C. ventricosum*, *C. Loddigesii* and *heterochilon* have flowers similar to the large form of *C. Warscewiczii*—*C. pentadactylon*, *C. aureum*, *C. maculatum* and *C. Egertonianum* bear flowers resembling the small form with a fringed stalked labellum.

Vanda, or *Renanthera Lowii*, is also peculiar in this respect. It produces several slender pendulous racemes 6 or 8 feet long, the majority of the flowers being of a reddish colour, veined with yellow, but near the base of the inflorescence are two flowers



FIG. 8.—LARGE FLOWER OF CYCNOCHES WARSCIEWICZII.



FIG. 9.—SMALL FLOWER OF CYCNOCHES WARSCIEWICZII.

quite different in hue, being yellow spotted with crimson. This has probably some bearing upon the fertilisation, but the respective functions of the two sets of flowers have not, I believe, been determined.

MIMICRY IN ORCHIDS.

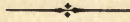
SEVERAL instances of mimicry have been given in the foregoing notes, but hundreds of others might be named; a few of the most distinct will, however, suffice. Many of our British Orchids possess flowers which are very suggestive of insects, as the Fly, Bee, and Spider Orchids, *Ophrys muscifera*, *apifera*, and *aranifera*; others again resemble animals, such as the Frog Orchid, *Peristylis viridis*, *Orchis Macra*, the Monkey Orchid *O. Hircina*, the Lizard Orchid, and others, which in some degree resemble various creatures. Amongst the exotic Orchids the mimicry is still more striking, as in the Dove plant, *Peristeria elata*, *Spirito Santo* of Panama (see Fig. 4), the flower of which, viewed in front, is much like a Dove about to alight.

The celebrated Butterfly Orchid, *Oncidium Papilio*, is also very remarkable, and its extraordinary flowers are said to have attracted the Duke of Devonshire's attention so strongly at one of the London Horticultural Society's Meetings many years ago that it induced him to give his attention to Orchids, and led to the formation of the noted Chatsworth collection. Wings, head, and antennæ are strangely imitated, the resemblance to a Butterfly when first seen being almost startling. In *Cynoches ventricosum* (Fig. 3) the column is slender and elegantly curved, the lip seeming to represent the body, and the petals the wings of a swan. An extraordinary species, the Toad Orchid, *Megaclinium Bufo*, has been thus graphically described. "Let the reader imagine a green snake to be pressed flat like a dried flower, and then to have a row of toads, or some such speckled reptiles, drawn up the middle in single file, their backs set up, their forelegs sprawling right and left, and their mouths wide open with a large purple tongue wagging about convulsively; and a pretty considerable approach will be gained to an idea of this strange plant, which, if Pythagoras had but known about it, would have rendered all arguments about the transmigration of souls superfluous."

FERTILISATION.

To effect the fertilisation of the flower, and the production of seeds which are to perpetuate the plant, it is necessary that the pollinia be conveyed to the stigma, and as in the majority of cases these organs are so placed relatively that it cannot be accomplished without foreign aid, we perceived a reason for the numerous elaborate contrivances that compel or induce insects to afford the requisite assistance. It has, however, been observed that in some species, like *Ophrys apifera*, self-fertilisation is commonly effected, owing to the pollen masses partly falling out of the anther case, and hanging in front of the stigma, against which the slightest wind blows them. On the other hand, it would require a large volume to describe the multitudinous plans by which the conveyance of pollen masses from one flower to another is provided for, examples of which can be found in plenty of our wild orchids. These and similar flowers are ably described in Mr. Darwin's celebrated work on Orchids, and cannot be referred to here, as without full description their action could not in most cases be rendered clear. One extraordinary example may, however, be given in *Coryanthes macrantha*. In this and others of the genus the lip is formed like a "bucket," one portion of which secretes a fluid that falls into the lip and remains there until evaporated, or it sometimes fills the "bucket" and overflows by a spout. *C. macrantha* has projections upon the lip, which tempt bees to gnaw them; and Dr. Cruger has observed that "the bees may be seen in great numbers, disputing with each other for a place on the edge of the hypochil. Partly by this contest, partly perhaps intoxicated by the matter they are indulging in, they tumble into the "bucket" half full of fluid; they then crawl along in the water towards the anterior side of the "bucket," where there is a passage for them between the opening of this and the column. If one is early on the look out, as these bees are early risers, one can see in every flower how fecundation is performed. The humble bee in forcing its way out of its involuntary bath has to exert itself considerably, as the mouth of the epichil and the face of the column fit together exactly, and are very stiff and elastic. The first bee, then, which is immersed will have the gland of the pollen mass glued to its back." It passes out with this, and perhaps enters the same or another flower. when the pollen masses are placed directly upon the stigma

in coming out as before. After the pollen masses are deposited upon the stigma of an orchid, minute tubes are emitted as in ordinary pollen, these passing down the tissue of the column to the ovary, where they fertilise the ovules. It is strange, however, that in some orchids, several days, weeks, or months are required for the tubes to perform this journey, although the distance is much shorter than in numbers of other flowering plants. Sachs, too, has remarked that "the embryo remains until the seed is ripe as a small round body, consisting of only a few cells, without any external differentiation into stems, leaves, and root; this only takes place after germination, and even then sometimes quite imperfectly." To insure the fertilisation of the ovules, a large number of pollen tubes enter the ovary, and occasionally they can be there seen by the naked eye, like a number of fine white hairs. When fertilisation is effected, the flowers at once commence fading, and it is curious to see flowers, that would perhaps have lasted for several weeks, show signs of decay in a few hours after the pollen is placed on the stigma.



THE THEORY OF ORCHID STRUCTURE.



A FEW words only need be given upon this, but they will perhaps serve to render the strange formation of orchid flowers more readily understood. Tracing the origin of abnormal structures, or their resemblance to the normally formed organs, is termed Homology, and applying this to the orchids, the following results have been obtained, which are now generally accepted, though many different views had been held previous to Darwin's time. The column of an orchid flower is theoretically regarded as composed of four stamens and three pistils, two other stamens being combined with the lip, and thus explaining its occasional three lobed form. The stamens are considered to be in two rings, the uppermost of the outer ring being that usually fertile, and the upper two of the inner ring are those seen in *Cypripedium*, while the lower two of the outer ring are those united with the lip; the two outer of the stigmas are united, and the upper one forms the rostellum. Comparisons with the flowers of allied plants, and tracing the bundles of spiral cells from the stem, have formed the foundation of this view.

By what means such changes have been effected and such remarkable structures produced we cannot tell. Evolution would teach us that if all the lost forms were present a gradation could be traced to one primitive form; that by the "survival of the fittest" there has been a continual advance in complexity of structure, and as Sachs observes, "A few million years, more or less, is a matter of but little consequence in the explanation of facts which require lapse of time in order to reach a given magnitude." Still the difficulties are innumerable, and it is impossible to understand upon the evolution theory alone why the changes that have taken place should have resulted in such astonishingly diverse contrivances for effecting the particular purpose of cross-fertilisation, for to this the majority tend. The advantages derived from cross-fertilisation have been ably described, in the struggle for life the plants thus obtained seeming usually to possess greater strength than those from self-fertilised parents; yet there are numbers of Orchids in which the adaptation seems directly in favour of self-fertilisation, and some are apparently planned for both methods. In the majority of cases, however, there is a manifest adaptation of the various organs to a particular purpose, and had the estimable Dr. Paley been familiar with the wonderful structure of Orchids, when he wrote his celebrated "Natural Theology," he would unquestionably have derived from them a powerful addition to his argument of design.

CLASSIFICATION.

Founded chiefly upon the characters of the Pollen-masses, Dr. Lindley formed a system of classifying Orchids, that may be briefly summarised as follows:—

Pollen-masses, waxy.

Malaxideæ, no caudicle.

Epidendreæ, one or two caudicles, but no gland.

Vandææ, one or two caudicles, attached gland.

Pollen-masses, granular or powdery.

Ophrydeæ, anther adnate to the top of the column.

Arethuseæ, anther operculate over the rostellum.

Neottieæ, anther erect, behind the rostellum.

Abnormal tribes

Cypripediæ, anthers 2.

Apostasiææ, anthers 2 or 3, Ovary 3-celled.

This has been generally accepted, but the latest system is

Mr. Bentham's modification of Lindley's, in which the Malaxideæ are incorporated with the Epidendreæ, the Arethuseæ with the Neottieæ, and the Apostasieæ with the Cypripediæ, thus reducing the number of tribes to five, each being divided into subtribes, the total number of these being twenty-seven.

THE USES OF ORCHIDS.

It has been frequently observed that families of plants which yield us the most beautiful flowers are often the least productive of substances useful to man, and this is shown in orchids; for, considering their numbers, very few are in the slightest degree beneficial as food, medicine, or in any similarly practical way. Yet, owing to their beauty, they have gained a commercial value superior to many plants of much more economic importance. The two chief products are Salep and Vanilla, of which the following full particulars are given by Dr. Robert Hogg, in his "Vegetable Kingdom":—

Salep is a substance much used as a nutritious food in the East, and is habitually used by the Turks and Persians at their meals. It is a fecula produced by the tubers of *Orchis mascula* and other allied species. This plant is one of our most abundant British orchids, and is found in woods, pastures, and by waysides. It also grows plentifully throughout Europe, Northern Africa, and the East. In Persia the fecula is obtained by washing the roots, and throwing them into boiling water to remove the outer skin; they are then dried, strung on cords, and hung in the sun till they are perfectly free of moisture, and will keep without injury for almost any period; they are sometimes dried in ovens. These bulbs, when thus dried, vary from the size of a cherry-stone to that of an olive, are slightly transparent, and of a horny colour; they are very difficult to pulverise, and, to facilitate the operation, they should be soaked in cold water till they become soft, and then rapidly dried. When reduced to powder, it is dissolved, like other fecula, in water, milk, or broth, requiring sixty parts of liquid to one of fecula. It is employed, in the East particularly, as a restorative and powerful analeptic, against weakness of the forces. In Poland the decoction of Salep is the drink used in

almost all diseases. It is highly nutritive, and may be used for the same purposes as sago, tapioca, and arrow-root. Dr. O'Shaughnessy states that two drachms afford a sufficient meal for an invalid; good salep, carefully prepared, is, in truth, one of the best articles of diet a convalescent can use. In India the salep of Cashmere is reckoned the best, and is obtained chiefly at the Hurdwar fair, from the Cashmere merchants. Dr. Royle considers the plant that yields Cashmere salep is an *Eulophia*. *O. morio* and *O. militaris*, both natives of Britain, also supply salep, equal in quality to that obtained from *O. mascula*, and it has been suggested that the substance might be profitably made in this country. The best time to gather the tubers is when the seed is formed and the stalk is going to fall, for then the new bulb, of which salep is made, is arrived at its full size. The new roots are washed in water, the outer skin removed, and then set on a tin plate, in an oven heated to the degree of a bread oven. In six, eight, or ten minutes they will have acquired a transparency like horn, without being diminished in size; they are thus to be removed into a room to dry and harden, which will be done in a few days, or they may be finished in a slow heat in a few hours. In North America salep is obtained from a species of *Habenaria*.

Vanilla was generally believed to be the fruit of *Vanilla aromatica*, but it is now supposed to be that of *V. planifolia*. It is a parasitical plant, with a long tortuous stem, twining among trees, and rising to their tops by means of suckers, after having taken root at their base, in the chinks of rocks, &c. It is found in humid, shady places in Mexico, Peru, Brazil, and Guiana, and it is cultivated in Cayenne, St. Domingo, the Mauritius, and Ceylon. The fruit, which is the part used, is straight, 4 to 8 in. long, and three or four lines thick, slender and curved at the end next the flower, and obtuse at the other extremity, containing, within its tough shell, a soft black pulp, in which numerous minute, black, glossy seeds are embedded. These seeds are, when the fruits open at perfect maturity, often adherent to the external surface of the pods, placed in plaits or channels, and it is there that a liquid, called *baume de vanille*, exudes. This is unknown in Europe, but it is made use of in Peru. The fruit has a strong, sweet, peculiar, and agreeable odour; a warm, aromatic, sweetish taste, and the interior pulpy matter is the most aromatic. It appears as if it contained benzoic acid, which is so abundant that it effloresces on the surface of the pods in fine needles. The pods are collected before they are ripe, and about three parts dried, then covered over with a coating of the oils, either of cocoa-nut, or castor-oil, or of *Anacardium occidentale*, to keep them pliant, to check the evaporation of the aromatic properties, and to protect them from the attacks of insects. They are then tied in

bundles, surrounded with sheet lead, or enclosed in small tin boxes, and sent to market. Vanilla is an aromatic substance, facilitates digestion, and is one of the most powerful aphrodisiacs, if taken in a large dose. It is used by perfumers, rectifiers, and distillers; but it is principally employed in flavouring ices, sherbets, bonbons, pastry, creams, and other articles of the dessert, and particularly chocolate, to which it imparts a sweetness and a beautiful delicacy, which assists in its digestion, and makes it useful in restoring the gastric forces when they are impaired. It thus strengthens the stomach, intestines, and heart; gives strength and activity to the brain and the mental powers, and is therefore recommended to hypochondriacs and others whose intellect is impaired. It is almost constantly used by the people of South America.

It may be added in reference to Vanilla that the powerful odour produced by the ripe fruit is said to have an intoxicating effect upon the men employed in gathering them.

Of the Bourbon Isle Faham, *Angræcum fragrans*, the leaves are termed Bourbon Tea, and are said to "taste like bitter almonds and smell like Tonquin beans," being employed to stimulate digestion, and in cases of pulmonary consumption. Helleborine root, *Epipactis latifolia*, has been employed for inflammation of the joints, the roots of an *Himantoglossum* and *Spiranthes autumnalis* are reputed aphrodisiac, those of *Gymnadenia conopsea* are said to be useful in dysentery, and of an *Arethusa* for humours and toothache, of *Spiranthes diuretica* for purposes implied by its name, of *Cypripedium pubescens* as an antispasmodic, of *Bletia verecunda* as a stomachic, of the Putty-root, *Aplectrum hyemale*, as a cement, the native Tasmanian potato, *Gastrodia sesamoides* is eaten like a potato, while the juice of some *Catasetums*, thickened by boiling, is employed in Brazil as a glue. There are others which owe various qualities of a similar character to the tubers, in which the most active properties of the plants are contained.



THE HOMES OF ORCHIDS.

RICHNESS and diversity characterise the vegetation of all tropical climates, except those remarkable for their aridity, and wherever we get heat and moisture in abundance there we find the Orchids luxuriating, especially the epiphytes, which clothe the tree stems with verdant foliage and brilliantly-coloured flowers, filling the air with hundreds of indescribable odours, and dancing about on every breeze, like myriads of marvellous winged insects, or exciting attention by their stateliness and aristocratic beauty. In that great archipelago, whereof Java, Borneo, and Sumatra are the principal islands, the necessary conditions for tropical vegetable life seem to be exactly provided, and there, accordingly, plants of innumerable kinds grow with rapidity and vigour, forming a density of vegetation such as non-travellers of temperate climes like our own can form but a very imperfect idea. Java, especially, is wonderfully rich in plant forms. "Few spots," says Dr. Seeman, "support a more luxuriant and diversified vegetation than the Island of Java. It is literally teeming with botanical treasures. Ferns and orchids, palms and oaks, bananas and nutmegs, vines and convolvulus, and an endless host of other plants, of which not even the name has penetrated beyond the circle of scientific botanists, cover its surface." But as in most other tropical lands where there are considerable elevations, there is also a good range of temperature; for instance, the traveller already quoted observes, still referring to Java: "After emerging from the Coast region, and ascending to the height of 4 to 6,000 feet, one experiences so great a change in everything surrounding him, that he can hardly believe himself to be in the same island. Instead of the sultry heat and clammy atmosphere, he now inhales a pure, cool air, which exercises a delightful reaction upon his spirits; mountain streams of delicious coolness are met with at every step, and a bright verdure is spread over hill and dale." Yet there essentially tropical plants are still found, and it affords a hint that some of the most successful cultivators of Orchids have taken full advantage of, in reducing the excessively high temperatures which were at one time considered necessary to these plants.

One feature of tropical vegetation which differs greatly from that of temperate climes, is the large numbers of species found in a comparatively small area. In Europe, for example, we have large forests of one or two species of trees, and thousands of

acres of open moorland similarly clothed with a few species of dwarf plants, like the common Ling; but in the tropics every few square yards is a small botanic garden. This is shown by the fact that a dozen different species of Orchids have been found growing upon one tree, and it is estimated that over 300 species have been introduced from Java alone. Concerning this region Mr. F. W. Burbidge has written most interestingly in his "Gardens of the Sun," and some charming passages occur in reference to the plants and orchids. As regards the temperature of this district, and Java may be taken as an example of several others, it has been recorded that on the Northern coast it is excessively hot and sultry, but elsewhere, and especially in the higher regions, it is much cooler, or even cold. In the dry season, from April till October, the average temperature is about 86 deg., while in the wet season, from November till March, it ranges from 83 deg. to 90 deg. Upon the Indian continent, in Burmah, and contiguous countries, where Orchids are also found in considerable numbers, the seasons are similar, namely, in wet and dry periods the former the season of growth, and the latter that of rest; but the further inland the situation, the greater are the extremes of temperatures, and in some places the rainfall is excessive, amounting to hundreds of inches a year.

Turning to the tropics of the New World, we have almost similar conditions in Southern Mexico, Guatemala, Peru, and Brazil, and then again Orchids are found luxuriating in the greatest profusion, but owing to the vast extent of the South American Continent and its high mountains there is a greater range of temperature; and often from the same region plants are obtained which require the two extremes of cool and tropical treatment. Thus, the "Orchid of the Clouds," *Oncidium nubi-genum*, has been found upon the mountains of Peru, at an elevation of 14,000 feet above the sea level, and from this, the highest recorded orchid, there is every gradation to the inhabitants of the lowlands; but large numbers are found in cool moist situations, from 6 to 8,000 feet above the sea, such as our elegant and chaste *Odontoglossum Alexandræ*. To these and similar regions in Mexico, indeed, we owe the majority of the "cool orchids," which are fast becoming such favourites in gardens.

Brazil produces a dense vegetation, and in its almost impenetrable forests are found the gorgeous *Cattleyas*, the noblest of a noble family, and countless others of imposing beauty or strange structure, like the *Catasetums*. The West Indies produce a good proportion of species, some of the earliest introduced epiphytes having been brought thence. Certain orchids in this region have peculiar positions, as with the charming *Epidendrum bicornutum*, which is described by one who has

collected it there as growing upon rocks in Trinidad, fully exposed to the sea; being frequently washed by the waves, yet thriving with a vigour seldom seen under cultivation. North America yields many orchids of the terrestrial class, amongst which the beautiful *Cypripedium spectabile* may be taken as a sample; and in Europe we have also representatives of the same group, Britain alone possessing about three dozen species. They are on open "downs," and in low damp places throughout the greater part of the kingdom, but more especially in the south; and in some districts *Orchis maculata* and *O. mascula* are

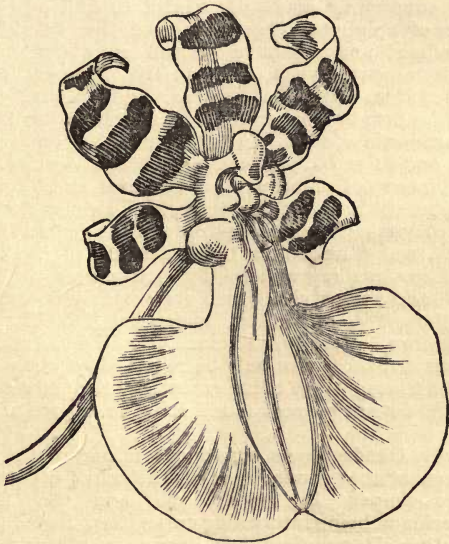


FIG. 10.—*ONCIDIUM TIGRINUM*.

important features of the local flora. As regards the extremes of distribution, it may be mentioned that *Calypso borealis* has been noticed as far north as 68 deg.; in the south *Earina mucronata* has been found in New Zealand, in latitude 35 deg.; and *Gunnia australis* in latitude 41 deg.; and *Dendrobium moniliforme* has been observed in Japan, latitude 37 deg. to 38 deg. north corresponding to the south of Spain. One of the most widely spread orchids is *Spiranthes australis*, which is said to range over 100 deg. of latitude, namely from the Altai mountains in the north to New Zealand in the south.

The great Australian continent, though abounding in distinct types of vegetation and possessing a tropical climate over a large portion of its surface, does not include many representatives of this beautiful family, which a few degrees farther north are so numerous in the islands of the Malayan Archipelago. This is doubtlessly due to the comparative dryness of the climate and the peculiar conformation of the surface, which is somewhat basin-shaped, the higher parts being near the coasts, the large central portion presenting a flat extent of land, mostly arid and desert-like, but relieved in a few localities by slight elevations. In such a country we could not expect to find any remarkable luxuriance of epiphytal vegetation like the humid forests of Brazil produce, and we have instead an abundance of those peculiar dry-climate types, such as the members of the Rue family, the Eucalypti, the Proteas, and others, mostly distinguished by firm or leathery foliage, which frequently possesses powerful aromatic odours. In a few districts, however, Orchids are found, and these include several beautiful species. They are nearly all natives of some part of the east coast from Moreton Bay to Torres Straits, but the terrestrial species far exceed the epiphytes in number; and though outside the genera *Dendrobium*, *Cymbidium*, and *Sarcochilus* there are few of the latter class, yet the others are represented by such genera as *Thelymitra*, *Cadadenia*, and *Pterostylis*, which are scarcely known in English gardens, though two familiar terrestrial Orchids have been observed there—namely, *Phaius grandifolius* and *Calanthe veratrifolia*: but these can only be regarded as strays from more northern latitudes. With these exceptions the terrestrial Orchids of Australia do not possess much value in a horticultural point of view.

The lovely *Dendrobium superbiens* is one of the best of the twenty forms of that genus found in Australia; several others, as the tongue-shaped *D. linguæforme*, and the Gherkin-like *D. cucumerinum*, being interesting curiosities. Some have strange positions, thus *D. æmulum* has been seen growing upon "the rugged Eucalyptus, in the open dry forests near Port Jackson." *D. undulatum* grows upon "barren hills, in tufts, on bare rocks, exposed to the full heat of the sun, and *D. linguæforme* is also found upon moss-covered rocks near Port Jackson and Moreton Bay.

