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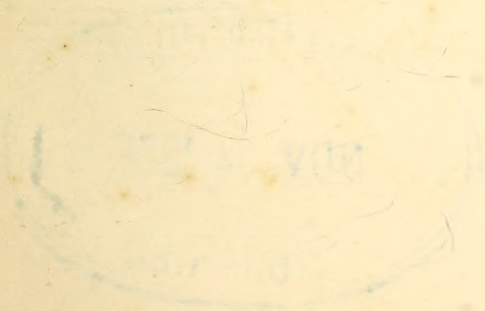
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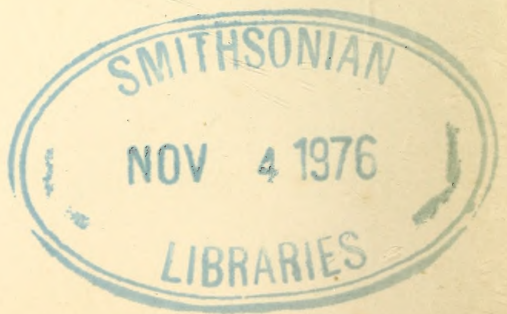
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CHOICE FERNS FOR AMATEURS:

Their Culture and Management
in the Open and Under Glass.

Abridged from the

“BOOK OF CHOICE FERNS,”

By **GEORGE SCHNEIDER,**

*Membre Correspondant de la Société Nationale d'Horticulture
de France (Paris), Membre Correspondant de la
Société d'Horticulture de St. Germain-
en-Laye (France), &c.*

**Illustrated with Numerous Wood Engravings
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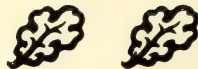
PUBLISHER'S PREFACE

SINCE the publication of "The Book of Choice Ferns" some years ago, quite a large number of fern-lovers have expressed a wish for a smaller volume on the same practical lines. The chief reason urged was one of expense, as it was contended, and with truth, that the large work was only open to the well-to-do, whilst the "million" interested had no really comprehensive book on the same lines. In deference, therefore, to the wishes so often expressed, the abridgment from the large work has now been undertaken. Necessarily, the enumeration of both species and varieties, and more particularly the latter, has had to be considerably restricted. Still, the object kept in sight has been to include therein all such as fairly merit being classed as "choice," irrespective of novelty, and that at the same time are in cultivation in this country.

All the valuable cultural notes that constituted such a feature in the larger work have been retained

Preface.

in the smaller one, even if they have been slightly abbreviated in order to bring them within the scope of a cheap book. The nomenclature employed in the larger work has been followed in the smaller one, while the genera and species have for facility of reference been given alphabetically. In the generic cross-references only those have been kept up that are usually met with in nurserymen's catalogues and trade lists generally. Similarly, with regard to the synonyms. By that means it is hoped that the book will be useful to that very large class, who, in making a selection of plants, require to know both the correct names and mere catalogue names that are often the reverse of being correct.



CHOICE FERNS FOR AMATEURS.

I.—NOTES ON CHOICE FERNS.

CLASSIFICATION AND DISTRIBUTION.

FERNS, or, as they are botanically called, Filices, are Flowerless plants forming the most important division of Linnæus's twenty-fourth Class, *Cryptogamia*—a name that has reference to the "concealed" mode of fructification, while in the second class of Lindley's "Natural System" they are called *Acrogens*, the division being *Filicales*. The generation of vegetative life in the case of Ferns is essentially different from that of Flowering plants, where everything connected with the process of fertilisation may be observed with the naked eye. With plants that produce flowers, the ovaries, when they are either naturally or artificially fertilised, swell, and in the course of time yield seeds; these, when placed under favourable conditions, possess the property of giving birth to plants which, like their parents, are capable of reproducing themselves in a direct manner by means of their flowers. Ferns are especially interesting to the botanist inasmuch as with the Lycopods they were undoubtedly amongst the first vegetation to

clothe the earth: this is amply proved by the fossil deposits that have been disclosed from time to time. Then the Ferns were veritable plant giants, as shown by the huge specimens found in the coal-measures both in this country and on the Continent. Some idea of their size may be obtained when it is stated that well-preserved specimens have been unearthed that measured 95ft. in height and 30ft. in circumference. Such plant giants have long since disappeared, and have been replaced by species and varieties of much smaller dimensions.