As might be expected, there is a great range in the temperature of so large an extent of land, the mean annual temperature varying from 60 deg. in the south to 80 deg. in the north; and the annual rainfall also varies considerably—namely, from 80 inches on some parts of the east coast to 12 inches, or even less probably, in the drier regions, so that it is of much importance to know the precise locality from which plants are obtained.

Some terrestrial orchids are natives of South Africa, especially in the Cape of Good Hope district, whence we have had the brilliant *Disa grandiflora*, which is scarcely equalled for beauty amongst that species of the group; there, too, is found the blue flowered orchid, *Herschelia cœrulea*.

On the West Coast of Africa, in Madagascar, in Bourbon, and Mauritius, is the head-quarters of the *Angræcums*, which revel in much heat and moisture, and there (in Madagascar) the Rev. W. Ellis spent a considerable time, two of the chief results of his travels being the descriptive works which have interested so many readers, and the introduction of the strange *Angræcum sesquipedale*, which has been previously noticed.

A few of the principal genera may be mentioned as examples of the distribution of Orchids. *Aerides*, chiefly East Indies, Java and Philippines; *Angræcum*, West Africa, Madagascar, &c., &c., also a few in South America and Japan; *Cattleya*, Brazil, Guatemala, Mexico; *Cypripedium*, East Indies, Archipelago, Europe, and North and South America; *Dendrobium*, East Indies, Archipelago, Philippines; Japan and Australia; *Epidendrum*, Brazil, Peru, Guatemala and Mexico; *Lælia*, similar; *Masdevallia*, New Grenada and Peru; *Odontoglossum*, Guatemala, Peru and Mexico; *Oncidium*, Brazil, Guatemala and Mexico; *Phalænopsis*, Java, Manila and Philippines; *Vanda*, East India, Java, Borneo, China and the Philippines. It is worthy of remark that in endeavouring to imitate the natural condition under which orchids grow, it has been thought that gases arising from decaying vegetation, always more or less abundant in tropical countries, are beneficial to the plants. In some degree this may be true, but travellers tell us that orchids avoid all pestilential districts, and appear to prefer the most healthful positions. Some advantage has, however, been derived from large beds of leaves beneath the plants, though probably this was due more to the constant moisture so provided than to anything else; one cultivator has, however, advocated the employment of carbonate of ammonia in small quantities to furnish a supply of ammonia.

THE HISTORY OF ORCHIDS.

It would be impossible within the limits of a small treatise like this to give an exhaustive review of the history of Orchids, but a brief summary will permit some idea to be formed respecting the advance made during this century, and the popularity extended to these plants at the present time.

Most of our British Orchids were known to the old herbalists, Parkinson and Gerarde, and by them were described or figured; but in their time no exotic species were to be seen in English gardens, though botanists very soon afterwards began to have a knowledge of some of the East and West Indian Orchids. It was, however, very imperfect, and it was not until Linnæus published his "Species Plantarum," in 1763, that an approach to an accurate idea either of their number or characters could be obtained. Ninety-one species were enumerated in that work, and all the epiphytal orchids then known were placed in the genus *Epidendium*. At that time there were only four exotic species in cultivation in England, namely *Cypripedium parviflorum*, 1759; *C. spectabile*, 1731; *Vanilla aromatica*, 1739; and *Bletia verecunda*, 1731; and these were probably known in very few gardens, though they were all grown by Philip Miller, in the Apothecaries' Garden, at Chelsea. Four years previously, namely, in 1759, Mr. W. Aiton, one of Mr. Miller's pupils, was appointed to the charge of the Botanical Gardens, at Kew, and a catalogue of the plants published by Dr. Hill, in 1768, showed that the collection was fast becoming of importance, and this was still further confirmed by Mr. Aiton's "Hortus Kewensis," which appeared in 1789. Previous to 1780, in addition to those already named, only the following had been introduced: *Bletia Tankervilleæ*, China, 1778, Dr. J. Fothergill; *Epidendrum fragrans*, subsequently figured as *E. cochleatum*, in the "Botanical Magazine," plate 152, Jamaica, 1778, Francis Goldney; *E. conopseum*, Florida, 1775, Dr. J. Fothergill; *Malaxis liliifolia*, North America, 1758, Peter Collinson, and *Calopogon pulchellus*, North America, 1771, William Malcom. As far as can be judged from these records, and some additional evidence furnished by an old work by Martyn, the first exotic orchid that was introduced to England was *Bletia verecunda*, which was sent over to Mr. Collinson, about 1731, as a dried specimen, but the tubers being planted, grew and flowered. *Cypripedium spectabile*, or *album*, as it was also called, however, appears to have been in cultivation about the same time or very shortly afterwards. In the next twenty years several species were brought to this country, chiefly through the means of Sir Joseph Banks, and the total number in cultivation, including native species, had increased to about 50. These included the first introduction of the firm, Messrs. Loddiges, *Cymbidium aloifolium* (1786); and the now well known *Aerides odoratum* (1809). A botanical work by Persoon, a few years later, enumerated several hundred species of Orchids as known to science, but the cultivated species did not keep space with their rapid increase, as the second edition of the *Hortus Kewensis*, published in 1813, only gives the names of 118 as comprised in that collection. By 1826, however, the number had advanced to

326, as we learn from Sweet's "Hortus Britannicus," of that date. During this period, Messrs. Loddiges', of Hackney, were doing much to spread a knowledge of Orchids, both by introduction and good culture, and their catalogue issued about this time enumerated 84 forms, which was then a remarkable collection for one firm. Taking four of the largest genera, we find the following members of species in Sweet's list: Epidendrum, 17; Oncidium, 12; Dendrobium, 10; and Cypripedium, 8. Of the same genera in 1840, Paxton enumerated of Epidendrum, 48; Oncidium, 43; Dendrobium, 40; and Cypripedium, 12, when the first *Odontoglossum* *O. cordatum* is named; while in the next ten years, the members had increased surprisingly, no less than 94 *Dendrobiums*; 172 *Epidendrums*, and 69 *Oncidiums* having been added to the list. These will convey some idea of the advance made, but the increase has been very rapid since then, for it is variously estimated that at the present time, between 4 and 5,000 species are known, of which probably at least half are in cultivation, about 200 species each of *Dendrobium* and *Oncidium* being known, while the *Epidendrums* have advanced to 400 species, other genera being proportionate.

At the commencement of the third decade of the present century, orchid growing was making some progress, Mr. Richard and Mrs. Arnold Harrison's collections at Aigburth, Liverpool, attracted much attention, Mr. Jas. Bateman, Knypersley Hall, Congleton, was gaining fame as an orchidist, and Mr. John Lindley, who commenced editing the "Botanical Register" in 1829, was giving much study to the family, the result being, that the plants were brought prominently into public notice. Mr. Cattley of Barnet, and the Rev. T. Huntley of Kimbolton, also grew considerable numbers of orchids. Collectors were dispatched to various regions, and the result of their journeys was the successful importation of many plants. In 1833 and 1834, Kew was enriched by collections from Demerara and Surinam, brought by Messrs. Aldridge and Lance, while Mr. Colley collected in Demerara, and dispatched to Mr. Fairbairn of Oxford, 60 species, two-thirds of which were said to be new. Mr. Knight of Chelsea, also, having acquired Mrs. Arnold Harrison's orchids, soon formed a considerable collection, the Liverpool Botanic Gardens, the London Horticultural Society, and Messrs. Lee, had more or less extensive collections. In the course of this decade, the Duke of Devonshire began to increase his collections, and Mr. John Gibson was dispatched to the East Indies in search of novelties, several hundreds being sent home during 1837, and in subsequent years the Chatsworth collection became, under the charge of Mr. Paxton, one of the most noted in the kingdom. In 1841, the "Gardener's Chronicle" was founded, and aided still farther in extending the public favour to these plants,

indeed it would be impossible to estimate how much this periodical has done for orchid lovers and orchid growers. Collections continued to increase. The celebrated Mrs. Lawrence of Ealing Park became widely famed as one of the most enthusiastic and successful amateur orchid growers. Mr. S. Rucker of Wandsworth, and Mr. Edwards, gardener to the Duke of Devonshire, at Chiswick, and the Rev. John Clowes, Broughton Hall, Manchester, also held prominent positions amongst the cultivators of the time. The travels of Galeotti in Mexico, and of Gardner in Brazil, yielded large numbers of plants, Warscewicz also dispatching considerable consignments from Costa Rica. Mr. George Ure Skinner, during a number of years before and after this time, sent several important collections from Guatemala, and sales in London became frequent. A few of the large collections began to be dispersed, the Rev. John Clowes' orchids were left to Kew in 1846, and Mr. Bateman's were sold in 1850, but the general increase continued rapidly. "The Cottage Gardener," which subsequently developed into the "Journal of Horticulture," was founded in 1848, and afforded another means of communication between orchid growers, Mr. Donald Beaton and others contributing materially to the advancing interest in the plants. It should also be here added, that subsequently, the "Gardener's Magazine," and later still, the "Garden" have also contributed largely to the extension of orchid culture. In the meantime a distinguished cultivator of orchids was coming to the front, Mr. B. S. Williams, gardener to C. Warner, Esq., Hoddesdon, Herts, who was one of the most successful exhibitors of these plants at that time. He contributed a series of articles to the "Gardener's Chronicle," entitled "Orchids for the Million," which were in 1852 reprinted as the first edition of his "Orchid Growers' Manual," that has since then passed through five editions, and a sixth is in course of preparation. Quite a little colony of orchid growers was formed in the neighbourhood of Hoddesdon, from which liberal contributions soon appeared at the Chiswick and Regent's Park Shows. Mr. Woolley, gardener to H. B. Ker, Esq., and Mr. Clark, gardener to Mr. Webb, being amongst the principal, and from other districts came Mr. Hume, gardener to Mr. Hanbury, The Poles, Herts; Mr. Carson, gardener to F. Farmer, Esq., Cheam; Mr. Rae, gardener to J. Blandy, Esq., Reading, who some years before had secured Mr. Barkers' collection; Mr. Bassett, gardener to R. S. Holford, Esq., Weston Birt; Mr. Pass, gardener to T. Brocklehurst, Esq., Macclesfield; Mr. Dean, gardener to J. Bateman, Esq., Knypersly; Mr. White, gardener to H. Kenrick, Esq., Birmingham, and Messrs. Gedney, Ivison, Keele, Dunsford, Green and Dodds. In 1853, considerable interest was given to the Chiswick exhibitors by the Horticultural Society offering some valuable prizes for collections of twenty

orchids, the chief being the large gold medal, value £15, and the gold Knightian medal, value £10, other medals being offered for smaller collections, and the result was some beautiful displays of well-grown plants, *Aerides* and *Saccolabiums* being especially well represented at that time. The leading trade exhibitors were Messrs. J. Veitch and Sons, and Rollissons of Tooting, both of whom were paying great attention to the orchid family, and forming vast collections.

In the course of 1853 large numbers of plants were collected by Warscewicz, on the Eastern Cordillera of the Andes, in a country that had previously been unexplored. Amongst these were many valuable treasures, which were eagerly purchased by the amateur and trade orchidists at high prices. Several important works upon orchids had appeared by this time, such as Bateman's *Orchidaceous Plants of Mexico and Guatemala*, and Lindley's *Genera and Species of Orchids* (1830-1840), and in 1854 the "Pescatorea" was commenced, with it being connected such men as Linden, Lüddeman, Planchon, and Reichenbach, all names of note in the orchid world. Linden, at Brussels and Ghent, had formed large collections. Lüddeman had charge of M. Pescatore's collection at Paris, and Reichenbach was rising high in fame as a skilled botanist. The last mentioned has for many years worked most assiduously amongst the orchids, he has devoted a life time to their study, and no one at the present time has such a competent knowledge of the family as he. Unfortunately his writings are much scattered, and we do not possess—what many earnestly desire—a full botanical elaboration of the order from his pen. In 1855-6 and 7 some important collections were dispersed, of which Mr. Schröder's, Loddiges', and that of the London Horticultural Society, were the principal, and some probably thought that "the orchid passion" was declining, but this was far from being the case, as subsequent events abundantly proved.

Some reference has already been made to the expansion of Messrs. J. Veitch and Sons' orchid collection, and it was brought still more prominently into notice in 1858, for it was then they first exhibited a hybrid orchid. This was *Calanthe Domini*, the result of a cross between *C. Masuca* and *C. furcata*, obtained by Mr. Dominy, foreman at the Exeter nursery, and exhibited at the Crystal Palace, September 8th and 9th, 1858. With it were shown several hybrid *Cattleyas*, between *C. Harrisoniæ* and *C. granulosa*, which also attracted much attention. Remarking upon these in the "Cottage Gardener," Mr. Beaton said, "There is not the slightest doubt about *Oncidiums*, *Dendrobiums*, *Epidendrums*, and all the great families sporting like *Calceolarias*; nor that nine-tenths of the pride of botanists—the species—are mere seedling varieties, which get fixed in time by

local influences. There is not such a thing in nature as a species as meant by botanists." This seemed to contain a prediction that has been most amply fulfilled in the scores of beautiful hybrids raised since then by Mr. Dominy, and especially by Mr. Seden and others. The first hybrid was indeed the commencement of an important era in orchidology, and well did Mr. Dominy deserve the numerous substantial testimonials that have been awarded to him. In another respect Messrs. Veitch were also fortunate in procuring the services of two enthusiastic plant collectors, the Brothers Lobb—Mr. Wm. Lobb, who travelled in America, and Mr. Thomas Lobb, who wandered over India, Assam, Borneo, Java, and the Philippines, adding grand stores of useful and handsome plants, including large numbers of orchids, to the Veitchian possessions.

Progress still continued, and the sixth decade was marked by several important events. The celebrated work on orchids, by Mr. Charles Darwin, appeared in 1862, and may be fairly said to have revolutionised opinion with regard to these plants. It was entitled, "The various contrivances by which orchids are fertilised by insects," and, so ably was the subject discussed, that it attracted the attention of the whole scientific world. Twenty years later a second edition was issued, with several important additions, and the work is invaluable for all interested in Orchids.

Mr. Robert Warner, of Broomfield, Chelmsford, had been steadily working as an enthusiastic orchidist, forming an extensive collection of fine specimens, many of which were subsequently

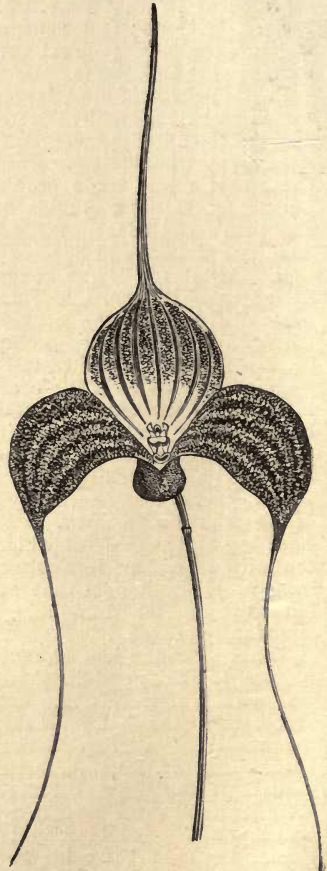


FIG. II.—MASDEVALLIA SHUTTILEWORTHII.

exhibited at all the leading shows, both at home, on the Continent, and even as far as St. Petersburg. With Mr. B. S. Williams Mr. Warner at the period under notice commenced a magnificent work, entitled, "Select Orchidaceous Plants," which gave coloured plates of the plants, natural size, and it is still issued at intervals.

A series of highly interesting lectures upon Orchids was also given at this time by Mr. J. Bateman, at the meetings of the Royal Horticultural Society, and the same gentleman, untiring in his efforts to maintain the interest in Orchids, offered a challenge medal or a prize of £20 in money to be awarded to the exhibitor who gained most marks for those plants at the exhibition of the Society. This was gained in 1868 by Mr. James Anderson, gardener to T. Dawson, Esq., Meadow Bank, Uddingstone, near Glasgow, by a large majority. The wonderful Meadow Bank collection was then in its prime, and many a grand specimen was shown by this skilful grower that provoked the good tempered envy of less successful competitors.

The record of several important sales of Orchids, *i.e.*, those of Mr. J. A. Turner, Pendlebury House, Manchester, in 1868; those of Mr. S. Rucker, in 1872; those of the Rev. William Ellis, in the same year; of Provost Russell, Falkirk, in 1875; and of Mr. Wilkins, in 1877; brings us to 1880, and renders a few words necessary upon the principal Orchid collections of the present times. It may, however, be mentioned that in addition to those already named, the following persons, either as amateurs, growers, or collectors, took an important part in Orchid affairs up to this time:—J. H. Schröder, Stratford Green; J. Gould Veitch, Mrs. Wray, Oakfield; Rev. C. S. P. Parish, Mr. Fairrie, of Liverpool; Mr. W. Maule, Bristol; Earl Fitzwilliam, (Viscount Milton) Wentworth House, Yorkshire; Consul G. W. Schiller, Hamburg; T. Brocklehurst, The Fence, Macclesfield; W. Wilson Saunders, Esq., Bowman, Blunt, Hartweg, Colonel Benson, Kramer, Hutton, Wallis, Hugh Low, Schlim, F. W. Burbidge, Mr. John Day, and R. Dodgson, Esq. To describe the labours of these and others would fill a large volume, for to all, in varying degrees, are Orchid growers of the present day indebted.

Writing in 1841, Mr. Jas. Bateman said that the collections of Orchids were innumerable, and if that was the case then, what would be said now? The plants were then numbered by hundreds now amateurs possess their thousands, and one, Mr. R. Warner, has even had as many as 12,000 plants of one species, *Odontoglossum Alexandræ*. In the leading collections a dozen houses or more are devoted to them, and coming to the trade stores the numbers are overwhelming. When we talk about plants by the 100,000 we seem to be dealing with bedding *Pelargoniums* or *Lobelias*, and not Orchids, yet one firm claims to possess that

number of *Odontoglossums* of the choicest species, hybrids and varieties; other large firms variously enumerate their collections at 20 to 60,000 plants, and these estimates are in some cases under the mark. The capital thus sunk in Orchids is enormous, and considering the salesmen, collectors, growers, and various other persons the trade in these plants gives employment to, we begin to perceive that it is one of the most important departments of commercial horticulture of the present time. Yet, when Miller had only a *Cypripedium* and *Bletia* to test his skill, and Linnæus estimated that further explorations might increase the number of known Orchids to about 100, who could have imagined to what an extent Orchid culture would develop?

In the foregoing hurried review of the advance made, many noted names have been necessarily omitted, and still more must now be passed, for to mention names alone would occupy far more space than can be spared in this small treatise. Glancing around we, however, find that, as it ever has been, there are some who, from their greater enthusiasm or greater wealth, have formed collections of leading importance. Amongst these, a prominent place must be given to Sir Trevor Lawrence, Bart., M.P., President of the Royal Horticultural Society, who, at Burford Lodge, Dorking, has formed a most beautiful and valuable store of plants. During a number of years every effort has been made to secure the choicest and most handsome Orchids in cultivation, and no expense has been spared to render it the chief collection in the country. Under the practical care of the late Mr. Spyers, the plants became famed throughout Europe, and many an invaluable hint in culture has been gained from that careful orchidist. At Downside, Leatherhead, W. Lee, Esq., has gradually increased his collection, until in extent it is probably unequalled. The plants, too, are in grand health, magnificent houses having been erected for them in recent years, of which the span roof *Cattleya* house, 100 feet long, is especially remarkable, though others devoted to *Odontoglossums* are of equal length. Baron Schröder, at The Dell, Egham, has a famous collection, under the charge of Mr. Ballantine, including many rare and valuable hybrids. Mr. R. Warner, at Broomfield, Chelmsford, has of late years devoted his attention more particularly to the "cool house" Orchids, such as *O. Alexandræ*, after proving his powers as an orchidist with *Vandas*, *Cattleyas*, and *Cypripediums*. F. A. Philbrick, Esq., Q.C., Oldfield, Bickley, has for many years taken a prominent interest in Orchids, and has in his five or six houses a choice assortment of the most effective species and varieties, particular favourites being the *Cattleyas*, *Lælias* and *Phalænopses*. Of the last named, few such fine collections can be seen, and all, under Mr. Heims' careful superintendence, are as healthy as could be wished. At Sydenham,

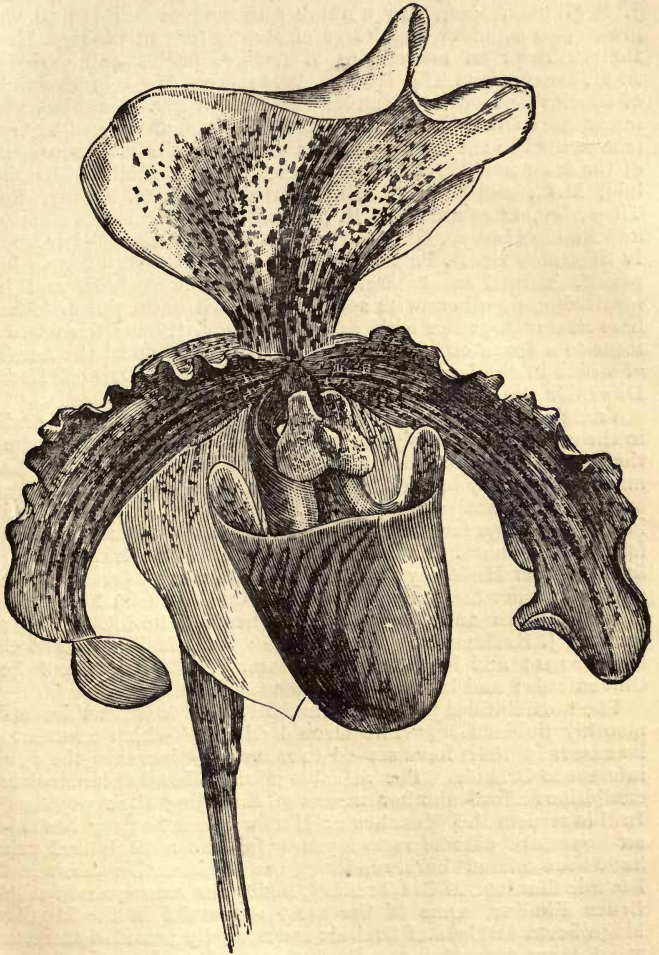


FIG. 12.—CYPRIPEDIUM LEEANUM SUPERBUM

there are several good collections, also at Streatham, where J. Southgate, Esq., has a number of houses devoted to well-grown plants, under the charge of Mr. Salter; at Bickley, H. M. Pollett, Esq., an assortment of choice species and varieties; A. H. Smee, Esq., The Grange, Wallington, has a large number of species and varieties under the care of Mr. Cummins, while many more Orchidists in the Metropolitan district will be found enumerated in the list on another page. In the provinces, some of the most noted Orchid-lovers are the Right Hon. J. Chamberlain, M.P., and C. Winn, Esq., Birmingham; G. Hardy, Esq., Timperley, Cheshire; Dr. R. F. Ainsworth, Lower Broughton; and Enoch Harvey, Esq., Riversdale Road, Aigburth, Liverpool. In Scotland, Dr. A. Paterson, Bridge of Allan, has, during a long period, worked most carefully amongst the Orchids, and has inspired many others with some of his own enthusiasm. Those here named, together with others in the list, have from two or three to a dozen or more houses devoted to Orchids, the number of which in the larger collections, like those at Burford Lodge, Downside, and the Dell, amount to many thousands.