Geographical Range.

Ferns have a very wide geographical range; indeed, they may be said to exist all over the world; while there is no other Order of plants whose representatives are found in such varied positions and dissimilar aspects, or whose habit of growth is so varied. Their range may be said to extend from the Tropics (where they are most abundant) to the Arctic regions, even as far north as Greenland. Moreover, they are found from the sea-level to 12,000ft. or 16,000ft. above.

Worthy of remark, too, in connection with Ferns in general is the singularly cosmopolitan character that certain species and varieties possess. Most of our native Spleenworts, for instance, are also found throughout the European Continent, Northern Asia, North and South Africa, in North America, and in various parts of India, &c. Another instance is furnished by our common Maidenhair Fern (*Adiantum Capillus-Veneris*), which is practically ubiquitous. Other instances of the characteristic alluded to are provided by our Royal Fern (*Osmunda regalis*), that grows plentifully on the banks of rivers and streams, on the Neilgherries and other high mountains in India; the common Shield Ferns *Aspidium angulare* and *Nephrodium spinulosum*, also found in many parts of India and North America; and by the violet-scented *Nephrodium fragrans*, originally introduced here from North America, that is now abundant on some of the Japanese mountains.

Giant Ferns.

Like all other Orders of cultivated plants, Ferns have their giants as well as their pigmies.



Fig. 1. A beautiful Tree Fern (*Cyathea dealbata*), growing to a height of over 40ft. in its native habitat, New Zealand, and even under cultivation attaining 15ft. and more high.

The former are represented by the huge Tree Ferns so abundant in many parts of Australia and New

Zealand, and some of them tolerably familiar even in this country, owing to the fact that they are readily amenable to culture under glass. South America, China, India, and South Africa each contributes its quota of Tree Ferns, but none of the species from those countries is very popular here. Strange as it may seem, the Tree Fern is absent from Europe. The Tree Ferns oftenest met with here are natives of the mountainous regions of Australia and New Zealand. In Victoria, on the one hand, and Mount Wellington on the other, the gigantic *Dicksonia antarctica* rears its lofty head to a height of from 50ft. to 60ft. Unfortunately, it is not sufficiently hardy to withstand our climatic changes, though its capability of enduring an amount of cold is well exemplified by the fact that it is not at all uncommon to find specimens whose heads are heavily laden with snow. Many attempts to keep it outdoors in this country have been tried, but without success so far as can be ascertained. Though the dimensions attained by *D. antarctica* are great, yet it is not the largest Tree Fern known to cultivation. *Cyathea medullaris*, with its ebony-black stalks, is entitled to this distinction; while *C. dealbata* (Fig. 1) is an extremely popular representative of a fairly large and beautiful family.

In this country Tree Ferns are usually treated as pot or tub specimens, and most effective they are when properly grouped. Frequently, too, one sees their dead stems very profitably utilised for the cultivation of some of the living pigmies of the family.

Giant Ferns there also are outside the Tree Ferns proper. The best of these will be noticed under their genera. Suffice it to say that their habits of growth are as diversified as are the colours of their foliage. To realise this one has but to call to mind such species and varieties as *Woodwardia radicans*, *Asplenium caudatum*, and *Nephrolepis davallioides furcans*; *Acrostichum scandens*; *Todea barbara*; the very familiar Bird's-nest Fern (Fig. 2) *Asplenium Nidus* and its variety *australasicum*;

Davallia divaricata; *Pteris laciniata*; *Polypodium aureum* (one of the Gold Ferns sold in such quantities at Covent Garden and other markets), and *Didymochlæna lunulata*. In the above, but a very



Fig. 2. Bird's-nest Fern (*Asplenium Nidus*), a singular and distinctive-habited species of "giant" Ferns bearing undivided fronds as much as 4ft. in length and 8in. in breadth. The fronds rise from a central crown, and form quite a hollow in the centre—a characteristic responsible for the popular name.

restricted selection, it is true, one finds sufficient variation of foliage, habit, and colour to satisfy all that the most exacting are likely to require for the decoration of the larger conservatory or the more ambitious winter garden.