Trade collections are far more abundant than they were earlier in the century, for nearly every nurseryman now includes some of these plants in his stock. There are, however, several who have made a speciality of Orchids, and who grow enormous numbers, occupying extensive ranges of twenty houses or more, varying in size up to 150 feet in length. The leading collections are the following: Messrs. J. Veitch and Sons, Chelsea; Mr. B. S. Williams, Upper Holloway; Mr. W. Bull, Chelsea; Messrs. H. Low and Co., Upper Clapton; Messrs. J. Laing and Son, Forest Hill; Messrs. Heath and Son and J. Cypher and Son, Cheltenham; Messrs. J. Backhouse and Son, York; Messrs. Sander and Co., St. Albans; and in Scotland, Messrs. W. Thomson and Son, Clovenfords; and Ireland and Thomson, Edinburgh.

The horticultural periodicals and Mr. B. S. Williams' beautiful monthly publication, "The Orchid Album," which commenced its career in 1881, have served to materially increase the public interest in Orchids. The valuable prizes offered at horticultural exhibitions afford another means of extending their popularity. In this respect the Manchester Horticultural Society has taken an important part of recent years, for the most liberal prizes have been offered there, rendering the Whitsuntide shows in the Botanic Gardens at Old Trafford, under the management of Mr. Bruce Findlay, some of the most successful in the kingdom. Magnificent displays of Orchids are annually provided there, and at no other place have such numbers of good specimens been staged in competition. No less than £156 are offered in prizes for Orchids alone, and until 1885 this had never been surpassed; but on June 9th of that year, the Royal Horticultural Society

provided a show of Orchids, at South Kensington, at which the prizes amounted to £184. Thus, in one season within a period of three weeks, £340 was offered for Orchids. The Royal Botanic Society have also for many years provided substantial prizes for Orchids, and some very beautiful groups have been obtained at the summer shows. The Crystal Palace Company have similarly supplied good prizes, and other societies throughout the kingdom have contributed in varying degrees to the encouragement of the plants.

The total amount of prizes offered in 1886 is the largest yet devoted to Orchids alone in one year. Birmingham, May 12th, and 13th, £141; Royal Botanic Society, Regent's Park, May 19th and June 9th, £100; Manchester, June 11th to 19th, £150; York, June 23rd to 25th, £50; the Provincial Show of the Royal Horticultural Society at Liverpool, £119, or £566, exclusive of the prizes offered at many other smaller shows, which would bring the total to considerably over £600.

The greatest event of Orchid history was, however, the exhibition and conference at South Kensington, May 12th and 13th, 1885, which proved very successful. The exhibition itself comprised large numbers, many of which were arranged in the conservatory, forming grand central and side banks. It was especially remarkable for the numbers of species and varieties represented, and in this respect has never been equalled. The official report gives full particulars concerning this, and ample notices were given in the horticultural periodicals at the time, so it need not be referred to here farther than to give the names of the principal exhibitors of groups, with the number of species, varieties, and hybrids staged:—Sir Trevor Lawrence, Bart, M.P., 64; W. Lee, Esq., 72; Duke of Devonshire, 40; Baron Schröder, a smaller number, but some of the best plants in the exhibition; J. Southgate, Esq., 60. Other smaller collections came from H. M. Pollett, Esq., A. H. Smee, Esq., J. T. Peacock, Esq., J. C. Duke, Esq., De B. Crawshay, Esq., Royal Gardens, Kew; W. E. Brymer, Esq., W. Cookson, Esq., F. A. Philbrick, Esq., Q.C., and H. Little, Esq. The trade was well represented by Messrs. B. S. Williams, Hugh Low and Co., Sander and Co., Shuttleworth and Carder, J. Veitch and Sons, W. Bull, J. Cypher and Son, and W. Thomson and Son.

As nearly as could be determined from notes taken at the time, the total number of genera represented was 56; of species, varieties, and hybrids, 347. With only two or three exceptions these were all in flower, and in the opinion of a noted continental Orchidist, the whole of Europe, exclusive of Britain, could not have produced such a number in flower at one time. The principal genera were represented by distinct forms as follows—*Odontoglossum*, 66; *Masdevallia*, 48; *Cypripedium*, 40; *Dendro-*

bium, 34; *Cattleya*, 27; *Oncidium*, 19; and *Lælia*, 11. Taking the number of times they were shown in distinct collections, and exclusive of duplicates in the same collection, these genera stand in the same order with the following numbers—*Odontoglossum*, 174; *Masdevallia*, 91; *Cypripedium*, 84; *Dendrobium*, 67; *Cattleya*, 66; *Oncidium*, 31; *Lælia*, 16. If the number of plants of each variety or species had been counted, the *Odontoglossums* would still further predominate. It might be estimated that under 1,000 plants were shown.

On the second day the conference was opened by the President, Sir Trevor Lawrence, with an appropriate speech, and the first paper read was one on botanical subjects, from Professor Reichenbach; this was followed by "The Hybridisation of Orchids," by Mr. Harry J. Veitch, a most interesting and valuable contribution, and an able paper on "The Cultivation of Orchids," by Mr. James O'Brien. When these were concluded the President stated that three gold medals, placed at the disposal of the Royal Horticultural Society by the Trustees of the Veitch Memorial Fund, had been awarded to Professor Reichenbach, for his labours in connection with Orchids; to the Rev. C. P. Parish, late of Moulmein, for numerous introductions of novelties; and to Mr. Seden, for his success in the hybridisation of Orchids. At the afternoon meeting some discussion took place concerning nomenclature, and the employment of manures for Orchids, but the principal points introduced respecting the latter are mentioned in another portion of this treatise,

Three distinguished Orchidists died in 1885, namely: Mr. R. P. Percival, The Clevelands, Birkdale Road, Southport, who died on December 14th. His name is celebrated in *Cattleya Percivaliana*, and the collection was sold by the Liverpool Horticultural Company, February 2nd, 1886. M. Regnier, curator of the Botanic Garden, Saigos, the importer of many Orchids, including *Calanthe Regnieri*, who was killed at Pursat, Cambodge, and Herr Benedict Roetzl, the collector and introducer of many rare South American Orchids, who died at Prague, October 14th.

THE VALUE OF ORCHIDS.

THE auction sales conducted at Steven's Rooms, King Street, Covent Garden, for so many years, at Messrs. Protheroe's, Cheapside, by the Liverpool Horticultural Company, and others, have dispersed many fine collections, and have also been the means of large numbers of imported orchids being placed in the hands of the public. A record of these sales would afford some

curious facts in the history of Orchids, but a short notice of the principal prices that have been obtained will suffice to indicate the enormous amount of money that has been expended upon these plants within the past 40 years. Good prices were obtained as early as 1830, such as £26 for *Sobralia macrantha*; £10 for *Arpophyllum giganteum*; £15 for *Lælia superbiens*, and £17 for *Barkeria spectabilis*. Sales of 48 to 168 lots realising from £118 to £600. In 1846 Mr. Barker's collection was sold to Mr. Blandy, of Reading, for £900, and about the same time a plant of *Vanda Lowi* was sold for £30, a large collection of Central American orchids from Mr. Skinner producing £613. Some of Mr. Bateman's plants were sold in 1850, when *Angræcum eburneum* fetched 19 guineas, *Vanda suavis*, 17 guineas, and others of proportionate amounts. At the sale of Warscewicz's introduction in 1853, the chief amount was 16 guineas for *Epidendrum Frederici Gulielmi*, and at another sale the same year *Phalænopsis grandiflora* realised £15 10s. Prices began to increase, and in 1855, at Mr. Schröder's sale, *Aerides Schröderi* fetched £89, *Vanda suavis* £31, *Aerides affine* £26, and *Oncidium Lanceanum*, said to be the finest plant then in cultivation, £16. The Loddiges' collection was sold in 1856, and one portion of 280 lots realised the sum of £717, *Vanda Batemanni*, £43, *Aerides nobile*, £21, *A. Schröderi*, 19 guineas, and *Saccolabium ampullaceum*, £15.

In the same year, the London Horticultural Society's collection was brought to the hammer, 300 lots realising £554, while in 1859 another portion was sold for £470.

At the first sale the most remarkable plants sold were *Phalænopsis amabilis*, which was bought by the Duke of Devonshire for £68 5s., and this was the fine specimen which Mr. Fortune purchased in the Island of Luzon for a dollar, ten or twelve years previously, and *Lælia superbiens*, the finest specimen in Europe, with 220 pseudo-bulbs, and 17 feet in circumference, £36 15s., bought by Mr. Fairrie, of Liverpool; at the latter sale, *Aerides Schröderi* realised £31. Before this time it is said that the Duke of Devonshire had given Messrs. Rollisson and Son £100 for *Phalænopsis amabilis*. In 1861, Dr. Butler's orchids were sold, 300 lots producing £1,500, *Saccolabium guttatum* and *S. giganteum* fetching £52 and £46 respectively. At a sale in Liverpool, in 1868, Messrs. Veitch gave 67 guineas for the finest plant of *Dendrobium Falconeri* in the country, which a few years before had been bought for 4 guineas. The Meadow Bank collection of 600 lots was sold for £2,000, *Lælia anceps Dawsoni* realising £46, and *Cattleya exoniensis* £32. The Pendlebury orchids were also dispersed for the sum of £2,824, some very high prices having been obtained, as £55 for *Odontoglossum nævium majus*, *Saccolabium giganteum* £72, *Aerides Schröderi* £55, and *Cattleya*

labiata, £31. The Rev. W. Ellis's collection sold for £600 in 1872. Mr. Russell's, of Falkirk, for £2,211, when *Cattleya Russelliana* fetched £44, *Saccolabium giganteum* £72, and *S. guttatum* £65. The Manley Hall collection, S. Mendel, Esq., which during several years (from 1869—73) had gained such fame, was sold for over £4,000, *Saccolabium guttatum superbum* realising £46, *Cypripedium Stonei* £38, *Oncidium splendidum* £47, *Masdevallia Lindeni* £39, and many others for smaller amounts. In 1877 Mr. Wilkin's orchids sold for £1,300. *Cymbidium Parishii*, flowered at Fallowfield in 1878, and also flowered at the same time by Mr. Day, of Tottenham, was purchased by Mr. B. S. Williams for 100 guineas, and is figured in the *Orchid Album I.* 25.

The first portion of Mr. Day's celebrated Tottenham collection was sold early in 1881 for £1,847, when *Cypripedium Stonei platytænium* brought the enormous sum of 140 guineas, the only plants of *Cattleya Bluntii* in the country realising 17 guineas and £42 respectively. The second portion, sold April 12th and 13th, brought £1,803, *Cattleya exoniensis* 48 guineas, *Phalænopsis intermedia* 62 and 42 guineas. *Dendrobium Schræderi* 38 guineas, *Lælia purpurata* 30 guineas, and *Cypripedium Spicerianum* 25 guineas. The third portion was sold the 4th and 5th of May, the total being £1,888 for 659 lots; *Cypripedium Stonei platytænium* 120 guineas, *Cypripedium Spicerianum* 42 guineas, *Cattleya labiata*, autumn flowering variety, 40 guineas, and many others realised similarly high prices. The fourth portion was sold at the end of May for £1,521, when *Cattleya Skinneri alba* realised 52 guineas. The total amount of these four sales exceeded £7,000, and some others were sold subsequently. Since then high prices have been obtained at various sales, but the most remarkable of all was in September, 1883, when a plant of a new *Aerides*, introduced by Mr. F. Sander, was sold, at Steven's Rooms, to Sir Trevor Lawrence for 235 guineas, the highest price ever paid for any orchid. This was subsequently named *Aerides Lawrenciæ*, and resembles *A. quinquevulnerum* in habit, the flower spike 2 feet long, the flowers numerous and intermediate between the species named and *A. odoratum*. The sepals and petals are white, tipped with rose-purple, the lip white, marked with rich amethyst. A portion of Dr. Paterson's collection was sold in 1883, realising £800, the plants bringing large prices as *Cattleya labiata Warneri*, 79 pseudo-bulbs 45 guineas, *C. labiata* 39 guineas, and *Dendrobium thyrsiflorum Walkerianum* 37 guineas.

Plants of *Cœlogyne cristata alba* have been sold for large sums, and it is said that Mr. W. Bull gave £200 for a plant of this variety in the Gledhorn collection, though huge specimens of the common variety have been sold for £10.

This list of prices may be concluded with the following recent sales. The collection of the late Mrs. M. J. Morgan, Madison Square, New York, was sold by auction in October, 1885, but, though it is reputed to have cost £40,000, the proceeds of the sales did not amount to one-third of the sum, yet some large prices were realised. The highest amount was £180, given by Siebrecht and Wadley, New York, for *Vanda Sanderiana*. Messrs. Veitch and Sons gave £150 for *Cypripedium Morganiaë*, which was originally obtained from the Chelsea Nursery, and the other principal prices were *Vanda Lowi* £80, *Cattleya exoniensis* £58, *C. Skinneri* £50, and *Vanda Batemanni* £20. At the sale of the late Mr. Percival's orchids, February 2nd, 1886, the principal prices (in guineas) were as follows:—*Cœlogyne cristata*, Chatsworth variety, 200 pseudo-bulbs, 17; *Lælia anceps Percivaliana*, 47; *Cypripedium punctatum violaceum*, 20; *Cattleya Mossiæ Arnoldiana*, 32; *Cattleya Percivaliana*, 36 pseudo-bulbs, 80; *Lælia purpurata alba*, 113 pseudo-bulbs, 50; *C. elegans alba*, 50; *C. anceps Percivaliana*, 90 pseudo-bulbs, 100; *Dawsoni*, 17, and *Barkeri*, 30. In April, 1886, Mr. Brownlow D. Knox, Caversham, Reading, exhibited at South Kensington a remarkable variety of *Odontoglossum Pescatorei*, with yellow flowers and crimson spots. It was named Knox's variety, and was sold the next day at Stevens' Rooms for £165, Baron Schröder being the purchaser; and ten days later the same Orchidist also purchased a handsome crimson-spotted variety of *Odontoglossum crispum* (*Alexandræ*) for £160, at Protheroe's Rooms.

Some hybrid orchids have realised very high prices by private sale, running up to 200 guineas, and an example of the most valuable is *Lælia bella*, with some of the *Cypripediums*, yet in contrast with these abundance of useful and easily grown orchids can now be purchased for a few shillings each, and for £5, an interesting little collection can be obtained. General Catalogue prices vary from 3s. 6d. to 15 guineas, but orchids may be purchased at lower prices than named, and the most costly varieties are not quoted in the lists. We thus have a remarkable contrast in the value of these plants, for while rare and beautiful species, varieties, or hybrids, have never realised such high prices as at the present time, never could "cool house" orchids be procured so cheaply. As an illustration of the variability of prices, the history of the rich crimson purple-tinted *Dendrobium nobile nobilium*, as related by Mr. H. James, is noteworthy:—"The original plant of *D. nobile nobilium*, was bought at Steven's Rooms in 1876, and was one of a bundle of twelve plants, which cost 12s. It flowered in the imported pseudo-bulb early in 1877, and was exhibited at Kensington. It was shortly afterwards sold to Messrs. Rollisson for 5 guineas, by whom it was exceedingly well grown, and flowered freely in 1879, when it was sent to the

Ghent Show in extremely cold weather and nearly killed. In the following autumn, I bought the apparently dead plant for 75s., and raised six small plants from the tops of the pseudo-bulbs." Small plants still realise 10 guineas each, and larger ones £40 to £50.



DENDROBIUM NOBILE NOBILIUS.

HYBRID ORCHIDS.

THE hybrid Orchids obtained within the past forty years constitute an important addition to the number of attractive cultivated forms, no less than 125 having been raised in that period, and the majority are distinguished by characters amply sufficient to command the attention of all who admire this variable family of plants, some like *Calanthe Veitchi* and *Cypripedium Sedeni* ranking amongst the most useful Orchids. The first recorded hybrid Orchid was one observed by M. Weddell on the Continent about 1841, which was described as possessing a combination of the characters of *Aceras anthropophora* and *Orchis militaris*, and was therefore regarded as a probable natural hybrid between those species. As Orchids were then coming much into favour, it is not surprising that some observant cultivators should have given, what proved a difficult matter—namely, a little attention to raising them from seed, and though several engaged in this, it appears that the principal success was attained in the Glasnevin Botanic Gardens, where from 1845 to 1850 numbers of plants were so raised. Dean Herbert also experimented in artificial hybridising amongst Orchids about the same time, but though he states that pods were secured from crossing an *Orchis* with pollen from an *Ophrys*, it does not seem that he succeeded in raising plants from the seed. He, however, mentions having seedling *Cattleyas*, *Bletias*, *Ophrys*, and *Herminium*. The first substantial results of such experiments were reserved for Mr. Dominy, who commenced hybridising in Messrs. Veitch and Sons' nursery at Exeter in 1853, and first obtained some seedling *Cattleyas*. Owing, however, to the quicker growth of some other seedlings which appeared subsequently, *Calanthe Domini* was the first to flower in October 1856, and was followed by *C. Veitchi* in 1859. About twenty others were selected from others which flowered in succeeding years, and were found sufficiently distinct to merit new names. Since then Mr. Seden has been remarkably successful in Messrs. J. Veitch and Sons' nursery at Chelsea, where large numbers of seedlings have been raised, and up to the present time over sixty handsome hybrids have been flowered and named. It is surprising that amateurs have done so little, for comparatively few have paid any attention to the matter. Amongst those, however, who have made some good additions to the list, must be named Sir Trevor Lawrence, Bart., M.P., Mr. R. Warner, Mr. J. C. Bowring, Mr. J. C. Cookson, Mr. W. Swan, M. Alfred Bleu, and Mr. Cross.

The following list contains all the hybrids concerning which any information could be obtained up to the present time, the seed-bearing parent is named first, and the pollen parent second, in all Mr. Seden's hybrids, and in other cases also where it could be ascertained.

MI. DOMINY'S HYBRIDS.

HYBRID.	PARENTS.
<i>Aërides hybridum</i> . . .	<i>A. affine</i> — <i>A. Fieldingi</i>
<i>Anæctochilus Dominii</i> . . .	<i>A. xanthophyllus</i> — <i>Goodyera discolor</i>
<i>Calanthe Dominii</i> . . .	<i>C. Masuca</i> — <i>C. furcata</i>
<i>Veitchi</i> . . .	<i>vestita</i> — <i>Limatodes rosea</i>
<i>Cattleya Brabantiae</i> . . .	<i>C. Loddigesi</i> — <i>Acklandiae</i>
<i>Devoniensis</i> . . .	<i>crispa</i> — <i>guttata</i>
<i>Dominii</i> . . .	<i>maxima</i> — <i>amethystina</i>
<i>exoniensis</i> . . .	<i>Mossiae</i> — <i>Lælia purpurata</i>
<i>Felix</i> . . .	<i>crispa</i> — <i>Regnelli</i>
<i>hybrida</i> . . .	<i>granulosa</i> — <i>Harrisoniae</i>
<i>hybrida maculata</i> . . .	<i>guttata</i> — <i>intermedia</i>
<i>Manglesi</i> . . .	<i>Mossiae</i> — <i>Loddigesi</i>
<i>Pilcheri</i> . . .	<i>crispa</i> — <i>Perrini</i>
<i>Pilcheri alba</i> . . .	<i>crispa</i> — <i>Perrini</i>
<i>quinquecolor</i> . . .	<i>Acklandiae</i> — <i>Forbesi</i>
<i>Sidniana</i> . . .	<i>crispa</i> — <i>granulosa</i>
<i>Cypripedium Dominii</i> . . .	<i>C. Pearcei</i> — <i>caudatum</i>
<i>Harrisianum</i> . . .	<i>barbatum</i> — <i>vilosum</i>
<i>vexillarium</i> . . .	<i>barbatum</i> — <i>Fairrieianum</i>
<i>Dendrobium Dominii</i> . . .	<i>D. nobile</i> — <i>moniliforme</i>
<i>Goodyera Veitchi</i> . . .	<i>Goodyera discolor</i> — <i>Anæctochilus Veitchi</i>
<i>Lælia Veitchiana</i> . . .	<i>Cattleya labiata</i> — <i>C. crispa</i>
<i>Plajus irroratus</i> . . .	<i>P. grandifolius</i> — <i>Calanthe vestita</i>
<i>inquilinus</i> . . .	<i>vestitus</i> — <i>Calanthe Masuca</i> (?)

MR. SEDEN'S HYBRIDS.

<i>Calanthe lentiginosa</i> . . .	<i>Limatodes labrosa</i> — <i>Calanthe Veitchi</i>
<i>Sedeni</i> . . .	<i>Veitchi</i> — <i>vestita</i>
<i>Cattleya Amesiana</i> . . .	<i>C. crispa</i> — <i>maxima</i>
<i>Chamberlaini</i> . . .	<i>Leopoldi</i> — <i>C. Dowiana</i>
<i>Fausta</i> . . .	<i>Loddigesi</i> — <i>exoniensis</i>
<i>Marstersoniae</i> . . .	<i>Loddigesi</i> — <i>labiata</i>
<i>Mardelli</i> . . .	<i>speciosissima</i> — <i>Devoniensis</i>
<i>porphyrophlebia</i> . . .	<i>intermedia</i> — <i>superba</i>
<i>triphthalma</i> . . .	<i>superba</i> — <i>exoniensis</i>
<i>suavior</i> . . .	<i>Mendeli</i> — <i>intermedia</i>
<i>Veitchiana</i> . . .	<i>crispa</i> — <i>labiata</i>
<i>Chysis Che-soni</i> . . .	<i>C. bractescens</i> — <i>aurea</i>
<i>Sedeni</i> . . .	<i>Limminghi</i> — <i>bractescens</i>
<i>Cypripedium albo-pur-</i>	
<i>pureum</i> . . .	<i>C. Schlimi</i> — <i>Dominii</i>
<i>calanthum</i> . . .	<i>biflorum</i> — <i>Lowi</i>
<i>calurum</i> . . .	<i>longifolium</i> — <i>Sedeni</i>
<i>cardinale</i> . . .	<i>Sedeni</i> — <i>Schlimi album</i>
<i>euryandrum</i> . . .	<i>barbatum</i> — <i>Stonei</i>
<i>Germinyanum</i> . . .	<i>vilosum</i> — <i>hirsutissimum</i>
<i>grande</i> . . .	<i>Roezli</i> — <i>caudatum</i>
<i>Leeanum superbum</i> . . .	<i>insigne Maulei</i> — <i>Spicerianum</i>
<i>leucorrhodum</i> . . .	<i>Roezli</i> — <i>Schlimi album</i>
<i>lucidum</i> . . .	<i>vilosum</i> — <i>Lowi</i>

HYBRID.	PARENTS.
<i>Cypripedium macrop-</i>	
<i>terum</i>	Lowi — Veitchi
<i>mariorophyllum</i>	Hookeræ — <i>barbatum</i>
<i>Marshallianum</i>	<i>venustum pardinum</i> — <i>concolor</i>
<i>microchilum</i>	<i>niveum</i> — Druryi
<i>Morganiaë</i>	Veitchi — Stonei
<i>nitens</i>	<i>villosum</i> — <i>insigne Maulei</i>
<i>cenanthum</i>	<i>Harrisianum</i> — <i>insigne Maulei</i>
" <i>superbum</i>	<i>Harrisianum</i> — <i>insigne Maulei</i>
<i>porphyreum</i>	Roezli — Schlimi
<i>po:phyrochlamys</i>	<i>biflorum</i> — <i>hirsutissimum</i>
<i>porphyrospilum</i>	Lowi — Hookeræ
<i>pycnopterum</i>	<i>venustum</i> — Lowi
<i>Schroëderæ</i>	<i>caudatum</i> — Sedeni
<i>Sedeni</i>	Schlimi — <i>longifolium</i>
<i>Sedeni</i>	<i>longifolium</i> — Schlimi
<i>Sedeni candidulum</i>	<i>Schlimi album</i> — <i>longifolium</i>
<i>selligerum & majus</i>	<i>barbatum</i> — <i>lævigatum</i>
<i>superciliare</i>	<i>barbatum</i> — Veitchi
<i>tessellatum</i>	<i>barbatum</i> — <i>concolor</i>
" <i>porphyreum</i>	<i>barbatum</i> — <i>concolor</i>
<i>Thibautianum</i>	<i>Harrisianum</i> — <i>insigne Maulei</i>
<i>vernixium</i>	<i>Argus</i> — <i>villosum</i>
<i>Wianianum</i>	<i>villosum</i> — Druryi
<i>Dendrobium endocharis</i>	<i>D. japonicum</i> — <i>heterocarpum</i>
<i>euosum</i>	<i>endocharis</i> — <i>nobile</i>
" <i>leucopterum</i>	<i>endocharis</i> — <i>nobile</i>
<i>micans</i>	<i>Wardianum</i> — <i>lituiflorum</i>
<i>rhodostoma</i>	<i>Huttoni</i> — <i>sanguinolentum</i>
<i>splendidissimum</i>	<i>aureum</i> — <i>nobile</i>
<i>Lælia bella</i>	<i>L. purpurata</i> — <i>Cattleya labiata</i>
<i>callistoglossa</i>	<i>purpurata</i> — <i>C. gigas</i>
<i>Canhamiana</i>	<i>Cattleya Mossiæ</i> — <i>L. purpurata</i>
<i>flammea</i>	<i>L. cinnabarina</i> — Pilcheri
<i>Philbrickiana</i>	<i>Cattleya Acklandiæ</i> — <i>L. elegans</i>
<i>Sedeni</i>	<i>superba</i> — <i>L. Devoniensis</i>
<i>Masdevallia Chelsoni</i>	<i>M. amabilis</i> — Veitchi
<i>Gairiana</i>	Veitchi — Davisi
<i>Phajus irroratus pur-</i>	
<i>pureus</i>	<i>P. grandifolius</i> — <i>Calanthe vestita</i>
<i>Phalænopsis intermedia</i>	
<i>Portei</i>	<i>P. amabilis</i> — <i>rosea</i>
<i>Zygopetalum penta-</i>	
<i>chromum</i>	<i>Z. Mackayi</i> — <i>maxillare</i>
<i>Sedeni</i>	<i>maxillare</i> — Mackayi

OTHER RAISERS' HYBRIDS.

<i>Angulo: media</i>	<i>A. Clowesi</i> — Ruckeri
<i>Calanthe Alexanderi</i>	<i>C. Veitchi</i> — <i>vestita rubro-oculata</i> .
<i>bella</i>	Turneri — Veitchi
<i>Cooksoni</i>	Veitchi — <i>vestita luteo-oculata</i> .
<i>porphyrea</i>	<i>Limatodes labrosa</i> — <i>C. vestita rubro-oculata</i>
<i>Sandhurstiana</i>	<i>L. rosea</i> — <i>C. vestita rubro-oculata</i>

HYBRID.	PARENTS.
Catt'eya calummata . . .	C. intermedia — Acklandiæ
Mitcheli . . .	quadricolor — guttata Leopoldi
veriflora . . .	labiata — Trianae (?)
Cypripedium Arthurianum . . .	C. Fairrianum — insigne
Ashburtoniæ . . .	insigne — barbatum
cbloroneurum . . .	not recorded
conchiferum . . .	caricinum — Roezli
Crossianum . . .	venustum — insigne
gemmiferum . . .	Hookeriæ — purpuratum
hybridum . . .	Stoniei — barbatum
Io . . .	Argus — Lawrencianum
Laforcadei . . .	Chantini — barbatum
Leeanum . . .	Spicerianum — insigne punctatissimum
meirax . . .	not recorded
melanophthalmum . . .	
politum . . .	barbatum superbum — venustum
Sallieri . . .	villosum — insigne
Seedling No. 1 . . .	javanicum — superbiens
stenophyllum . . .	Schlimi — caricinum
Swanianum . . .	Dayanum — barbatum
Williamsianum . . .	villosum — Harrisianum (?)
Dendrobium Ainsworthi . . .	nobile — aureum
Leechianum . . .	nobile — aureum
Masdevallia Fraseri . . .	ignea — Lindeni
Thunia Veitchiana . . .	
(Wrigleyana) . . .	Bensoniæ — Marshalliana
Zygopetalum Clayi . . .	Z. crinitum — maxillare

SUPPOSED NATURAL HYBRIDS.

Anguloa dubia . . .	A. uniflora — Clow si
Cattleya Whitei . . .	C. labiata — Schilleriana
Cœloglossum Erdingeri . . .	C. viride — Orchis sambucina
Gymnadenia intermedia . . .	G. conopsea — odoratissima
Strampfi . . .	G. odoratissima — Cœloglossum albidum
Lælia Crawshayana . . .	L. albida — anceps
Dormanniana . . .	Cattleya bicolor — L. pumila
Leeana . . .	Cattleya marginata (?)
Nigritella brachystachya . . .	Gymnadenia sub-conopsea — N. nigra
Henfleii . . .	or N. nigra — N. suaveolens
megastachya . . .	G. super-conopsea — N. nigra, or G. conopsea
micrantha . . .	— N. suaveolens
suaveolens . . .	N. nigra — G. albida
N. nigra — G. conopsea	
Odontoglossum Andersonianum . . .	O. crispum — gloriosum
aspersum . . .	Rossi — maculatum
baphicanthum . . .	crispum — odoratum
Coradinei . . .	triumphans — odoratum
Dennisoniæ . . .	crispum — luteo-purpureum
Editibiæ . . .	crispum — Andersonianum
elegans . . .	cirrhosum — cristatum
Galeottianum . . .	nebulosum — Cervantesi
hebraicum . . .	

HYBRID.		PARENTS.
Odontoglossum	Hors-	
manni . . .	. . .	Pescatorei — luteo-purpureum
Humeanum . . .	. . .	cordatum — Rossi
Læeanum . . .	. . .
mulus . . .	. . .	luteo-purpureum
Murrellianum . . .	. . .	Pescatorei — nævium
Pollettianum . . .	. . .	crispum — gloriosum
Ruckerianum . . .	. . .	crispum — Andersonianum
Schroderianum . . .	. . .	tripudians — Pescatori
stellimicans . . .	. . .	Pescatorei — triumphans
Williamsianum . . .	. . .	grande — Schlipperianum
Orchis		
*lata . . .	. . .	O. laxiflora — Morio
ambigua . . .	. . .	incarnata — maculata
Lorcnziana . . .	. . .	maculata — pallens
Morio-papilionacea.		Morio — papilionacea
pu pureo-militaris .		purpureo — militaris
Regeliana . . .	. . .	maculata — Gymnadenia odoratissima
Valesiaca . . .	. . .	O. globosa — G. conopsea
Phalænopsis		
Casta . . .	. . .	P. Schilleriana — amabilis
intermedia . . .	. . .	rosea — amabilis
leucorrhoda . . .	. . .	Schilleriana — amabilis
Sanderiana . . .	. . .	amabilis — Schilleriana
Valentini . . .	. . .	Cornu-Cervi — violacea
Vcitchiana . . .	. . .	rosea — Schilleriana

It will be seen from this list that while hybridisers have been very successful in some genera they have not obtained many results in several others, and in a few they have hitherto failed to secure any hybrids. Thus of *Aerides*, *Anoctochilus*, *Goodyera*, *Phalænopsis*, and *Thunia* one hybrid each has been raised. Of *Chysis* two, and *Phajus* three, of *Madevallia* and *Zygopetalum* three each, of *Lælia* seven, *Dendrobium* and *Calanthe* nine each, *Cattleya* twenty-four, and *Cypripedium* fifty-three; nearly half the total number having been obtained in the last-named genus. In the case of the *Cattleyas* Mr. H. J. Veitch has observed that the "members of the labiata group and also the Brazilian species with two-leaved stems, as *C. intermedia*, *C. Acklandiæ*, &c., cross freely with each other and the Brazilian *Lælias*; but neither the *Cattleyas* nor the Brazilian *Lælias* will cross freely with the Mexican *Lælias*, such as *albida*, *autumnalis*, *majalis*, and *acuminata*, except *L. anceps*." From the same authority we learn that the East Indian *Cypripediums*, though crossing readily with each other, do not cross so freely with the South American *Selenipediums*; and though plants have been raised from crosses between these two sections, they have not flowered yet. No one appears to have succeeded in flowering an artificially raised hybrid *Odontoglossum* up to the present time, although so many are regarded as probable natural hybrids. Mr. Cookson obtained some seedling *Odontoglossums* from a cross between *O. gloriosum* or *O. Uro-Skinneri* and *O. crispum*, but they subsequently died. The late Mr. Spyers, when gardener to Sir Trevor Lawrence, obtained seed from crosses between *O. vexillarium* and other species, but he informed me that he could obtain no seed from crosses between *O. vexillarium* and the *Miltonias*;

and I believe it was from the same source that Mr. Bentham obtained the statement he inserted in the "Genera Plantarum" to that effect, and to which Mr. H. J. Veitch objected as contrary to their experience. He has found that by crossing *O. vexillarium* and *Miltonia spectabilis* seed was produced, though it could not be secured from crosses with any other *Odontoglossum*. It does not appear, however, that seedlings have been raised in any case.

As examples of bigeneric hybrids we have crosses between *Anoëtochilus* and *Goodyera* and *vice versâ*, *Lælia* and *Cattleya*, *Phajus* and



Fig. 13.—*Zygopetalum* Clay

Calanthe, *Calanthe* and *Limatodes* and the reverse, though in the last instance *Limatodes* is now referred to the genus *Calanthe*, and *Cattleyas* and *Lælias* are very closely allied. Many strange crosses have been made in Messrs. Veitch's nursery. Thus plants have been raised, but not flowered, from crosses between *Cattleya Trianae* and *Sophronitis grandiflora*, *C. Trianae* and *Brassavola Digbyana*, and *C. intermedia* and *Sophronitis grandiflora*. Capsules of apparently good seed have been

had from crosses between *Acanthophippium Curtisi* and *Chysis bracteescens*, *Bletia hyacinthina* and *Calanthe Masuca*, *Chysis aurea* and *Zygopetalum Sedeni*, *Odontoglossum bictonense* and *Z. maxillare*, *Z. Mackayi* and *Lycaste Skinneri*. Abundance of seed has also been secured by crossing *Z. Mackayi* with *Odontoglossums* and other genera, but the seedlings have invariably proved to be *Z. Mackayi*.

The principal hybrids mentioned in the list under Mr. Seden's were raised by the following orchidists :—

Anguloa media, by J. C. Bowring, Esq.; *Calanthe bella*, though sent out by Messrs. Veitch & Sons, was not raised in their nursery; *Calanthe Alexanderi* and *Cooksoni*, by N. C. Cookson, Esq., Wylam-on-Tyne; *Calanthe porphyrea*, by Sir Trevor Lawrence, Bart., M.P.; *Calanthe sandhurstiana*, by Mr. P. H. Gosse, Sandhurst, Torquay; *Cattleya calumata*, by Mr. Alfred Bleu, Paris; *C. Mitcheli*, by Mr. Mitchell, gardener to Dr. R. F. Ainsworth; *C. veriflora*, origin unknown, bought as a seedling at Stevens' Rooms by Sir Trevor Lawrence; *Cypripedium Ashburtonis* and *Crossianum*, by Mr. Cross, gardener to Lady Ashburton, Melchet Court, Romsay; *C. Io*, by N. C. Cookson, Esq.; *C. Lecanum*, by Sir Trevor Lawrence; *C. chloroneurum*, *C. meirax*, *C. melanophthalmum*, *C. politum*, and *C. Williamsianum*, by R. Warner, Esq., Chelmsford; *C. conchiferum*, *C. gemmiferum*, and *C. stenophyllum*, by J. C. Bowring, Esq.; *C. Swanianum*, by Mr. W. Swan; *C. Laforceadei*, by M. Bauer, Paris; *C. Sallieri*, by M. Godefroy-Lebenf [M. Bergman, in "Revue Horticole," October, 1885]; *C. Seedling No. 1*, M. Bleu, Paris; *Dendrobium Ainsworthi*, by Dr. R. F. Ainsworth; *D. Leechianum*, by Mr. W. Swan, when gardener to W. Leech, Esq., Fallowfield, Manchester; *Masdevallia Fraseri*, by Mr. Fraser, Dorncleugh, Aberdeen; *Thunia Veitchiana* or *Wrigleyana*, by Mr. George Toll, Manchester; *Zygopetalum Clavi*, by Colonel Clay, Birkenhead.

The natural hybrids are mostly introduced forms of exotic Orchids, which are found to be so clearly intermediate between the species named as parents, that they are regarded as the probable result of hybridisation effected by insect agency. Some European forms are, however, included, as in the genus *Cœloglossum*, *Gymnadenia*, *Nigritella*, and *Orchis*, which have been noted and described by continental botanists.

ORCHID LITERATURE.

THE literature of Orchids is extensive but widely scattered through botanical works, and the number of books devoted to the family is not so large as might be imagined. In the following list I have included all I could gain any information about, also giving the titles of the principal works containing coloured plates of Orchids. Many woodcut illustrations have also appeared in the horticultural periodicals, and a great many species have been described by Reichenbach in the *Gardeners' Chronicle*. The chief authority for the genera is Lindley, whose characters are accepted for 114 out of the 334 genera enumerated in Hooker and Bentham's "Genera Plantarum." Whilst Lindley was editor of Edwards' "Botanical Register" many Orchids were figured and described in that work. Bateman's, Lindley's, and Warner's works are magnificent productions, but necessarily very costly.

Aubert du Petit-Thouars.—"Histoire des Orchidées des trois îles d'Afrique." Paris, 1822. 4to.

Baldwin, Henry.—"Orchids of New England." 4to, sixty-two illustrations. United States, America.

Bateman, J.—"Second Century of Orchidaceous Plants." Royal 4to, 100 coloured plates from Curtis's "Botanical Magazine." London, 1864-70. "Monograph of Odontoglossum." Thirty coloured plates and wood engravings. Imperial folio. London, 1864-74. "Orchidaceæ of Mexico and Guatemala." Elephant folio. London, 1837-43.

Bauer, Franz, and Notes by *J. Lindley*.—"Illustrations of Orchidaceous Plants," London, 1830-38. Folio.

Beer, J. G.—"Praktische Studien an der Familie der Orchideen." Vienna, 1854. 8vo.

Bentham, G.—Pages 281-360, "Notes on Orchidæ," Journal of the Linnean Society, vol. xviii. 1881.

Bentham, G., and *Hooker, J. D.*—"Orchidæ." "Genera Plantarum," vol. iii, part 2, pp. 460-636. 334 genera. London, 1883.

Breda.—"Genera et Species Orchidearum et Asclepiadearum Javæ." Folio. 1827 (Pritzl).

Britten, J., and *W. H. Gower*.—"Orchids for Amateurs." London, 1878. 8vo.

Blume.—"Collection des Orchidées les plus remarquables de l'Archipel Indien." Paris, 1864. Folio. "Flora Javæ, series nova, Orchidæ." Folio. 1858. "Javaanische Orchideen." Batavia, 1825. Folio.

Brook & Co.—"Descriptive Catalogue of the Fairfield Orchids." 8vo. 1872.

Burbidge, F. W.—"Cool Orchids, and How to Grow Them." London. Three coloured plates, crown 8vo. 1874.

Castle, Lewis.—"Orchids, Structure and History." 1885. Second edition, "Structure, History and Culture." 1886. London. Crown 8vo.

Curtis's Botanical Magazine.—London, 1786 to the present time. 6872 plates. Published monthly.

Darwin, Charles.—"Fertilisation of Orchids." London. First edition 1862. 8vo. Second edition 1877. 8vo.

- Edwards' Botanical Register.*—London, 1815–1847.
- Fitzgerald, R. D.*—“Australian Orchids.” 1874–1885. Sydney, New South Wales. Folio.
- Henshall, John.*—“Practical Treatise on the Cultivation of Orchidaceous Plants.” Royal 8vo. 1815. In German 1846.
- Hooker, W. J.*—“Century of Orchidaceous Plants.” London, 1846. 4to.
- Jennings, S.*—“Orchids, and How to Grow Them in India and Other Tropical Countries.” Forty-eight coloured plates. London. Royal 4to. 1875.
- Lexarza, J.*—“Orchidianum opusculum.” Forms part of “La Llave and Lexarza.” Nov. reg. desc. fasc. 11, with separate register.
- Linden, J.*—“Lindenia.” “Pescatorea, Iconographie des Orchidées de la Collection de M. Pescatore au Château de la Celle, St. Cloud.” Brussels, 1855–1860. Folio.
- Lindley, J.*—“Folia Orchidacea, Enumeration of the Known Species of Orchids” Nine parts (all published). London, 1852–59. 8vo. “Genera and Species of Orchidaceous Plants.” London. 8vo. 1830–40. “Sertum Orchidaceum.” London. Folio. 1838.
- Loddiges' Botanical Cabinet.*—2000 plates, many of Orchids. London, 1818–1833.
- Lyons, J. C.*—“Management of Orchidaceous Plants.” With catalogue of 1000 London, 1845. 8vo.
- Miner, H. S.*—“Orchids, the Royal Family of Plants.” Twenty-four coloured plates. Folio. 1885.
- Moore, Thomas.*—“Illustrations of Orchidaceous Plants.” London, 1851. 8vo.
- Mutel, A.*—“Orchidées Nouvelles.” Paris, 1842. 4to.
- Paxton's Magazine of Botany.* London, 1834–1849.
- Puydt, E. de.*—“Les Orchidées.” Fifty coloured plates, 244 engravings. Royal 8vo. Paris, 1880.
- Rand, E. S.*—“Orchids.” New York, 1876. 8vo.
- Reichenbach, fl. H. G.*—“Xenia Orchidacea.” Leipzig, 1858. 4to.
- Richard, M. Achille.*—“Monographie des Orchidées des Iles de France et de Bourbon.” Paris, 1828. 4to. “Monographie des Orchidées recueillies sur la Chaîne des Nilgherries par M. Perrottet.” Paris, 1841. 4to.
- Richard Achille and Galeotti, H.*—“Monographie des Orchidées Mexicaines.” 4to. 1884. “Orchidographie Mexicaine.” 8vo. 1845.
- Richard, L. C.*—“De Orchidibus europeis annotationes.” Paris, 1817.
- Rodrigues, J. Barboza.*—“Structure des Orchidées Rio de Janeiro.” 1883. “Genera et Species Orchidearum novarum Sebastianopolis.” 1882.
- Vriese, W. H. de.*—“Illustrations d'Orchidées.” La Haye, 1854. Fol.
- Walpers' Annales Botanices Systematicæ.*—Tomus 6, Lipsiæ, 1861, pp. 167 to 933 Orchids, by H. G. Reichenbach.
- Warner, R.*—“Select Orchidaceous Plants.” First series. London. Folio. 1862. Second series, 1865. Third series, 1877.
- Williams, B. S.*—“Orchid Manual.” London. First edition, 1852. Sixth edition, 1885. 660 pp.
- Williams, Warner, and Moore.*—“Orchid Album.” London. Royal 4to. Monthly since 1881. Four plates in each number.

HINTS ON ORCHID CULTURE.

As the following hints on the requirements of Orchids are chiefly intended for amateurs or beginners, the instructions have been made as brief and simple as possible, the object being to convey such information as will enable inexperienced persons to overcome the few difficulties most frequently encountered, and to guide them in the selection of easily grown species. The rapidly increasing popularity of Orchids has been materially assisted by the simplification of their culture, for so long as it was supposed that they could only be grown in highly heated houses specially constructed for them they were confined to few establishments. When, however, it was found what a large number could be successfully grown in lower temperatures in ordinary houses, the number of their patrons was speedily augmented. The increased demand caused larger numbers to be imported, and the result was a considerable reduction in the prices, which has placed them within the means of thousands who a few years ago would have regarded them as quite beyond their reach. It has been proved that a great part of the difficulty in Orchid culture was imaginary, and that with ordinary care the majority of species can be grown satisfactorily. Some, of course, cannot be managed so readily, but these need not be included in small collections, as there are plenty of others to select from without them. Still, it is necessary to observe closely the peculiarities of the plants, and by arranging them in suitable positions in a house numbers of very different habit may often be accommodated as well as if several structures were at command. Plants frequently evince partialities for particular positions, and while thriving in one part may refuse to make progress in another a yard or two away. Such facts as these can only be learnt by observation, and success is largely dependant upon them. It is also highly important that the plants be always clean, or the best culture will be nullified, and one of the most experienced orchidists of the present time attributes the health of his plants mainly to keeping them free from insects. With close attention to these, and similar apparently small matters to be afterwards referred to, no one need fear undertaking the cultivation of the most useful Orchids.