Pigmy Ferns.

Turning to the pigmies for a moment, we have, so far as the majority of cultivators are concerned, a

still more useful section; for the Ferns coming under this designation that need protection, call for less pretentious structures than those required for their giant relatives. Compactness and neatness of habit, as well as small size, are found in many of the genera that fall under this heading. *Acrostichum*, *Adiantum*, *Asplenium*, *Davallia* (Fig. 3), *Actiniopteris*, *Cheilanthes*, *Doodia*, *Nothochlæna*, *Pellæa*, *Polypodium*, and *Woodsia*, for instance. Nor are the



Fig. 3. A pretty dwarf Fern (*Davallia heterophylla*), and one of the most distinct of the large family, as except *D. angustata* it is the only species with entire fronds.

representatives of such genera necessarily of exotic origin: on the contrary, we find some of the best of all small-growing Ferns amongst the natives of Britain. Necessarily, therefore, such Ferns would appeal to a wider section of the public. Delightful species and varieties for the hardy Fernery that readily come to mind are *Asplenium Ceterach* (Fig. 4), *A. fontanum*, *A. germanicum*, *A. Ruta-muraria*, *A. Trichomanes*, *Cystopteris alpina*, *C. fragilis* and its vars. *Dickieana* and *sempervirens*;

Lomaria Spicant and its many beautiful varieties; *Woodsia caucasica* and *W. hyperborea*. For stove or greenhouse culture an even more extended list is available. So that the prospective cultivator with only comparatively small structures, so long as the heating capacity is sufficient, has plenty of choice.

Tinted, Variegated, and Crested Ferns.

It is often stated by way of disparaging Ferns, that compared with Flowering plants they are far



Fig. 4. Scaly Spleenwort (*Asplenium Ceterach*), an interesting British dwarf species found growing on walls and ruins from sea-level to 600ft. above.

less attractive to the eye. Usually such statements emanate from those whose knowledge of the subject is confined to a few species of British, or it may be of European origin. To those who have this somewhat warped view of a really marvellous family, the best thing is to recommend a visit to any collection giving place to the Japanese, North American, and East and West Indian species. There will be found a wealth of colour which will favourably compare with that found in the Flowering plants of even those

countries. True it is that the brightest tints are on the fronds of species and varieties requiring warm-house treatment; but still there are some most elegantly-tinted fronds. The genus *Adiantum* (Fig. 5) furnishes by far the greatest number of species and varieties yielding tinted foliage; but other genera contributing are *Blechnum*, *Brainea*, *Davallia*, *Doodia*, *Lomaria*, *Nephrodium*, *Osmunda*, *Pellaea*,



Fig. 5. *Adiantum monochlamys*, an exceedingly pretty Japanese species, having tinted bluish-green foliage. One of the best dwarf Ferns for the cool conservatory or the greenhouse.

Polypodium, *Pteris*, *Woodsia*, *Woodwardia*, and a few others.

Attractiveness of foliage is also provided by variegation and cristation, the former being almost exclusively restricted to exotic species and varieties, and the latter is oftenest found in European Ferns. In fact, it has been very truthfully stated that there is scarcely a British species that has not yielded a crested form—the Common Bracken (*Pteris aquilina*)

not excepted. Variegation is not always constant, and so far as European representatives are concerned, there is not a single species or variety that with truth may be said permanently to maintain its variegation. Exotic Ferns have often provided instances of accidental variegation, though directly



Fig. 6. One of the most popular of variegated Ferns—*Pteris cretica albo-lineata*, and one, moreover, that has a reputation for "coming true" from spores.

man has attempted to fix such variation from the type he has signally failed.

To *Pteris* and *Adiantum* we are chiefly indebted for our variegated Ferns, the former more particularly, and it would be impossible to name a more distinctive or popular kind than *P. cretica albo-lineata* (Fig. 6), a variety sold by the hundreds of thousands in our plant-markets. *P. c. Mayii* is another pretty

form; while *P. biaurita nemoralis variegata* and *P. quadriaurita tricolor* are alike distinctive and beautiful. Of variegated Maidenhairs we have *Adiantum formosum variegatum* and *A. macrophyllum striatum*; while distinctly lovely is the Japanese *Nephrodium Otaria variegatum*, a very popular subject because of its robust constitution, a characteristic



Fig. 7. A noteworthy example of Crested Ferns originally found growing at Tramore, Waterford—*Asplenium Adiantum-nigrum grandiceps*. The fronds are from 8in. to 1ft. long, and 1in. to 1½in. broad.

not often associated with variegated plants. "Spotting" rather than variegation, as ordinarily understood, must be applied to the very distinctive *Gymnogramme Muelleri* and the leathery foliaged *Nephrodium albo-punctatum*.

Crested Ferns (Fig. 7), by some regarded as monstrosities, are extremely numerous. To the botanist cristation is a most interesting variation from the normal; while to the cultivator the variety it provides is infinite. Sometimes the whole extremity of the frond may be so sub-divided as to form a tassel-

like appendage; at others, the variation may be seen in the tips of the fronds. Still, in whatever form the character exists, it will be found that the pinnæ, like the frond extremities (Fig. 8), are affected,



Fig. 8. Portion of Frond of *Nephrodium molle grandiceps*. A pretty garden variety whose fronds are crested at their extremities.

though not to the same extent. Cristation, too, in a simple form is seldom found on the stems; but an abnormal fasciated or flattened condition is not uncommon. Cristation, when found in exotic Ferns, is practically

constant, but it is worthy of record that the many crested forms of these are largely products of cultivation in this country. In British species and varieties there is a great tendency to revert to the type. Very many experiments have been made with the spores of crested forms of both exotic and British Ferns with a view to obtaining trustworthy information upon the constancy or inconstancy of the individual, and the results have been published in the horticultural Press. Attention can only be directed here to a few Crested Ferns, as illustrative of the characteristic. When dealing with the different genera seriatim, all the more important will be recorded. *Nephrolepis davallioides furcans* stands very high upon the list of these Ferns, but it is not as constant as some. *Davallia hirta cristata* is especially worthy of mention, as it is one that the amateur is almost sure to find upon the miscellaneous market, being quite one of the most robust of the group, as well as one of the most constant. Nor must that truly beautiful form of the Royal Fern *Osmunda regalis japonica corymbifera* be omitted, for, apart from its compact habit, it is one of the forms that is most constant. *Doodia aspera multifida* is one of the tasselled forms that may be relied upon to reproduce itself from spores. Apart from the interesting variation exhibited by Crested Ferns, there is the additional fitness of the majority for basket culture.

Gold and Silver Ferns.

When enumerating the many charms of the huge Order *Filices*, it would be a distinct omission to leave out of consideration those species and varieties that are popularly grouped as Gold and Silver Ferns. They undoubtedly constitute an important section even when considered purely from a decorative standpoint. There is no British representative of the group, it is true, all being exotics; but we find the silvery characteristic associated with huge Tree Ferns like the New Zealand *Cyathea dealbata* and the tropical *Alsophila pruinata*; and gold with

midgets—*Gymnogramme sulphurea*, for example. The gold or silvery appearance responsible for the popular names these Ferns bear, is produced



Fig. 9. An exquisite example of the very characteristic Silver Ferns (*Cheilanthes argentea*). The upper surface is bright green; the lower one is covered with a powder that is at first yellowish, but afterwards pure white.

in various ways. Usually it is due to the secretion of a powdery substance that evenly coats the under-surface of the fronds. Sometimes, as in the *Cheilanthes* (Fig. 9), the silver character is imparted by

scales or hairs being superposed, evenly covering the surface; while in the Silver Tree Ferns already alluded to, it is due to a "bloom"-like coating that is most evenly distributed, but readily removed. For the golden appearance so much admired the effect is oftenest due to a thick coating of spores of a very brilliant colour—*Onychium auratum*, for example. In the Gymnogrammes both Gold and Silver varieties are met with, due to the presence of a mealy powder. There is yet another section in which the "silver" appearance imparted is of a more enduring character, as when it is the result of a uniform layer of a glaucous hue as in *Cyathea dealbata*. Of the section depending upon the superposition of scales or of short hairs for their character, the most noteworthy genus is *Nothochlana*, the species *N. ferruginea*, *N. lanuginosa*, *N. Newberryi*, *N. sinuata*, and *N. sulphurea* being excellent examples.