PROCURING ORCHIDS.

ESTABLISHED PLANTS.—If it is intended to commence with a collection of established Orchids it is advisable to purchase small



THE PHALÆNOPSIS HOUSE

(From the Journal of Horticulture)



AT OLDFIELD, BICKLEY.

plants from any nurseryman who makes them a specialty. This is advantageous in several ways. Strong plants can be obtained that will not be so likely to disappoint the amateur cultivator. Any varieties or species required can be insured being true to name, and the plants having been properly potted will give little trouble the first year. They can also be purchased at prices to suit all pockets now, and the expenditure of from £5 to £10 will procure a varied little collection to start with, the larger amounts being chiefly required for the varieties or specimens of greater size. In the former case it is preferable to state what is required and the amount intended to be spent, leaving the selection to the nurseryman unless the buyer has a special liking for certain species. When a large collection is being formed for several houses it will have to be decided whether it shall contain as great a number of species and varieties as possible, or whether there shall be a quantity of some of the leading useful Orchids, such as *Odontoglossum crispum* (*O. Alexandræ*). In all cases it is preferable to form collections gradually, commencing with a small number and increasing them as the cultivator's knowledge advances.

IMPORTED PLANTS.—Some amateurs prefer starting with a number of imported Orchids, and though it is longer before the flowers are obtained, with some probable losses in the meantime, yet there is the chance of obtaining novel varieties amongst others of indifferent merit, and this alone induces people to purchase them. Imported Orchids may at times be procured very cheaply, and one amateur states that he never gives more than a shilling each for *Odontoglossums* and four or five shillings for *Cattleyas*, *Lælias*, &c., with others in like proportion. This, however, necessitates a frequent attendance at the sales, with a thorough knowledge of the plants. Importations vary considerably apart from the value of the species or varieties, for the condition in which the plants are received makes a surprising difference in their subsequent progress. Plants with comparatively fresh green leaves and stout pseudo-bulbs are worth very much more than those that have lost the greater part of their foliage, have withered exhausted pseudo-bulbs, and perhaps arrived at a time of year when they are likely to suffer from frost. These points have to be considered in purchasing imported Orchids, and there is so much uncertainty about it that it is far better to rely upon established plants for commencing and add to the collection afterwards as desired.

When, however, imported Orchids are obtained they require some care to get them into condition for potting or basketing. They must first be well washed in tepid water, and then be placed in a shady position in a temperature from 50° to 60°, the *Odontoglossums* of the *O. crispum* character requiring the coolest place, and the *Cattleyas* and *Dendrobiums* the warmest. Those who import Orchids in large

quantities usually devote a house to them, where they are either spread out upon a slightly moist stage or hung from the roof, the air being kept in a moist condition. The object is to induce the growths to "plump up," as it is termed; and when this has been effected and the roots are showing freely they can be potted in the usual way. When small numbers are being established the best way is to place the plants in pots of rough clean potsherds and charcoal. The neck of the plant must be well elevated, and some prefer laying the plants upon the surface until roots are formed. Mr. J. Douglas has in this way succeeded admirably with some Orchids ordinarily considered difficult to establish. Most of the non-pseudo-bulbous Orchids like the *Cypripediums* may be potted as described, and all seem better than when laid upon stages, as water can be supplied more freely. The principal point is to give sufficient moisture to induce root-growth without causing any portion of the plant to decay, as it is very liable to do after its long journey and the severe drying it has had.

STRUCTURES FOR ORCHIDS.

The fanciful idea that peculiarly constructed and expensive houses of various kinds were essential for Orchids having been dispelled, it was soon found that much less depended upon the form of the structure than had been long imagined, and that if the requisite heat could be provided the plants would succeed in houses of all kinds and in all positions. The primary consideration is insuring the full exposure of the plants to light with sufficient means at command to break the force of the sun in the hottest weather. In our climate this is most important, for it must be remembered that exotic Orchids, even those needing the coolest treatment, came principally from equatorial regions, where, though at great elevations, they are exposed to a nearly vertical sun during a great portion of the year. The influence of light upon Orchids is astonishing; it matures the foliage and growths or pseudo-bulbs and lays the foundation for successful flowering another season, for with these, as most other plants, much depends upon the ripening of the current year's growth. It is advisable to employ houses with roofs that offer the least obstruction to light, those having large heavy rafters or broad laps being avoided; and it is absolutely necessary that the glass be kept clean at all times. Some advocate close glazing, relying upon the use of the ventilators for admitting the requisite amount of air, but in the cool houses for *Odontoglossums* and *Masdevallias* a kind of permanent ventilation is provided by leaving a space between the bottom pane of glass and the eave of about one-eighth of an inch, the glass overlapping the wood sufficiently to throw off the water; and in very severe weather these spaces can be stopped by pieces of wood. There is a large cool house at Downside, Leatherhead, with a roof constructed in this way, and it

is rarely found necessary to use the plugs mentioned. For tropical Orchids of the *Cattleya* and *Phalænopsis* type the ordinary close glazing is preferable, and the ventilation can be satisfactorily arranged in other ways, as will be described under that head. It is important to avoid drips, as these are often destructive to Orchids, and the strongest plants soon suffer if exposed to them. Rafters are grooved the whole length to take off the condensed moisture that accumulates along the bars, but the most effective method is to have a narrow piece of zinc screwed or nailed to the under side of the rafters, and bent so as to form a little channel that will readily convey the condensed moisture to the lowest part of the roof.

The houses may be span-roofed or lean-to, according to convenience, and the aspect is not of very much importance, though the former may preferably run north and south for tropical Orchids, thus giving an east and west aspect for the two slopes, lean-tos for a similar purpose running east and west, with the slope to the south, or for cool Orchids to the north. A north aspect is not essential for cool Orchids. East or west, or indeed any aspect except direct south, can be made to suit them; but the more exposed these plants are to the rays of the sun in summer the greater the attention they will need in supplying them with water, and it is also frequently difficult to prevent the temperature rising unduly high; otherwise they must have the lightest position possible, and dark corners, or those much shaded by trees, should be avoided. Houses of moderate breadth and height are the best for most Orchids, but *Cattleyas* and *Lælias* thrive in lofty spacious structures better than other plants, and seem to prefer such houses, as can be seen in the cases of the two magnificent *Cattleya* houses at Mr. W. Lee's and Messrs. J. Veitch & Sons', the latter being probably the largest house devoted to Orchids in this country. It is 132 feet long, 22 feet wide, and 11½ feet high in the centre; and the plants are all in capital condition. In private collections, however, some of the best grown plants are seen in small houses, and for cool Orchids they are now generally employed with the roofs pitching on to the eaves nearly level with the side stage, thus dispensing with side lights. For small-growing *Odontoglossums* and *Masdevallias* these are very suitable, but for taller plants and in warmer houses side lights are advisable, as they give greater space for arranging them and admit more light. A span-roofed house intended for a large miscellaneous collection of Orchids should be in two or more divisions according to its size, and the kinds of plants that are to be cultivated having the warmest division at the boiler end, and the coolest can be employed for *Odontoglossums* or plants in flower, as the blooms last much longer in a lower temperature and less moisture. A well built lean-to frame against the side of such a house can be used for *Odontoglossums* if sufficient piping be supplied

to prevent the temperature falling below 40° in the winter, and in several gardens they are so grown with excellent results, the plants being placed upon a bed of sifted ashes and carefully looked after to prevent the depredations of slugs.

When houses are set apart for Orchids the staging to be employed requires some consideration. The plants need a constant moisture round the roots and foliage when in growth, and cool-house Orchids must have it at all times. This is provided in various ways. In some cases the stage is constructed of slate slabs with iron supports, and upon it is placed a layer of fine pebbles, spar, shells, small coke, or coal, the chief objection to the two last being their dull appearance, though they are now much employed in nurseries. Whatever material is selected it must be kept constantly moist by syringing or otherwise, and the plants are either stood direct upon the material or elevated on inverted pots. In Messrs. J. Laing & Co.'s nursery corrugated zinc is now generally employed as staging for Orchids and other plants, being covered with a layer like that described. It

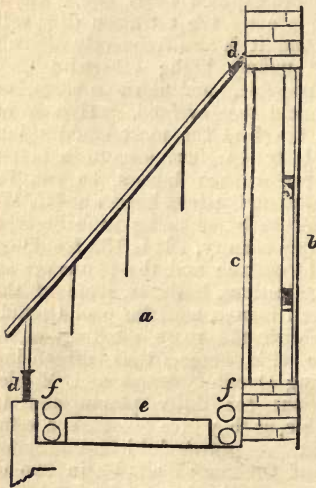


Fig. 14.—An Orchid Case.

is very durable, and forms a useful storehouse of moisture, while preventing any undue accumulation. Open wooden stages are frequently placed over the solid stages and the plants arranged on these, where, if the supports are isolated by means of little cups kept filled with water, as is now practised in some of the best collections, there is no danger from slugs, woodlice, or other pests of that character unless they are introduced in the soil with the plants. In warm houses the lower stages are often planted with Panicum, small Ferns, Selaginellas, &c., which have a pleasing appearance and serve moreover to preserve a healthily moist atmosphere. They are sometimes objected to as harbouring insects, but with the double stage there is nothing to be feared in that respect. For

such houses as that at Oldfield, Bickley, where the Phalænopses are nearly all suspended from the roof, it is a great improvement and very beneficial. When central stages are employed they are usually of open lattice shelves, over tanks or beds of some material, old

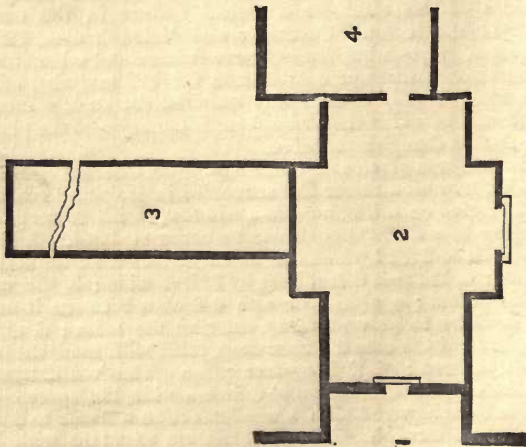
leaves being occasionally used as the moisture-holding substance. In many houses, especially those for *Odontoglossums*, tanks are constructed on each side of the path under the stages to serve as reservoirs of rain water, and to provide a continual supply of moisture in the air. If intended merely for the latter purpose they are usually only shallow troughs, 4 to 6 inches deep. Paths can be formed as desired, those of red or ornamental tiles having the best appearance, but those of any loose material, or even of the earth itself, are equally good as regards the health of the plants.

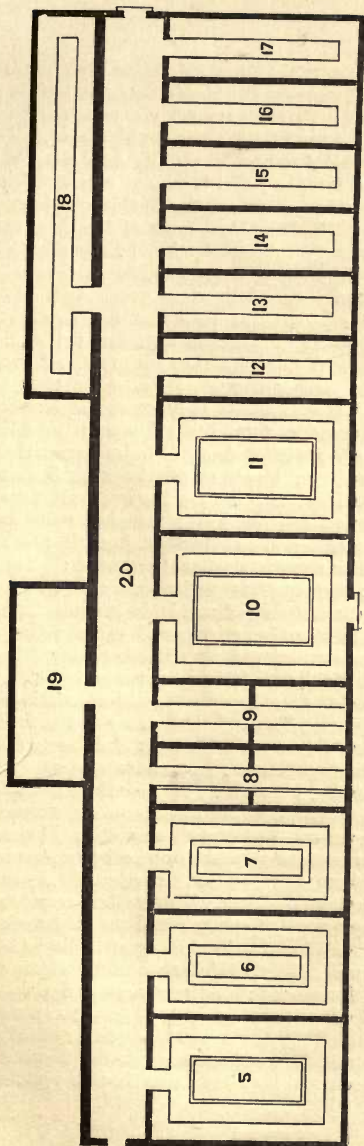
From the foregoing remarks it will be seen that houses can be easily altered and fitted to suit Orchids; but in some gardens it may not be convenient to go to that length, and the houses must be utilised as they are. This need not deter anyone from commencing the culture of Orchids, for some of the best can be grown with other plants. For instance, the ordinary stove will accommodate a far greater number of tropical Orchids than is usually supposed. Vineries or Peach houses where forcing is proceeding exactly suit numbers, such as *Dendrobium nobile*; and a warm conservatory, which in some places is maintained at a temperature intermediate between that of a stove and a greenhouse, is admirably adapted for many Orchids when in flower; and we have seen some extremely pretty effects produced by the tasteful grouping of *Dendrobiums*, *Oncidiums*, *Odontoglossums*, *Cypripediums*, and even *Phalænopses*, with Ferns and graceful foliage plants. At Furzedown, Tooting, the residence of C. Seeley, Esq., the gardener, Mr. Laing, has for many years made groups of this character a special feature in the conservatory early in the season. Cucumber and Melon houses, Pine pits, forcing houses, propagating houses, warm frames, and other structures afford abundant space and convenience for the majority of heat-loving Orchids, the only house really unsuited for such plants being the greenhouse, in which the atmosphere is too dry and the plants too much exposed to draughts to thrive.

An instance was given some time ago in the *Journal of Horticulture*, showing how an amateur had succeeded in growing Orchids in a small case erected on a lead outside a window, which is worth notice as illustrating how easily Orchids can be accommodated. A diagram of this is given in fig. 14 which will be understood from the following explanation: *a*, the case 6 feet long by 3 feet wide; *b*, the window of the sitting room; *c*, glass door with 6 inches between it and the window, in order to prevent damp entering the room; *d*, *d*, ventilators; *e*, body of the case 6 inches deep, filled with sand, the bottom being well drained; *f*, *f*, hot-water pipes. The ventilators were wooden shutters 18 inches long and 6 inches wide, the space opposite these inside being covered with a woollen net on a frame to filter the air as it passed through. In this miniature structure with liberal supplies of water the owner succeeded in growing the following

Orchids in a smoky district of London. *Aerides crispum*, *A. virens*, *Aganisia pulchella*, *Brassavola acaulis*, *Broughtonia sanguinea*, *Calanthe vestita*, *Camarotis purpurea*, *Cœlogyne cristata*; *Dendrobium formosum*, *Lowi pulchellum*, *Jenkinsi*; *Huntleya marginata*, *Læliopsis domingensis*, *Peristeria elata*, *Phalænopsis amabilis* and *P. grandiflora*, *Saccolabium curvifolium* and *miniatum*, *Sobralia macrantha*, *Sophranitis grandiflora*, *Stanhopeas aurea*, *insignis* and *tigrina*, and *Vanda suavis*.

A RANGE OF ORCHID HOUSES.—The plan appended represents a range erected for the Right Hon. J. Chamberlain, M.P., at Highbury, Moseley, Birmingham, by Mr. Hope, Lionel Street, Birmingham, and is so well designed that it deserves mention here. The plan is drawn to a scale of 32 feet to an inch, the range runs east and west, the houses are span-roofed, and are heated by two "Climax" boilers. 1, The mansion; 2, Conservatory; 3, Stokehole; 4, Fernery; 5, Stove; 6, East Indian Orchids; 7, Cattleyas; 8, Calanthes and Phalænopses; 9, Orchid show house; 10 to 14, Miscellaneous plants; 15 and 16, Orchids; 17, Primulas; 18, Odontoglossums; 19, Poultry sheds; 20, Glazed corridor connecting all the houses.





ORCHIDS IN VINERIES.—Some reference has already been made to the adaptability of vineries for many Orchids, but it deserves more particular attention. In ordinary early houses the Vines are started at a convenient time for starting the Orchids also. The temperature and moisture suitable for one is equally suitable for the other, and later on when the Grapes have been cut and the Vines are resting can be made the resting season of the Orchids. Many fine specimens have been grown in this way, and some of the most remarkable were those exhibited some years ago by Mr. L. Temple, then gardener to W. G. Joy, Esq., Headingley, Leeds. The success of the treatment may be judged from the following particulars of the principal plants:—*Cattleya crispa superba*, 4 feet in diameter, fifty blooms; *C. Harrisoniæ violacea*, 3 feet in diameter; *C. crispa*, 3 feet in diameter, thirty flowers; *Odontoglossum grande*, 2 feet in diameter, forty-one flowers; *Dendrobium nobile*, 4 feet in diameter, 400 blooms; *Miltonia Clowesi*, 3 feet in diameter, 100 blooms; *M. spectabilis*, 3 feet in diameter, forty-nine flowers; *Oncidium flexuosum*, 4 feet in diameter, forty spikes; *Phajus grandifolius*, 4 feet in diameter, thirty spikes; *Cypripedium insigne*, 3 feet in diameter, forty flowers; and *Dendrobium densiflorum*, forty-four spikes. Most of these were grown in tubs 2 feet 6 inches wide and 1 foot deep. These were exceptionally fine specimens, but all the following have been found to thrive with similar treatment:—*Anguloas Clowesi*, *Ruckeri*, *uniflora*; *Arpophyllum giganteum*; *Barkerias elegans*, *Lindleyana*, *Skinneri*, *spectabilis*; *Brassavola glauca*, *Brassia verrucosa*; *Cattleyas citrina*, *Harrisoniæ*, *crispa*, and others; *Cœlogyne cristata*; *Cymbidium eburneum*, *giganteum*, *Hookerianum*, *Mastersi*; *Cypripediums insigne*, *Schlimi*, *Sedeni*, *venustum*, and many others; *Dendrobium nobile*, *densiflorum*, *thyrseiflorum*, *chrysanthum*, *Hilli*, *speciosum*, *Wardianum*, *Pierardi*, and others; *Epidendrum amabile*, *aromaticum*, *macrochilum*, *vitellinum*; *Lælias albida*, *acuminata*, *autumnalis*, *majalis*, *superbiens*; *Lycaste aromatica*, *cruenta*, *Skinneri*; *Masdevallias coccinea*, *Harryana*; *Mexillarias aromatica*, *grandiflora*, *Harrisoni*, *venusta*; *Odontoglossums Alexandræ*, *citrosimum*, *cordatum*, *gloriosum*, *Lindleyanum*, *Pescatorei*, *nævium*; *Phalænopsis pulchellum*, *Uro-Skinneri*; *Oncidium bifolium*, *crispum*, *incurvum*, *leucochilum*, *ornithorhynchum*, *serratum*; *Pleione humilis*, *lagenaria*, *maculata*, *Wallichiana*; *Trichopilia tortilis*; *Zyopetalums crinitum*, *Mackayi*, and *maxillare*. To these were afterwards added *Aerides odoratum* and *crispum Warneri*; *Calanthes vestita* and *veratrifolia*; *Cattleyas elegans*, *intermedia*, *Skinneri*, *Mossiæ*, *labiata*, and *Trianae*; *Dendrobium moniliforme* and *formosum*; *Lælias anceps* and *purpurata*; *Odontoglossum Alexandræ*, with *Stanhopeas tigrina*, *oculata*, and *insignis*. It may be remarked that the coolest position should be assigned to the *Masdevallias* and *Odontoglossums* at the forcing period of the year, and for this reason they are better in late vineries than in early

ones, as the former are especially impatient of too much artificial heat. Some orchidists are, however, now advocating higher temperatures for these plants, giving the minimum as 50°, or preferably 55°; but something depends upon the situation and style of house, for very good plants are grown where the temperature in winter is allowed to fall to 45° or even 40°.

TEMPERATURE.—Since Orchids are found in such widely varied districts it can be readily understood that with other conditions the temperatures to which they are exposed differ considerably. In cultivation, however, we are compelled to group the plants as nearly as possible according to their respective requirements as regards heat. Nurserymen and wealthy amateurs who have extensive collections commonly devote houses to each of the larger genera, structures being appropriated to *Cattleyas*, *Lælias*, *Dendrobiums*, *Cypripediums*, *Phalænopses*, *Vandas*, *Odontoglossums*, *Masdevallias*, &c.; but in smaller establishments it is seldom that more than three houses can be used for Orchids alone; and all that need the protection of glass can be readily grown in those by regulating the temperature. Thus the warmest house (day temperature of the year 65° to 80°) would contain the Orchids from the tropical regions of the Old World, especially the East Indies, the Malayan Archipelago, and adjoining countries on the main land. An intermediate house (day temperature of the year 60° to 75°) would be used for the tropical Orchids of America, comprising the *Cattleyas*, *Lælias*, and other plants from Brazil and the lower parts of Mexico. The third house (day temperature of the year 50° to 65°) would answer for most of the *Odontoglossums* and *Masdevallias*, with other plants from high regions in tropical countries. All indoor Orchids can be satisfactorily grouped in these three divisions, and in the following notes they will be referred to as the warm house, intermediate house, and cool house. It should be observed that in general practice there has been a great reduction in the temperatures for Orchids, and some very experienced growers, like Dr. H. Paterson of Bridge of Allan, rely exclusively upon sun heat for the higher summer temperatures, and at that season frequently have no artificial heat. There can be no doubt that highly heated houses during the winter when we are compelled to rest the majority of our Orchids is exceedingly injurious, weakening them and rendering them precocious in flowering, and much more liable to the attacks of insects. If strong growth is made and well ripened under plentiful sun heat and free ventilation Orchids will endure a much lower temperature than is usually supposed, and will be far more satisfactory than when roasted, as they were in the early stages of their culture. As a general guide to the temperature of the year for Orchid houses the following table, which was included in the paper read by Mr. James O'Brien at the Orchid Conference in 1885, is very useful:—

TABLE OF TEMPERATURES FOR ORCHID HOUSES.

Months.	Warm House. East Indian.		Cattleya, or Inter- mediate House.		Cool, or Odonto- glossum House.	
	Day Degrees.	Night Degrees.	Day Degrees.	Night Degrees.	Day D gr es.	Night Degrees.
January	65-70	60	60-65	55	50-55	45
February	65-70	60	60-65	55	50-55	45
March.....	65-70	60	60-65	55	55-60	50
April	65-70	60	60-65	55	55-60	50
May	70-75	65	65-70	60	60-65	55
June	75-80	70	70-75	65	60-65	55
July	75-85	70	70-80	65	60-70	55
August	75-85	70	70-80	65	60-70	55
September.....	75-80	70	70-75	65	60-65	55
October	70-75	65	65-70	60	60-65	55
November	65-70	60	60-65	55	55-60	50
December	65-70	60	60-65	55	50-55	45

Amateurs are often puzzled as to the quantity of piping to be used in a house to maintain a particular temperature; and though these matters are best entrusted to horticultural builders, who will give due consideration to the position, exposure, and other circumstances bearing on the point, yet a few hints may be useful as a guide. Many formulæ are given for the purpose of calculating the approximate number of feet of piping necessary, but they are all somewhat perplexing and occasionally misleading. The following, based on a table by Mr. F. A. Fawkes, has the merit of simplicity, and it is, moreover, as nearly correct as any calculation of the kind can be. The length of 4-inch piping named is that needed for each 1000 cubic feet of internal atmospheric contents, and the temperatures, as elsewhere in these notes, are given in degrees Fahrenheit.

Warmest house, 65° to 80°. Lean-to houses, 55 ft. to 65 ft. Spans, 60 ft. to 70 feet.

Intermediate house, 60° to 75°. Lean-to houses, 50 ft. to 60 ft. Spans, 55 ft. to 65 ft.

Cool house, 50° to 65°. Lean-to houses, 40 ft. to 50 ft. Spans, 45 ft. to 55 ft.

These figures practically correspond with what is usually recommended for span-roof houses of good size—namely, warm house, four rows of pipes in each side; intermediate house, three rows; and cool house, two rows, and from them an idea can be gained as to what extent of piping is needed, but it is always advisable to have too much than too little, as is proved in houses of all kinds, whether devoted to plants or fruits. The greater the radiating surface the more regular the temperature, and the less injurious it is to the plants in severe weather when it may be necessary to keep the fires going briskly

It may be observed that if a few particulars are known respecting the habitat of newly introduced Orchids it is not difficult to provide for their requirements. The first point is to ascertain the country and latitude, then the altitude, and finally any other circumstances, such as whether the position is exposed or shaded, and in the case of terrestrial Orchids the character of the soil in which they are growing. The rule usually given for calculating the depression of temperature in ascending mountains is to allow a fall of 1° Fahr. for every 300 to 350 feet of altitude, but the depression is more rapid in the higher regions. Thus in the tropics, where the temperature at the ground level might be 80°, at an elevation of 6 to 7000 feet would be estimated to be 55° to 60°. This is, however, necessarily influenced to a great extent by the position of the land, whether sloping towards the sun or not, also whether the mountains are near the sea or inland; but an approximate idea may be gained of what the plants need.

CULTURAL MATERIALS.

Good results in plant culture are largely dependent upon the soil employed for them, and too little attention is often paid to the subject. For Orchids it is particularly important, and a few notes on the principal materials necessary may be useful.

PEAT.—This is a well-known substance used extensively for hardwooded plants, Heaths, &c.; and for the majority of Orchids it is indispensable. It varies greatly in its character, depending chiefly upon the nature of the soil where it is obtained and the roots of which it is composed. In some places it consists mainly of the roots of grasses and a black soil derived from the decomposition of vegetation, and is then termed bog peat; in others it chiefly comprises wild Heath roots and finer grasses, and is found in higher districts, a third kind being mainly formed of Fern roots and rhizomes, both the last named containing a varying proportion of light brownish soil from the farther decomposition of the roots, &c. These are the principal kinds, but there are many intermediate grades. The bog peat, which also generally contains a proportion of sand, is most suitable for Heaths and similar plants; the second kind is used for Ferns, and the third is the best for Orchids. For these plants it must abound in fibre, and the smaller particles should be shaken out before it is used, when it can be broken up into pieces of various sizes according to the plants for which it is to be employed, but never very small. If a quantity is procured at one time it must be stacked where it will not be exposed to the wet, and yet not in a hot position where it will become too much dried. When ordering peat intending purchasers should state that it is required for Orchids, and the dealers will then know what to supply.

SPHAGNUM.—The moss used for Orchids consists mainly of *Sphagnum obtusifolium*, but *S. squarrosum*, *S. acutifolium* and

cuspidatum, with others that have been considered as varieties of one species, are also abundant in some districts. These are termed bog mosses, and are found in low moist places frequently partly submerged, and are abundant in most parts of Britain. The sphagnum serves as a retainer of moisture, and by its decay furnishes something for the support of the plant grown in it. When received it should be spread out on a bench or floor and carefully picked and selected, removing all the weeds, leaves, grasses, or foreign substances, and divide it into three qualities. The first should consist of the fresh-growing points of the shoots, which must be preserved for surfacing; the next in freshness will be set aside for chopping up and mixing with peat for potting; and the third, comprising all the roughest and most decayed portions, being employed for covering the drainage in the pots before the principal soil is placed in. It should all be kept in a damp warm position, especially the first named, to induce growth, which soon takes place under favourable circumstances, assuming a bright green colour. The chopped sphagnum is sometimes scalded with hot water to destroy insects, and in any case these must be looked after very closely or they will do much mischief afterwards, when they cannot be so readily found. A substance termed Trepho, consisting of compressed sphagnum, is sold by Mr. B. Field, Swan Place, Old Kent Road, and has been recommended by several Orchid growers for blocks or for potting purposes. The sphagnum is placed under hydraulic pressure, and thus formed into compact firm blocks that can be cut to any size required, which, as might be imagined from the nature of the substance, are very retentive of moisture. It is employed in this way as blocks to grow Orchids upon and for breaking up as a substitute for or an addition to peat. It is well worth a trial, and the fact that it is being employed by some nurserymen is a sufficient proof of its merit.

LOAM, CHARCOAL, AND POTSHERDS.—For exotic Orchids loam is not much used except for *Calanthes*, a few *Cypripediums*, or other strong-growing species; but whenever employed it should be of a light fibrous character, heavy and clayey loam being especially avoided, and that of a very sandy nature is also unsuitable. It must be stacked as for other plants and used in an intermediate state of moisture. Charcoal is an important material for mixing with compost for many Orchids, and some, like the *Phalænopsis* and others of that character, can be grown in that and potsherds alone. The latter must be thoroughly cleansed and sorted in different sizes, using the largest for the lower drainage in pots and for baskets.

MANURES.—Though ordinary manures have been long used for strong-growing Orchids of the *Calanthe*, *Cypripedium insigne*, and *Dendrobium nobile* types, they have not come into general use for other Orchids, and it is quite evident that although some of the character named may be benefited by stimulants, these must be

employed very sparingly and with great judgment for the majority. It is true that many tropical Orchids grow where there is naturally a luxuriant vegetation, and the gases arising from the rapid decomposition may be supposed to be beneficial ; also that bird guano deposited upon the stems and branches of trees may afford some support of this kind. Under artificial conditions it is, however, necessary to be extremely cautious or much injury will result, and beginners had better abstain from dangerous experiments until they gain more knowledge of Orchid culture. Some experienced cultivators have, however, proved that manures can be employed with advantage, and several have been recommended for the purpose. Cow manure in an old and partially exhausted condition is used for mixing with the soil for strong terrestrial Orchids, chiefly for those needing loam, and which will be afterwards enumerated. Horse, sheep manure, and soot are similarly used, but the most elaborate trials appear to have been made with Jensen's fish manure, Mr. A. Borwick of Higham Hill, Walthamstow, having tried it generally on a miscellaneous collection of Orchids with evident advantage to the majority, especially *Cymbidiums*, *Lycastes*, and *Cœlogynes*, which have made very strong growths. This was used at the rate of a 48-potful to a barrowload of peat or other soil ; but it is safer to use a smaller quantity, and in any case this or any other manure should be thoroughly mixed with the compost. The manures named are also used as liquids diluted with water, but these must always be very weak—scarcely tinged ; or in the case of the fish potash $\frac{1}{4}$ oz. to a gallon is ample, and less is advisable. As liquids, and for sprinkling upon the stages or floors of houses, some persons have tried nitrate of soda, sulphate of ammonia, and carbonate of ammonia, which are dissolved in water and then sprinkled about. Sometimes pieces of the carbonate are placed in jars in the pipes and allowed to remain there constantly, thus giving off a supply of ammonia. Experiments of this kind have been found to improve the colour of the foliage wonderfully ; but when given to the plants in a comparatively strong state they either make a vigorous growth and become exhausted and turn yellow, or their roots are at once killed. At The Grange, Wallington, the residence of A. H. Smee, Esq, where so many interesting experiments have been tried, Clay's Fertiliser has been employed for many Orchids, applied as a top-dressing for the strongest, or about a spoonful is placed in a gallon of water, and the liquid thus formed is given to the majority of terrestrial Orchids. A very strong specimen of *Cyrtopodium Saintlegerianum*, which had been thus treated has been exhibited and certificated at South Kensington.

CULTURAL UTENSILS.

POTS AND PANS.—Large numbers of Orchids are now grown in pots and pans, more so, perhaps, than formerly, when baskets, rafts,

and blocks were almost exclusively used for epiphytal species. They are obtained in a great variety of sizes and shapes ; some very artistic, such as Mr. Matthews occasionally exhibits, and others of plainer design, but equally useful. Those with perforated sides are preferred by some, and they have the advantage of affording a quick drainage, which is necessary if deep pots are used. Shallow pots or deep pans for large specimens are, however, being more generally employed, and of late small pans, 3 inches deep and 4 to 6 inches in diameter, have become popular for many Orchids, and it is astonishing what pretty plants can be grown in them, *Odontoglossums* of the *Cervantesi* and *Rossi* character, *Sophronitis*, and other small Orchids doing well, while some of the *Dendrobiums* succeed admirably in the same way. All, in fact, that do not need much root space. Where insects are

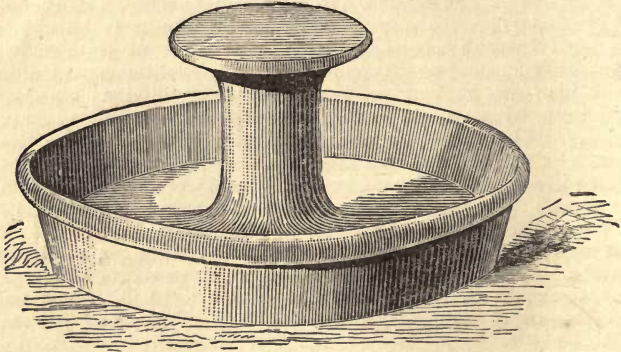


Fig. 15.—An Orchid Pan.

troublesome it is a common practice to invert a pot in a saucer of water and place the other on this ; but a simpler way of accomplishing the same object is afforded by the Orchid pan employed at Downside, Leatherhead, which was prepared from a design by the gardener, Mr. Woolford. It consists of an ordinary saucer, in the centre of which arises a little pillar expanded at the top into a flattened plate, upon which the pot is placed. The saucer being then filled with water, no insects can pass from the stage to the plant.

BASKETS AND BLOCKS—Baskets suitable for Orchids are readily constructed, but they are now so cheap that it is much better to purchase them from some of the dealers, from whom they can be obtained of any size desired and of several forms. They are mostly made of teak, and are very durable, though constantly exposed to

moisture. The principal forms are shown in the accompanying cuts, which represent some of those made by Mr. Sidney Williams, 21, Farringdon Road. The ordinary square basket is formed with the bars extended at the end, as in fig. 16, or with the ends flush, and it is immaterial which is employed; they are also made with four wires for suspending them by, and with two, but the former is generally preferred. Fig. 17 represents a boat basket, a convenient form for some Orchids, and fig. 18 is a cylinder, employed in many establishments for *Phalænopsis* and similar kinds. Mr. Bonny, Hackney Downs, also constructs very useful baskets in which the wires are removeable, so that different lengths can be employed as desired, and cane is used between the bars instead of lead. For blocks almost any wood is suitable that is not so soft that it readily decays, or of so



Fig. 16.

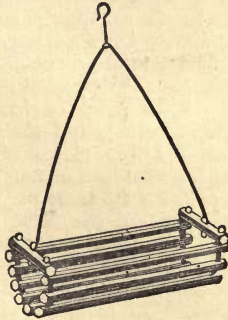


Fig. 17.



Fig. 18.

hard and close a texture that the roots cannot obtain a hold upon it; but teak slabs are also frequently used as blocks, rafts formed of parallel bars answering the same purpose. A soft freestone has been used as blocks for epiphytal Orchids with good results, and porous earthenware pots, filled with water inside and the plants secured to the outer surface, have been found similarly suitable for many species. The use of compressed sphagnum for this purpose has been already noticed.

Of miscellaneous utensils the most important, in addition to the ordinary watering cans with fine and coarse roses, and syringe with nozzle and rose, will be a little metal tank on wheels for dipping baskets, blocks, &c., where the collection is large, as it can be taken round the house and the work quickly performed. For a small collection a pail will suffice.

CULTURAL OPERATIONS.

POTTING AND BASKETING—In all operations connected with Orchids it must be remembered that the roots cannot be safely treated like those of many plants in general cultivation; they are much more delicate and readily injured, consequently in potting or basketing much care is needed. If the old roots are adhering to the sides of the pots or the drainage, the pots must be broken, and these, or the pieces of crocks, placed in the new pots, disturbing the roots as little as possible. All dead roots must, however, be cut away, and if any of the others appear unhealthy, or if the compost was old or much decayed, they should be washed in tepid water. When it is desired to transfer a plant from a small basket to a larger one, and the roots are much interlaced amongst and adhering to the bars, as is often the case with epiphytal species, it is usually a safer plan to employ a basket of sufficient size to allow the old one being placed in it, filling the intervening space with the compost. Pots should be thoroughly drained, the largest having smaller sized ones inverted in them, and the space round these filled with clean potsherds, or these can be used alone. For all large specimen epiphytal Orchids the drainage should be two-thirds the depth of the pot; for terrestrial Orchids less will be required according to the strength of the individual plant and the character of the species. Large pieces of potsherds are arranged hollow side downwards, but charcoal, or rough burnt clay, such as is termed ballast, can be used for the same purpose. Over this place a layer of sphagnum, and then put the plant in position, filling with the compost which may have been either previously mixed, or the peat, &c. can be introduced separately, firming it amongst the roots sufficiently to hold the plant steady, but not pressing it down as is practised with other plants. In the case of large heavy Cattleyas, Lælias, &c., it is sometimes needful to employ a few pegs, or a stake, to assist in holding them steady until established. It is advisable in most cases to raise the base of pseudo-bulbous Orchids slightly above the rim of the pots, making an even rounded surface of peat, covering this with the selected sphagnum previously mentioned. Some have tried other native mosses, such as are usually found in abundance in woods or shady places, for this purpose, and in the cool houses they succeed well, having a pretty and more diversified appearance than the sphagnum; such material, however, needs very careful examination, or many destructive insects may be introduced with it. For a number of the more delicate epiphytal Orchids grown in baskets, potsherds, charcoal, or a few lumps of peat are sufficient, or the two former alone, rather loosely arranged, especially for species of the Stanhopea and Acineta type, which force out their flower spikes from the base in a downward direction. Orchids grown in the small shallow perforated pots already noted require scarcely anything but peat and a surfacing of moss. Blocks are not so frequently employed



MESSRS. J. VEITCH & SONS'

(From the Journal of Horticulture)



CATTELEYA HOUSE, CHELSEA.

(page 215, Vol. X., 3rd Series.)

now as formerly, but there are some plants, like *Cattleya citrina* for instance, which from the nature of their growth are much better on blocks than in pots or baskets; but there are comparatively few strong-growing species which cannot be more satisfactorily grown in baskets. One reason for this is probably due to the fact that in baskets they do not suffer quite so quickly in hot weather, whereas blocks need very frequent attention in watering during the summer, or the plants may be injured beyond recovery. When an Orchid is to be grown on a block a little moss may be placed round the base of the plant, and the latter firmly fixed by a few pieces of copper wire passed across and nailed to the side or back of the block. In some cases the moss is not requisite, but it is safer for beginners to employ a little at first.

The time at which these operations require to be performed varies, for in their native countries Orchids commence their growth at very different periods; but it may be taken as a general rule that as soon as root or leaf growth is commencing potting or basketing can be safely done. In many species the commencement of activity is readily seen in the protrusion of young roots at the base of the stem or pseudo-bulb, and in others new growths will be seen pushing from the lower portion of the plant. The adoption of lower winter temperatures necessitates resting most Orchids which need that treatment in the duller months of the year, consequently growth generally commences in February and March, when the majority can be safely potted. But the rule previously given can be followed as regards those that start at other times; but for such as are growing to some extent all the year, like *Odontoglossums*, the potting season may be regulated according to convenience, and Orchids of the *Vanda* and *Aerides* type may be so treated whenever they are not in active growth, but preferably just before they start, and the early spring will be found the most satisfactory time for the majority. Some Orchids require repotting or basketing much more frequently than others, the strong, quick-growing species needing attention every year; the slower, more delicate sorts often thrive well enough for several seasons with only an occasional renewal of the surfacing. The latter should, however, be looked to every year, as it improves the appearance of the plants very much, and is beneficial to the young roots, which dislike old decayed materials about them.

WATERING, SYRINGING, RESTING.—Few plants that are not aquatics require so much water as Orchids both about their roots and in the atmosphere, and therefore the supply of moisture is an important operation. Healthy Orchids when growing freely can scarcely have too much water, and during the summer they will need attention twice a day independent of damping the paths and stages, or syringing. In the winter and during the resting period of Orchids, whether terrestrial or epiphytal, the supply must be greatly reduced

for all except *Odontoglossums*, *Masdevallias*, and others which continue active throughout the year. Non-pseudo-bulbous Orchids must also have a more liberal supply of water than those with pseudo-bulbs, which serve as storehouses of nutriment. In the summer and growing season the material on the shelves and the paths must be kept well moistened, and in cool houses shallow tanks should be provided at the sides of the paths. For supplying the plants and syringing rain water is the best, and it must always be used about the temperature of the house. Hard water should be avoided except for damping purposes, as though lime is not injurious to some Orchids it disfigures the foliage. Baskets and blocks can be dipped, but this must be carefully done with the former, or the drainage may be disturbed. There is some difference of opinion respecting the beneficial effects of syringing, but the majority of cultivators have proved its usefulness, and in some large trade establishments the plants are syringed most liberally, ordinary watering-cans being seldom used. Morning and evening syringings in the spring, summer, and autumn are beneficial to growing Orchids, but care must be exercised to keep the water off the flowers, and as much as possible off young tender growths, particularly those of *Lælias* like *L. purpurata*; while in the winter it should be discontinued, especially when the weather is severe. At St. Albans a simple and labour-saving mode of damping the houses is adopted, which is, however, only suitable for large establishments. Under the stages and along the paths in every house are taken two or more pipes 1 inch in diameter, which are perforated at short intervals and connected with the main supply, so that by turning taps in convenient positions the whole house or any portion can be quickly damped with little trouble.

The atmosphere of Orchid houses must be constantly moist, and in hot weather this can only be effected by a frequent and liberal distribution of water upon the paths and stages. A useful instrument for determining the amount of moisture in the air is the hygrometer, consisting of two thermometers graduated exactly alike, with small projecting bulbs. These are affixed an inch or two apart to a porcelain or other frame, and the bulb of one is connected by a little syphon of cotton, or lamp-wick, with a small bowl kept constantly filled with water. The evaporation of water from the latter, termed the wet bulb, by the extraction of heat, causes the mercury to fall, and by comparing the temperature thus registered by that shown in the dry-bulb thermometer, which indicates the temperature of the house, it is seen at a glance whether the air is dry or moist. When saturated with moisture the mercury in the two tubes will stand at the same level, and the drier it is the greater will be the difference between them. This simple instrument can be easily constructed if two evenly balanced thermometers are obtained, but they can now be purchased very cheaply, and should be employed wherever Orchids

are grown in quantity. In fig. 19 is represented a convenient hygrometer from Messrs. Negretti & Zambra, Holborn, but there are several other forms, some being constructed with a mechanical arrangement and dial. One of these, which is termed a self-recording hygrometer, is shown in the woodcut, fig. 21. In this "the two thermometers with the water cistern are mounted upon a frame in connection with the clock. An index hand on the dial of the clock enables the observer to arrange the release of a catch or detent at any moment, and by the action of the clock cause the hygrometer to revolve on its axis. By this movement the mercury contained in the



Fig. 19.



Fig. 20.

left-hand tubes of the thermometer breaks off and passes over into the right hand tubes, where it records the temperature." This is a very elaborate instrument, but the simpler forms answer the same purpose. A cheap useful thermometer for registering the lowest temperatures is represented in fig. 20, and consists of zinc scale enclosing the glass tube, containing a black glass index floating in the spirit.

Deciduous terrestrial Orchids require a decided period of rest, during which water is either entirely withheld or is given in very small quantities. Evergreen pseudo-bulbous Orchids must never be

“dried off,” but their rest consists in lessening the heat and moisture, though in the case of the *Odontoglossums* the supply must always depend upon their condition. Deciduous pseudo-bulbous Orchids also require a period of rest, but water must be given in sufficient quantities to prevent shrivelling.

VENTILATING AND SHADING.—In warm moist districts ventilation can be given much more liberally than in cold exposed or dry

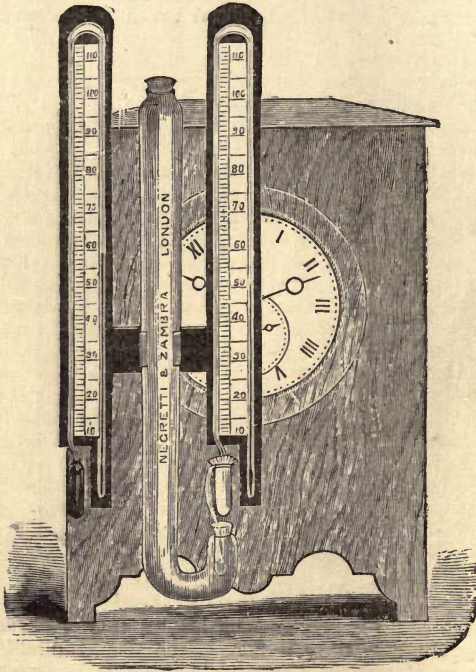


Fig. 21.

situations, and to these varying circumstances are due the different opinions on the advantages to be derived from free ventilation. Wherever the climate is suitable and when the weather is favourable there is no question that most successful results are obtained by admitting air freely not only to cool-house but to tropical Orchids,

and I have seen the late Mr. Percival's fine Cattleyas being absolutely blown about by brisk sea breezes, and Dr. Paterson in warm Bridge of Allan has adopted a similar system with equal advantage. For cool Orchids a liberal supply of air during the greater portion of the year is essential, and in one of the largest trade establishments small wooden pegs are placed between the laps of the glass, so that there is a space of an eighth of an inch between each two panes, and a similar space at the bottom of the rafter. In the same place the walls are constructed so that there is a moveable half-brick at the end of each whole brick just below the side shelf and opposite a hot-water pipe. These act as plugs, which are removed in spring immediately the frost has departed and are not put in again until autumn, thus affording a free admission of air both day and night. This is only noted as an example of what can be done, for in ordinary establishments a piece of board 8 or 9 inches wide, slicing in two grooves outside the house opposite the pipes, is sufficient for ventilation beneath the stages, though iron or wooden hinged shutters are also employed. In one place I have seen the following method adopted: a channel runs down the side of the path under the pipes, communicating with a small chamber outside the house covered with a grating. The channel opens into the house by several apertures, which can be opened or closed by small lids, and the cold air thus admitted ascends directly to the pipes, being partially warmed before it comes in contact with the plants. The outside grating can also be covered when necessary. Roof ventilation can be accomplished in various ways according to convenience, but for all warm houses, especially in cold bright weather, it is advisable to have pieces of tiffany stretched across the opening to break the force of the cold current. During the winter whenever the wind is keen or frost severe never ventilate, and in very hot dry weather it is better to shade well, employ no fire heat, damp liberally, and ventilate but little. Without artificial heat the temperature of all but the typical cool houses may be allowed to rise considerably above the maximum temperatures given in the table without danger if water be abundantly supplied. For this reason the houses may be closed at 3 to 5 P.M. according to the season and the weather, but a little all-night ventilation in the height of summer will not be hurtful to tropical Orchids, and for the others it should be the rule at that time of year.

The ordinary roller blinds are the most convenient for shading purposes, as they can be quickly run down or up according to the weather. A very convenient form of blind is the Parisian chain blind, which is formed of narrow strips of wood a short distance apart, so that, while effectually breaking the force of the sun's rays, they do not darken the house. These are giving satisfaction in several Orchid-growing establishments. For *Odontoglossum* houses in sunny positions permanent shading is sometimes applied to the

glass, and the best I have found for the purpose is prepared in the following way : 1 lb. each of tallow and flour and $\frac{1}{2}$ lb. of whiting are mixed together with cold water and sufficient Brunswick green to tint it as required, and the mixture is then warmed in a pail before applying it to the glass, which should be done when the sun is shining. This lasts well and does not render the house too dark if put on thinly. This will only be needed in the spring and summer, and houses with a north aspect will not require it. Some Orchids require more shade than others, and those like *Cypripediums* or *Phalænopses* should be given the shadiest side of the house. Artificial shading should, however, only be employed in very bright weather and in the hottest part of the day to prevent the temperature rising too high, as too much shade weakens the plants and prevents their growths ripening.

PROPAGATING.—Few Orchids can be quickly increased by any artificial method of propagation, and it is owing to this fact that hybrids raised in this country so long maintain their value, whereas an introduced species may be scarce and high-priced for a time, and then perhaps a fortunate collector sends home a large shipment and the value falls immediately. Amateurs cannot depend upon propagation to add much to their stock, as in most cases it takes too long, and it is far better to purchase small established plants, which can be had much cheaper than formerly, or even to procure imported plants. It may happen, however, that a particular variety is possessed that it is desirable to increase, or perhaps it is wished to try a few experiments, and in either case some hints will be needed as to the modes to be adopted. In the first place do not commence experimenting with any valuable plant ; gain a little experience first with some of little consequence, for Orchids are easily injured by any process of division unskilfully performed, and some seem to object to it altogether. Strong healthy examples only should be selected, and even these must be carefully treated afterwards. The latter remarks especially apply to the method adopted with many Orchids having short ovoid pseudo-bulbs of the *Cattleya* or *Odontoglossum* types—namely, cutting between the pseudo-bulbs and through the rhizome, so as to retain some roots with each. The safest plan is to leave these in the pot for some time until it is seen that fresh growths are coming from the divided portions, when they can be potted or otherwise as is most convenient. This plan is also adopted when it is desired to produce what are termed “back growths” to make a better specimen, as old pseudo-bulbs will often form growths when thus treated, greatly improving the appearance of a plant. *Lycaste Skinneri* is readily increased in this way, and old pseudo-bulbs can be separated and potted singly, giving them little water until a bud starts from the base. Most hardy tuber-bearing Orchids can be increased by division in autumn after their stems are dead, or preferably in early spring before growth starts.

For many exotic, deciduous, or evergreen Orchids with long cylindrical pseudo-bulbs another system may be tried, as, for example, with *Dendrobium nobile* and species of similar habit. Of these, any pseudo-bulbs that have flowered but are not old or shrivelled may be cut from the parent plant and laid lengthwise in moss, secured to a block or in a pan, or cut into lengths of about 6 inches and inserted in pots of moss kept constantly damp. *Dendrobium nobile* produces young plants from the nodes very readily when treated in this way, and I have reared a dozen from one pseudo-bulb; but usually the plants are chiefly formed in the upper portion, and are occasionally so produced without removing the pseudo-bulbs from the old plant, while some prefer pegging them down round the pot in which they are growing, though this is sometimes inconvenient. *Thunias* are propagated by cuttings in the same way as mentioned for *Dendrobiums*, but sand should be substituted for the moss. The best time for such operations is early in the spring, as it gives the young plants so obtained a better chance of becoming established before winter, which in our climate tries them severely even with the best care. When separated or potted singly water must be supplied in small quantities until some progress is observed, when they may be gradually accustomed to the treatment given to the other plants. *Vandas*, *Aerides*, and others of similar habit can be increased by taking off side breaks or the tops of the plants with a few roots attached and potting them in moss, and when the former become too tall they are occasionally reduced to more convenient size in this way; but they should receive very careful attention for some time afterwards in shading and keeping them close. *Cypripediums* are easily increased by division in the ordinary way, and skilful growers do not hesitate to practise this with the most valuable hybrids.

What may be termed natural methods of propagation can be taken advantage of with Orchids which produce young plants upon their stems or pseudo-bulbs, like several *Epidendrums*; others, as the *Phalænopses*, particularly *P. Lüddemanuiana*, occasionally bear plants on their flower stems or on their roots, as with *P. Stuartiana*; while others, like *Calanthe vestita* or the *Pleiones*, produce young plants on their old pseudo-bulbs that can be separated and grown on as advised.

If the ordinary methods of propagation are slow, raising Orchids from seed is a still slower process, and it cannot be recommended except for those who are interested in obtaining hybrids. It requires much patient waiting, constant attention, and perhaps after years of this care some enemy may devour the plant; it may die some hot day from a little neglect in watering, or it may "damp off" in a dark cold winter. Independent of these difficulties seed-bearing is exceedingly weakening to Orchids; a weak plant may be killed and

a strong one so injured that it will take several seasons to recover its usual condition. Even producing flowers alone is weakening, and young delicate plants should not be allowed to produce many or retain them long; in fact it is better not to permit any plant in doubtful health to flower at all. Then it is difficult to insure the proper maturation of the seed-pods, and even when these develop and ripen satisfactorily they are occasionally found to contain no seeds, or only imperfect rudimentary bodies that will not germinate. Mr. Harry J. Veitch in his paper read at the Orchid Conference gave some interesting particulars concerning the time the capsules take to ripen, from which the following are selected as examples: *Calanthe*, three to four months; *Masdevallia*, four months; *Zygopetalum Mackayi* crossed with *maxillare*, six months; *Phalænopsis Schilleriana*, six months; *Lælia purpurata*, nine months; *Cypripedium insigne*, ten months; *C. Spicerianum*, eleven to twelve months; *Cattleya labiata* and others, eleven to thirteen months; *Anguloa Clowesi*, *Chysis bractescens*, *Dendrobium aureum*, *Maxillaria Harrisoniana*, and *Odontoglossum maculatum*, twelve months. Considerably longer periods are required to bring the plants from the germinating to the flowering stage, as the undermentioned facts will show from the same authority as the preceding. *Dendrobium aureum* crossed with *D. nobile*, three to four years; *Phaius* and *Calanthe* about the same time, the seed of the latter germinating in two to three months from the time of sowing; *Masdevallia* and *Chysis*, four to five years; *Cypripedium Schlimi* crossed with *longifolium*, four years; the reverse cross, six years; *Zygopetalum maxillare* crossed with *Mackayi*, five years; the reverse cross, nine years; *Lycaste*, seven to eight years; *Lælias* and *Cattleyas*, usually ten to twelve years, but some have taken much longer, as *Lælia callistoglossa*, which was sown in 1858 and flowered in 1877, the quickest being *Lælia triophthalma*, sown in 1875 and flowered in 1883.

Seed must be sown immediately it is ripe, but it should be done if possible in the spring or early summer, as it is much more likely to germinate then than in autumn or winter. It is usually sown upon living moss in pans where other Orchids are growing, or upon blocks of wood, Fern tree stems, the sides of pots, and various other ways; but the first named is the best, and the chief object is to keep the moss constantly moist, disturbing it as little as possible, until the diminutive plants have made some progress and are forming their leaves. They may be then very cautiously removed and placed in thimble-pots of moss plunged in a larger size, the space between the two being filled with moss kept regularly moist. The utmost care will be needed in this respect, and the seedlings must not be exposed to the direct rays of the sun or draughts of cold air. After some years of trouble the cultivator may possibly be rewarded by seeing a novelty of great merit flower. Amateurs must not be discouraged

by these difficulties, but all who have the time should try some experiments, for though wonderful progress has been made in hybridising by Messrs. J. Veitch & Sons, there is still an ample field for investigators, and many gentlemen have turned their attention to the matter in recent years. In any attempt of the kind care must be exercised to prevent the intended seed-bearer being fertilised from any other source, both before and after the desired cross has been made. This may be effected by tying a piece of gauze round the flower when it is expanded, also removing its own pollinia.

CULTIVATORS' ENEMIES.

Orchidists have abundance of enemies to contend with, for the plants are subject to the attacks of many insects ; but in this, as in other cases, prevention is better than cure, and a continual watchfulness for the first appearance of these pests and the adoption of prompt measures will save endless trouble. It is important to insure that the plants purchased are thoroughly clean, and if there be any doubt on the matter they should be well washed with tepid water and a small quantity of softsoap, sufficient to discolour the water, this being especially necessary for imported plants, the roots of which should also be washed in clean water. Orchids are subject to the attacks of most insects which infest other plants, such as green fly, red spider, thrips and scale of several sorts, and mealy bug ; while snails, slugs, woodlice, ants, and cockroaches also cause much trouble if allowed to become numerous. It is not difficult to keep a small collection clean, but where large numbers of plants are grown it requires constant care ; and in some establishments it is the rule to thoroughly clean the whole stock periodically, for delicate plants once a month. The frequent use of tepid water, softsoap in very small quantities, or weak tobacco water is the best means of keeping the foliage clean, applying the liquids with a sponge or camel's-hair brush. Green fly and the thrips may be destroyed by fumigation with tobacco or tobacco paper. Though this is commonly recommended it is a dangerous expedient in the hands of beginners, for a strong fumigation will often prove far more injurious than beneficial. It should only be resorted to in extreme cases, and then it should be given very moderately on several alternate nights ; choose a quiet evening, have the house drier than usual, and if moveable blinds are employed pull these down. Be careful to place the fumigator where the hot smoke does not ascend directly under any plants, and do not employ burning coal or coke, as the gases arising from these are very injurious. Slugs and snails must be looked after closely, a little bran being a good bait for them. A few cabbage leaves can also be laid about on the stages, and frequently examined ; hollowed potatoes, a little moss, and various other things serve as traps for woodlice.

Ants may be caught in glasses of sugar or treacle and water sunk in the stages level with the material, or old bones can be placed about and occasionally plunged in hot water ; while for cockroaches I have never seen anything better than Chase's phosphor paste, which can be spread on pieces of paper, wood, slate, or any substance and placed at night where they are most frequent, removing it again in the morning. Isolating stages by means of metal saucers soldered round the supports and filled with water is an excellent plan, and the Orchid pan already noticed answers a similar purpose. There are several insects which are peculiar to Orchids, and one of the worst of these is that which attacks Cattleyas, causing the pseudo-bulbs to swell, and for which the only remedy seems to be cutting the growth away immediately it is seen to be swelling unusually. A useful little friend in the Orchid house is the green frog, which is a most persevering and voracious destroyer of insects, and two or three of them in a collection will save the cultivator a great amount of trouble.

The diseases of Orchids are few, and are principally due to excessive moisture in the air or at the roots, accompanied by unduly low temperatures. Many Orchids will continue healthy with very little heat, but the supply of water must be correspondingly diminished or decay of some kind will commence. That form termed "rot" chiefly attacks the pseudo-bulbs, but sometimes the leaves, and in any case the decayed portion must be cut clean out, dusting the surface freely with sulphur. "Spot," which appears on the leaves, has a similar origin, and the best plan is to alter the treatment as to heat and moisture, cutting away the worst leaves, or dusting them with sulphur. It is important to keep all material in a fresh clean state, providing a wholesome atmosphere by suitable ventilation.

SELECTIONS OF ORCHIDS.

The number of genera of Orchids recognised in the latest authoritative work, Hooker and Bentham's "Genera Plantarum," is 334, which comprise a total of about 5000 species. Of these probably 2000 are in cultivation, but very few collections comprise 1000 species, and the majority are confined to much smaller numbers, especially where quantities of one sort like *Odontoglossum Alexandræ* are grown. The variation in habit, floral form, and colours is very great, and in no generally cultivated family do we get such a remarkable range. The majority of Orchids are comparatively dwarf, and in some cases diminutive, as in the bulbophyllums, the Australian *B. minutissimum*, and a Bornean species found by Dr. Beccari having pseudo-bulbs one-twelfth of an inch in length and breadth, and are the smallest Orchids known. From these we get many gradations to the stem-producing *Vandas* and *Vanillas*, and then by a great advance to *Erythrorchis* or *Galeola*, which has bare scrambling stems sometimes

exceeding 100 feet in length in its native habitats. The majority of cultivated Orchids produce pseudo-bulbs, and are either evergreen, as in the Cattleyas and Odontoglossums, or deciduous as in the Calanthes. The stem-bearing Orchids of the *Aerides* and *Vanda* type, with the leaves arranged in a two-ranked manner on each side of the stem, are all evergreen, as also are the non-pseudo-bulbous Orchids of the *Cypripedium* type, except where these have tuberous roots, when they are usually deciduous, as in the North American forms of that genus. These peculiarities of habit must be all taken as indications of the treatment required, and, as previously pointed out, the deciduous species should all have a good period of rest.

Some of the most useful genera to the cultivator are the following:—*Aerides*, *Saccolabium* and *Vanda*, mostly small flowers, soft tinted, in racemes, and fragrant; *Angræcum*, principally white or cream-coloured flowers, varying much in size, *A. sesquipedale* being the largest; *Calanthe*, rosy crimson and white, free useful plants; *Cattleyas* and *Lælias*, showy Orchids, with large flowers representing rich and soft tints of crimson, with white and gold markings; *Cœlogyne cristata*, white with yellow blotch, very useful; *Cypripedium*, variously coloured, not bright tints except some of the *C. Sedeni* group, but free and useful; *Dendrobium*, a handsome genus with abundance of golden yellow tints, or crimson purple and white in combination; *Dendrochilum*, small flowers, but in *D. glumaceum* very fragrant; *Lycaste*, white and crimson, very durable; *Masdevallia*, free useful plants, white, crimson, scarlet, and orange; *Odontoglossum*, chiefly white or yellow with brown spots and markings; *Oncidium*, a large number with bright yellow flowers; and *Phalænopsis*, white and rosy crimson. These comprise the most effective Orchids, but there are many other small genera, including species of great beauty. The principal curiosities as regards floral structure are found in the genera *Bulbophyllum*, *Catasetum*, *Cynoches*, *Coryanthes*, *Gongora*, *Mormodes*, and *Restrepia*, which present some extraordinary forms. The following will give some idea of the number of species in the leading genera, a few of the largest or best known being selected:—*Epidendrum* 400, *Pleurothallis* 350, *Dendrobium* 300, *Oncidium* 250, *Stelis* 150, *Maxillaria* 100, *Spiranthes* 100, *Masdevallia* 100, *Eria* 80, *Odontoglossum* 80, *Cœlogyne* 50, *Cypripedium* 40, *Cattleya* and *Lælia* 20 each. There are sixty-one monotypic genera—that is, comprising only one species each, and there is a large number with less than a dozen each.

WHITE-FLOWERED ORCHIDS.—White varieties of several Orchids are now much in demand and realise high prices; while sometimes the ordinary type of the species may be only worth a few shillings, as in *Lycaste Skinneri*, the white variety *alba* is sold for as many guineas. Of the cheaper white-flowered Orchids, such as *Odontoglossum Alexandræ*,

Cœlogyne cristata, and *Phalænopsis grandiflora*, many are now being grown for market, and, together with the coloured *Dendrobium nobile*, make a feature in the florists' windows in Covent Garden Market. The following is a selection of the best white-flowered Orchids :—*Aeranthus Leonis*, *Angræcums*, *Anguloa eburnea*, *Calanthe Turneri nivalis*, *Cattleya Dominicana alba*, *C Percivaliana alba*, *C. Skinneri alba*, *Cœlogyne cristata alba*, *Cymbidium eburneum*, *Cypripedium niveum*, *C. Sedeni candidum*, *Dendrobium Deari* (very useful), *D. infundibulum*, *D. formosum*, *D. Jamesianum*, *Lælia albida*, *L. anceps alba*, and other varieties, *L. elegans alba*, *Lycaste Skinneri alba*, *L. Harrisoniæ alba*, *Masdevallia tovarensis*, *Odontoglossum Alexandræ*, *O Pescatorei*, *O. pulchellum*, *O. Roezli album*, and *O. vexillarium album*. Some of these are not pure white, but there is very little colour in the majority, the *Lælias*, *Odontoglossums*, and *Cœlogyne* being valuable for cutting.

ORANGE AND SCARLET-FLOWERED ORCHIDS.—These tints are not very abundant, though shades of yellow are very numerous in the *Oncidiums* and *Dendrobiums*. The following are a dozen of the best of these tints, which are very effective, arranged with other lighter coloured flowers :—*Ada aurantiaca*, *Epidendrum vitellinum*, *E. aurantiacum*, *E. cinnabarinum*, *Lælia cinnabarina*, *L. flammea*, *L. harpophylla*, *Masdevallia coccinea*, *M. ignea*, *M. Veitchiana*, *Renanthera coccinea*, and *Sophrønitis grandiflora*.

ORCHIDS FOR EVERY MONTH.

A supply of Orchid flowers can be easily obtained throughout the year ; some like *Odontoglossum Alexandræ*, producing its blooms at all seasons, others like *Lycaste Skinneri*, last for a considerable time, and others are almost constantly in flower from the succession of blooms they bear. Orchids are by no means constant in their time of flowering, but the great majority of flowers are produced from March to midsummer, some of the *Lælias*, *Calanthes*, and others yielding an autumn and winter display. The following list by Mr. Cummins, gardener to A. H. Smee, Esq., The Grange, Wallington, is a record of the times of flowering as observed in that establishment, where large numbers of species are grown. It will be understood that the months under which the plants are arranged are those in which the flowers expanded, and that some consequently extended into the next or perhaps the following months. Though the periods named cannot be taken as fixed, they will serve to indicate what may be expected to flower at the principal seasons.

JANUARY.—*Cypripedium insigne* and varieties, *C. venustum*, *C. Boxalli*, *Cœlogyne cristata*, *C. sparsa*, *C. speciosa*, *Dendrobium Ainsworthi*, *D. crassinode*, *D. Devonianum*, *D. nobile*, *D. revolutum*, *D. primulinum*, *D. speciosum*, *D. Wardianum*, *Dendrochilum uncatum*, *Lælia albida*, *L. anceps*,

L. elegans, *L. superbiens*, *Masdevallia ignea*, *M. Estradæ*, *M. Normani*, *M. polysticta*, *M. triangularis*, *Maxillaria aromatica*, *M. cruenta*, *Odontoglossum Alexandræ*, *O. cariniferum*, *O. maculatum*, *O. pulchellum*, *O. Rossi majus*, *Oncidium Forbesi*, *O. flexuosum*, *O. ornithorhynchum*, *O. serratum*, *O. varicosum*, *Phajus grandifolius*, *Phalænopsis amabilis*, *P. grandiflora*, *P. Sanderiana*, *P. Schilleriana*, *Pilumna fragrans*, *Sophronitis grandiflora*, *Zygopetalum Mackayi*.

FEBRUARY.—*Ada aurantiaca*, *Brassavola glauca*, *Calanthe Regneri*, *Cattleya amethystoglossa*, *C. bulbosa*, *C. Percivaliana*, *C. Trianae*, *C. chocoensis*, *Cœlogyne flaccida*, *Compactia falcata*, *C. macroplectron*, *Dendrobium aggregatum majus*, *D. heterocarpum*, *D. luteolum*, *D. infundibulum*, *Epidendrum crassifolium*, *E. ectectum*, *Helcia sanguinolenta*, *Odontoglossum Pescatorei*, *O. radiatum*, *O. odoratum*, *O. triumphans*, *Oncidium cornigerum*, *O. Jonesianum*, *O. O'Brienianum*, *Lælia harpophylla*, *Lycaste Skinneri*, *Vanda cœrulescens*, *Phalænopsis Stuartiana*.

MARCH.—*Angræcum citratum*, *A. Ellisi*, *A. falcatum*, *Cattleya citrina*, *C. Lawrenciana*, *Cœlogyne ocellata*, *C. hololeuca*, *Chysis aurea*, *C. bractescens*, *Cypripedium argus*, *C. barbatum*, *C. ciliolare*, *C. hirsutissimum*, *C. Sedeni*, *C. villosum*, *Cyrtopodium Andersoni*, *C. Saintlegerianum*, *Dendrobium barbatalum*, *D. Jenkinsi*, *D. primulinum giganteum*, *D. fimbriatum oculatum*, *D. superbiens*, *D. Freemani*, *D. Pierardi*, *Epidendrum sceptrum*, *Lycaste plana*, *Odontoglossum Halli*, *O. Oerstedii*, *O. Phalænopsis*, *O. Roezli*, *O. cordatum*, *Oncidium cucullatum*, *O. Cavendishianum*, *O. unguiculatum*, *Phalænopsis Boxalli*, *Vanda tricolor*, *Zygopetalum crinitum*.

APRIL.—*Aerides Leeanum*, *Acineta Humboldti*, *Arpophyllum giganteum*, *Brassia Keiliana*, *B. verrucosa*, *Cattleya Mendeli*, *C. intermedia*, *C. Skinneri*, *Colax jugosus*, *Cymbidium eburneum*, *Dendrobium Cambridgeanum*, *D. thyrsoiflorum*, *D. densiflorum*, *D. secundum*, *Epidendrum alatum*, *E. vitellinum majus*, *E. xanthinum*, *E. fragrans*, *Masdevallia Harryana*, *M. Lindeni*, *M. Shuttleworthi*, *M. Chimæra*, *Meospidium sanguineum*, *Odontoglossum cirrhosum*, *O. Cervantesi*, *O. vexillarium*, *O. citrosum*, *Oncidium concolor*, *O. Marshallianum*, *O. longifolium*, *O. fuscatum*, *Leptotes bicolor*, *Lycaste fulvescens*, *L. Dowiana*, *L. candida*, *L. Skinneri*, *Phalænopsis Manni*, *P. Luddemanniana*, *Saccolabium guttatum*, *Vanda teres*.

MAY.—*Camarotis purpurea*, *Aerides Fieldingi*, *Cirrheæ viridi-purpurea*, *Cœlogyne pandurata*, *Bulbophyllum Lobbi*, *Cattleya Aclandiae*, *C. crispa*, *C. Mossiæ*, *Cymbidium aloifolium*, *C. Lowianum*, *Cypripedium caudatum*, *C. Hookeræ*, *C. Lawrencianum*, *C. Lowii*, *C. Pearcei*, *C. Stoneanum*, *Dendrobium chrysanthum*, *D. albo-sanguineum*, *D. Falconeri*, *D. japonicum*, *D. moschatum*, *D. chrysotoxum*, *D. lituiflorum*, *D. Parishii*, *D. Lowii*, *D. macrophyllum*, *D. suavissimum*, *D. transparens*, *Epidendrum fragrans*, *E. macrochilum*, *Galeandra Devoniana*, *G. nivea*, *Huntleya violacea*, *Leptotes bicolor*, *Masdevallia amabilis*, *M. Houtteana*, *M. Wagneriana*, *M. Veitchiana*, *Maxillaria Harrisoni*, *Lælia purpurata*, *Odontoglossum cordatum*, *O. Halli*, *O. hastilabum*, *Palumbina candida*, *Saccolabium Blumei*, *S. curvifolium*, *Vanda Denisoniana*, *V. Batemanni*.

JUNE.—*Aerides Ballantianum*, *A. crispum*, *A. crassifolium*, *A. Fieldingi*, *A. Lobbi*, *A. odoratum*, *Brassia maculata*, *Anguloa Clowesii*, *Dendrobium Bensoniæ*, *D. infundibulum*, *Cattleya Warneri*, *C. Forbesii*, *Cypripedium barbatum nigrum*, *Govenia fasciata*, *Lycaste Deppi*, *Lælia crispa*, *Masdevallia Peristeria*, *Maxillaria grandiflora*, *Odontoglossum Lindleyanum*, *O. tripudians*, *O. Udo-Skinneri*, *O. sceptrum*, *Oncidium macranthum*, *O. reflexum*, *O. tricuspidatum*, *O. crispum*, *O. Papilio*, *O. Gardnerianum*, *O. luridum*,

O. *Krameri*, O. *dasystyle*, O. *prætextum*, *Stanhopea insignis*, S. *tigrina*, S. *Wardi*, *Thunia alba*, T. *Marshalli*, T. *Bensoniæ*, *Trichopilia coccinea*, T. *Galeottiana*.

JULY.—*Bollea cœlestis*, *Anguloa uniflora*, *Cattleya Eldorado* C. *Gaskelliana*, C. *Leopoldi*, C. *superba splendens*, *Cymbidium pendulum*, *Cypripedium lævigatum*, C. *Veitchii*, *Dendrobium Farm-eri*, D. *sanguinolentum*, D. *formosum giganteum*, *Epidendrum falcatum*, E. *radiatum*, *Grammatophyllum Ellisii*, *Masdevallia Trochilus*, M. *Normanii*, *Miltonia Regnelli*, *Odontoglossum Insleayi*, O. *Schleiperianum*, O. *constrictum*, *Oncidium bicolor*, O. *leucochilum*, O. *Lanceanum*, O. *incurvum*, O. *ampliatum*, *Phalaenopsis rosea*, P. *violacea*, *Promenæa stapelioides*, *Sobralia macrantha*, *Vanda limbata*, *Zygopetalum maxillare*.

AUGUST.—*Aerides quinquevulnerum*, *Acropera Loddigesii*, *Brassavola nodosa*, *Cattleya Loddigesii*, C. *Wallisi*, C. *speciosissima*, *Cypripedium Harrisianum*, *Dendrobium Deari*, D. *Tattonianum*, D. *triadenium*, *Disa grandiflora*, *Lycaste Cobbiana*, L. *Smeana*, *Masdevallia Davisi*, *Miltonia spectabilis*, *Odontoglossum bictonense*, O. *grande*, *Oncidium tigrinum*, *R-strepia elegans*, *Sarcanthus Parishii*, S. *teretifolius*, *Trichopilia tortilis*, *Satyrium aureum*, *Stanhopea aurea*, S. *oculata*, *Warscewiczella Wendlandi*, *Zygopetalum Gautieri*.

SEPTEMBER.—*Cœlia macrostachya*, *Cattleya maxima*, *Cymbidium Mastersii*, *Burlingtonia granadensis*, *Dendrobium Ajax*, D. *crumenatum*, D. *leucolophotum*, *Houlletia odoratissima*, *Lælia autumnalis*, L. *pumila*, *Maxillaria nigrescens*, *Miltonia Clowesii*, *Oncidium aurosum*, O. *Harrisoniæ*, O. *trulliferum*, *Phalaenopsis violacea Schrœderi*, *Rodriguezia planifolia*, *Vanda cœrulea*, V. *multiflora*.

OCTOBER.—*Burlingtonia decora*, *Cyrtochilum maculatum*, *Cypripedium Spicerianum*, *Goodyera discolor*, *Houlletia chrysantha*, *Dendrobium bigibbum*, *Miltonia Weltoni*, *Lælia Dormaniana*, L. *præstans*, L. *Perrini*, L. *marginata*, *Masdevallia tovarensis*, *Maxillaria picta*, *Odontoglossum Roezli*, *Phalaenopsis Esm-ralda*, P. *Lowi*, *Pleione humilis*, *Sophronitis grandiflora*, *Trichocentrum albo-purpureum*, *Trichosmia suavis*, *Zygopetalum Mackayi*.

NOVEMBER.—*Barkeria Barkeriola*, *Calanthe Veitchi*, C. *vestita*, C. *vestita lutea*, *Cattleya Holfordi*, *Cœlogyne assamica*, C. *falcata*, *Cymbidium giganteum*, C. *sinense*, *Cypripedium niveum*, *Dendrobium heterocarpum Philip-pinense*, *Epidendrum ciliare*, *Masdevallia oethodes*, *Maxillaria venusta*, *Miltonia Mor-liana*, *Oncidium cheiroporum*, *Pleione lagenaria*, *Vanda Sanderiana*, *Zygopetalum crinitum cœruleum*.

DECEMBER.—*Angræcum Scottianum*, A. *sesquipedale*, *Barkeria Skinneri*, *Cattleya dolosa*, *Cypripedium concolor*, *Dendrobium nobile cœrulescens*, D. *Paxtoni*, *Lælia peduncularis*, *Odontoglossum gloriosum*, O. *Insleayi* *Leopardinum*, *Pholidota imbricata*, *Sophronitis cernua*.

TWO HUNDRED CHEAP USEFUL ORCHIDS.

The appended list contains a selection of the cheapest Orchids suitable to form a good representative collection for an amateur commencing the culture of these plants, and it has been made as diversified as possible, excluding those most difficult of culture. They are arranged in the houses which suit them best during growth, but it will be understood that when in flower or resting the plants of the

warm houses can be placed in cooler quarters. Where not otherwise stated the plants can be grown in pots in peat and sphagnum. Few are named for blocks, baskets being preferred for the reasons before explained.

WARM HOUSE.—*Aerides crassifolium* (basket), *crispum*, *odoratum*, *roseum*, *virens*; *Anoëtochilus* (peat, sand, and sphagnum), *Lowi*, *setaceum*; *Angræcum citratum*, *sesquipedale*; *Arundina bambusæfolia* (peat and loam); *Cypripedium caudatum*, *concolor* (peat, sand, and lime), *Lawrencianum*, *niveum*, *Spicerianum*, *Stonei*, *superbiens*; *Cyrtopodium punctatum* (loam and manure); *Dendrobium aggregatum* (pot or block), *Ainsworthi*, *Dearei*, *formosum*, *luteolum*, *macrophyllum*, *thyrsofolium*, *Wardianum* (basket); *Dendrochilum filiforme*, *glumaceum*; *Epidendrum bicornutum* (peat); *Galeandra Devoniana* (peat); *Huntleya violacea* (peat); *Ionopsis paniculata* (block); *Limatodes rosea* (peat, loam, and sand); *Mormodes pardinum* (peat); *Oncidium zebrinum*; *Phalænopsis* (pot, basket, or block) *amabilis*, *grandiflora*, *Luddemanniana*, *Schilleriana*; *Saccolabium* (basket), *ampullaceum*, *Blumei majus*, *curvifolium*, *giganteum*; *Scuticaria Steeli* (block); *Thunia alba*, *Bensoniæ*, *Marshalliana*; *Vanda teres*, *tricolor*, *Parishi*; *Vanilla aromatica*.

INTERMEDIATE HOUSE.—*Acineta Humboldti* (basket); *Aerides Fieldingi*, *japonicum*, *maculosum*; *Angræcum falcatum*; *Batemannia Melcagris*; *Brassavola Digbyana* (block); *Brassia Lanceana*, *verrucosa major*; *Broughtonia sanguinea* (block); *Burlingtonia* (basket, sphagnum) *candida*, *fragrans*; *Calanthe* (loam, leaf soil, and manure) *Ma-uca*, *Veitchi*, *vestita*; *Cattleya Acklandiæ* (block), *amethystoglossa*, *crispa*, *Dowiana* (basket), *Eldorado*, *gigas*, *guttata*, *Leopoldi*, *intermedia*, *labiata*, *Mendeli*, *Mossiæ*, *Skinneri*, *Trianæ*, *Walkeriana* (*C. bulbosa*, block), *Warszewiczii*; *Chysis bractescens*; *Cœlogyne ocellata*; *Colax jugosus*; *Compartmentia falcata* (block, sphagnum); *Cypripedium barbatum*, *Harrisonianum*, *Roezli*; *Dendrobium chrysanthum* (basket), *chrysotoxum* (peat), *crassinode* (basket, sphagnum), *densiflorum* (peat), *Devonianum* (basket, sphagnum), *Falconeri* (basket), *heterocarpum* (aureum), *nobile*, *Pierardi* (basket), *primulinum* (basket, sphagnum); *Epidendrum nemorale*; *Goodyera pubescens* (sphagnum); *Lælia cinnabarina*, *elegans*, *harpophylla*, *majalis*, *Perrini*, *purpurata*; *Leptotes bicolor* (peat); *Lycaste* (peat), *aromatica*, *Harrisoniæ*, *Skinneri*; *Miltonia* (peat), *cuneata*, *spectabilis*; *Odontoglossum Phalænopsis*, *Roezli*, *vexillarium*; *Oncidium ampliatum majus*, *flexuosum* (sphagnum), *Forbesi* (block), *Papilio* (block), *sphacelatum*; *Peristeria elata* (loam and leaf soil); *Phajus grandifolius* (loam, leaf soil, and manure); *Sobralia macrantha* (peat); *Uropedium Lindeni* (loam, sand, and peat); *Vanda cœrulea*; *Zygopetalum* (peat), *crinitum*, *Mackayi*.

COOL HOUSE.—*Ada aurantiaca*; *Anguloa* (peat), *Clowesi*, *uniflora*; *Arpophyllum giganteum* (peat); *Barkeria elegans* (block); *Bletia hyacinthina* (loam and leaf soil); *Cattleya citrina* (block); *Chysis aurea*; *Cœlogyne cristata*; *Cymbidium* (peat and loam) *eburneum*, *giganteum*; *Cypripedium* *insigne* *Maulei*, *Sedeni*, *venustum*, *villosum*; *Dendrobium Jamesianum*, *Disa grandiflora* (peat, sand, sphagnum, and manure); *Epidendrum vitellinum*; *Lælia acuminata*, *albida* (block), *anceps*, *autumnalis*, *Dayana*; *Masdevallia Davisi*, *Harryana*, *ignea*, *Lindeni*, *polysticta*, *Shuttleworthi*, *tovarensis*, *Veitchiana* (Fig. 22); *Maxillaria grandiflora*, *venusta*; *Mesospinidium sanguineum*;



Fig. 22.—*Odontoglossum Pescatorei Veitchianum*.

Nanodes Medusæ (basket); *Odontoglossum Alexandræ* (*crispum*), *Cervantesi*, *cirrhosum*, *citrosimum*, *cordatum*, *gloriosum*, *grande*, *Halli*, *Insleayi*, *maculatum*, *odoratum*, *Oerstedii* (pot or block), *Pescatorei*, *pulchellum*, *Rossi* (basket or block), *triumphans*; *Oncidium cheirophorum*, *concolor*, *cucullatum*, *Marshallianum*, *ornithorhynchum*, *tigrinum*; *Pescatorea cerina*; *Pilumna fragrans*, *Pleione* (loam, peat, sphagnum, and sand), *humilis*, *lagenaria*, *maculata*, *Wallichiana*; *Promenæa citrina* (peat); *Sophronitis grandiflora* (pot or basket); *Stanhopea* (basket, sphagnum), *aurea*, *grandiflora*, *tigrina*; *Trichopilia* (peat), *coccinea*, *suavis*; *Trichosma suavis* (peat).

THE DURATION OF ORCHID FLOWERS.

Many Orchids continue in flower for a great time, either from the duration of the individual flowers or their production in succession over an extended period. Some, like *Cypripedium insigne*, last for a remarkably long time when cut and placed in water, continuing fresh for two or three weeks. *Dendrobiums* of the nobile character are useful for cutting, as they can be employed in bouquets and button-holes with great advantage, though not lasting so well as the *Cypripedium*. To assist in the preservation of flowers on the plants avoid an excess of moisture in the air, and be careful not to damp the flowers when syringing. Some also remove the pollinia to prevent fertilisation, and where bees are numerous this is advantageous, as the flowers of most Orchids fade almost immediately after fertilisation. The list appended gives the names of a selection of the Orchids which continue longest in flower :—

Orchids lasting eight weeks in bloom — *Vanda Sanderiana*, *Oncidium Jonesianum*, and *Cœlogyne ocellata*. Lasting twelve weeks — *Cypripedium Argus*, *C. barbatum*, *C. Spicerianum*, *Dendrobium Deari*, *Lycaste Skinneri*, and *Masdevallia ignea*. Lasting thirteen weeks — *Oncidium tigrinum*, *Odontoglossum cariniferum*, *O. Rossi majus*, *S. phronitis grandiflora*, and *Vanda cœrulea*. Lasting sixteen weeks — *Cypripedium Harri-anum*, *Calanthe Regnieri*, *Epidendrum crassifolium*, *Lælia pumila Dayana*, *Odontoglossum cordatum*, *O. bictonense*, *Oncidium cucullatum*, *O. incurvum*, *Masdevallia tovarensis*, *Phalænopsis grandiflora*, and *Vanda Batemani*. Lasting twenty weeks — *Epidendrum radiatum*, *O. vitellinum majus*, *Odontoglossum maculatum*, *O. membranaceum*, *Oncidium flexuosum*, and *O. linguæ-forme*. Lasting twenty-six weeks — *Dendrobium bigibbum*, *Masdevallia Normani*, *Odontoglossum Uro-Skinneri*, and *Phalænopsis rosea*.

The *Cymbidiums* also last a long time, and others could be named, but those mentioned will suffice as examples, though one curious instance, *Masdevallia othodes*, deserve notice, as a plant has been had in flower for five years.

ORCHIDS OUT OF DOORS.

Many of the Orchids already named in the various lists can, under certain favourable conditions, be placed out of doors during the summer months, and the hardier of the cool Orchids seem benefited by such treatment; while with all it has the advantage of keeping them free from insects, and ripens the growths well. It can, however, only be safely done in gardens that are rather sheltered and moist in warm districts, like the southern counties of England. To expose Orchids in hot, dry, or cold gardens would be ruinous, and amateurs who do not wish to lose a large proportion of their plants had better

not try such experiments ; though with any kind of shelter, as an ordinary frame, most cool Orchids can be grown during the six warmer months of the year. The principal experiments with Orchids out of doors have been tried in Mr. A. H. Smee's garden, where large numbers have been placed out from June to October with satisfactory results, but this garden has a low moist situation, and is otherwise favourable for the purpose. [See *Journal of Horticulture*, p. 392, November 8th, and pp. 481 and 550, December, 1883.] Upon the continent similar experiments have been repeatedly tried ; indeed it is quite common there to place all but the most tender Orchids outside in the summer.

HARDY ORCHIDS.

The hints which have been previously given refer exclusively to the exotic Orchids, which require to be grown in glass houses in this country, but there is a large group of beautiful species, mostly terrestrial, which can be cultivated out of doors. Amongst them are several found wild in Britain, but none the less worthy of attention on that account, though we owe the showiest to North America, such as the beautiful rose and white *Cypripedium spectabile*, which, when well grown, is superior to many of its tropical brethren. *Orchis foliosa* and *maculata*, with crimson and spotted flowers in dense racemes, are also plants of great attraction, and admirably adapted for culture in pots. We have plenty structurally interesting in the genus *Ophrys*, which comprises the Bee, Spider, and Fly Orchids, and many are also sweetly scented. The situation most suitable to the greater number is at the foot of a rather shady bank or rockery, and then the other species which are found on higher lands, and require a chalky or sandy soil, can be accommodated upon the slope. For some a constantly damp soil of peat, leaf mould, and a little turfy loam is the best, such as *Cypripedium spectabile*, *Epipactis palustris*, *Orchis foliosa*, *O. latifolia*, *O. maculata*, and *O. Stabiana*. Another group requires a slightly drier position and a small proportion of sand in the soil, such as *Calopogon pulchellus*, *Cephalanthera grandiflora*, *C. rubra*, *Cypripediums acaule*, *Calceolus, candidum, japonicum, macranthum, and pubescens* ; *Epipactis latifolia*, *Goodyera pubescens*, *Gymnadenia conopsea*, *Habenaria japonica*, *H. radiata*, and *H. viridis* ; *Orchis mascula, papilionacea, and spectabilis* ; *Serapias cordigera, and longipetala*. The third group require to be comparatively dry during winter, but moist at other times, though not wet like the first named, and the soil should consist of loam or peat and chalk. The best for this position are the following : *Aceras anthropophora, Habenaria bifolia, lutea, and chlorantha* ; *Neottia spiralis, Ophrys arachnites, aranifera, apifera, Speculum, tenthredinifera* ; *Orchis atlantica, coriophora, longicornis, militaris, pyramidalis, and undulatifolia*. Some of those named for the cool house can also be

grown, like *Bletia hyacinthina*, and *Disa grandiflora* can also be grown in cold frames out of doors, and the former has proved hardy in a few sheltered districts. All the hardy Orchids deserve much more attention than they receive, and they are by no means so difficult to grow as some imagine, if strong roots are obtained when dormant, and planted either in late autumn or early spring, the latter being the best if the plants are giving no signs of growth. The greatest trouble is experienced with wild plants lifted when in growth and transferred to gardens, as these almost invariably die. Most of the species enumerated can now be purchased cheaply at nurseries, where hardy plants are made a specialty.



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The above list contains the names of the principal Amateur Orchidists, the names of the Gardeners being placed in brackets, or, if arranged in alphabetical order, the word "Gardens" is appended to the name of the place. At the majority of the establishments good collections of Orchids are grown, and collections will be found at nearly all the Provincial and other Botanic Gardens, that at the Royal Gardens, Kew, being one of the most extensive.

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ADDENDA et CORRIGENDA.

- PAGE 12.—Line 11, “proceeding” *should be* “preceding.”
- „ 14.—“Anætochilus” *should be* “Anætochilus.”
- „ 15.—For further Remarks on Manures for Orchids see p. 76.
Paxtonia was established as a *genus* by Lindley, but afterwards *P. rosea* was regarded as a regular form of *Spathoglottis spicata*.
- „ 16.—Some of the brightest blue tints are found in the Australian Caladenias.
- „ 18 & 23.—“Fig. 1” *should be* “Fig. 12.”
- „ 28.—“Fig. 4” *should be* “Fig. 3.”
- „ 37.—At the end of line seven “found” is omitted.
- „ 38.—“Phaius” *should be* “Phajus.”
- „ 40.—“Gerarde” *should be* “Gerard” and “Epidendium” *should be* “Epidendrum.”
- „ 42.—The Sixth Edition of the Orchid Grower’s Manual is now published, see p. 62.
- „ 62.—To the list of Orchid works must be added “L’Orchidophile,” published monthly at Argenteuil, France, and “Reichenbachia,” published monthly by Messrs. Sander & Co., St. Albans. The “Lindenia” is also published monthly in Belgium.

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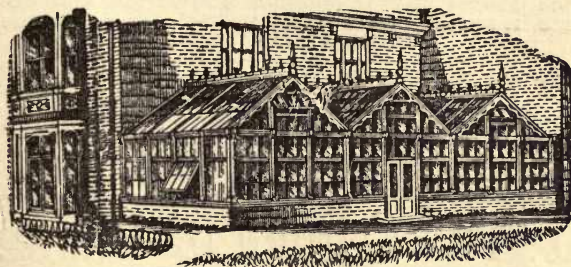
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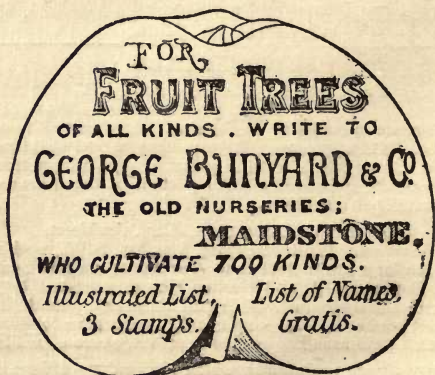
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