Climbing and Trailing Ferns.

Very few amateurs seem to be aware of the existence of Climbing Ferns; yet the genus *Lygodium* undoubtedly furnishes a few species that are of either climbing or partially climbing habit, and whose fronds may be made to extend from 20ft. to 30ft. by careful culture and training. The value of such members in the decoration of a house devoted to Ferns is so great that it is impossible to rate such a characteristic too highly. The larger and more robust-growing species and varieties are admirably adapted for covering pillars, arches, or for training along the roof-glass; while the smaller-growing ones may be effectively employed as window plants, thriving, as they do, in a much lower temperature than their larger relatives, whose native home is tropical America, Australia, and the Polynesian Islands. Of this highly-decorative section the most popular of all is *L. japonica*, a rapid-growing basket-plant of the greatest beauty; while *L. palmatum* (Fig. 10) is an elegant species for the greenhouse.

Trailing Ferns are of almost infinite variety; while the ways in which they may be effectively utilised in the decoration of Ferneries are as numerous as the species themselves. It is to this group that we largely look for material for clothing unsightly wood-work, the trunks of Tree Ferns, and for furnishing hanging-baskets (Fig. 11). As there are some species and varieties that are at home in the warm-house, and others in the cool-house, their utility in the general scheme of decoration will be at once apparent. Ferns possessing the characteristics chiefly belong to *Davallia*, *Gleichenia*, *Nephrolepis*, and *Polypodium*, though these by no means exhaust the list of genera that furnish individuals falling under the heading of "trailers." *Davallia canariensis* (Hare's-Foot Fern), *D. bullata* (Squirrel's-Foot Fern), and *D. Tyermanni* (Bear's - Foot Fern) are three species as popular as they are decorative. Next to *Davallia* in point of utility comes the genus *Nephrolepis*, though in point of number of species available it is weak in comparison therewith. *Polypodium* has already been

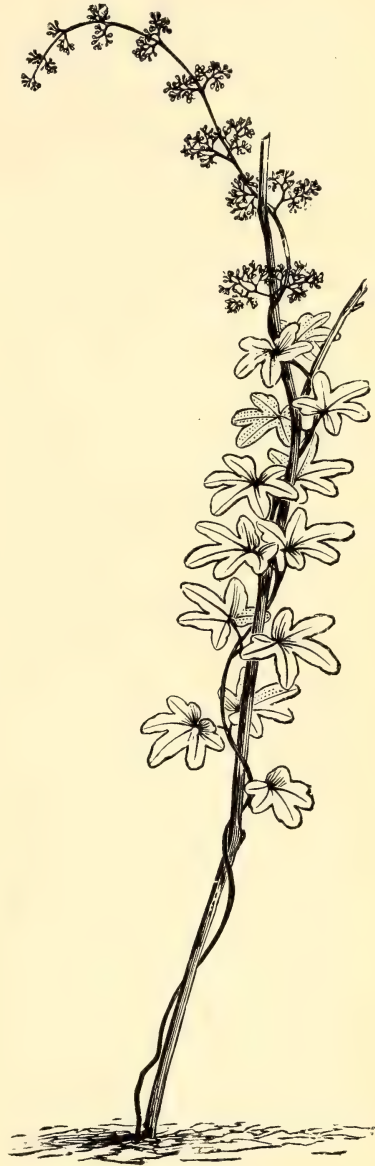


Fig. 10. *Lygodium palmatum*, a delicate-looking, but very robust climbing Fern for the greenhouse.

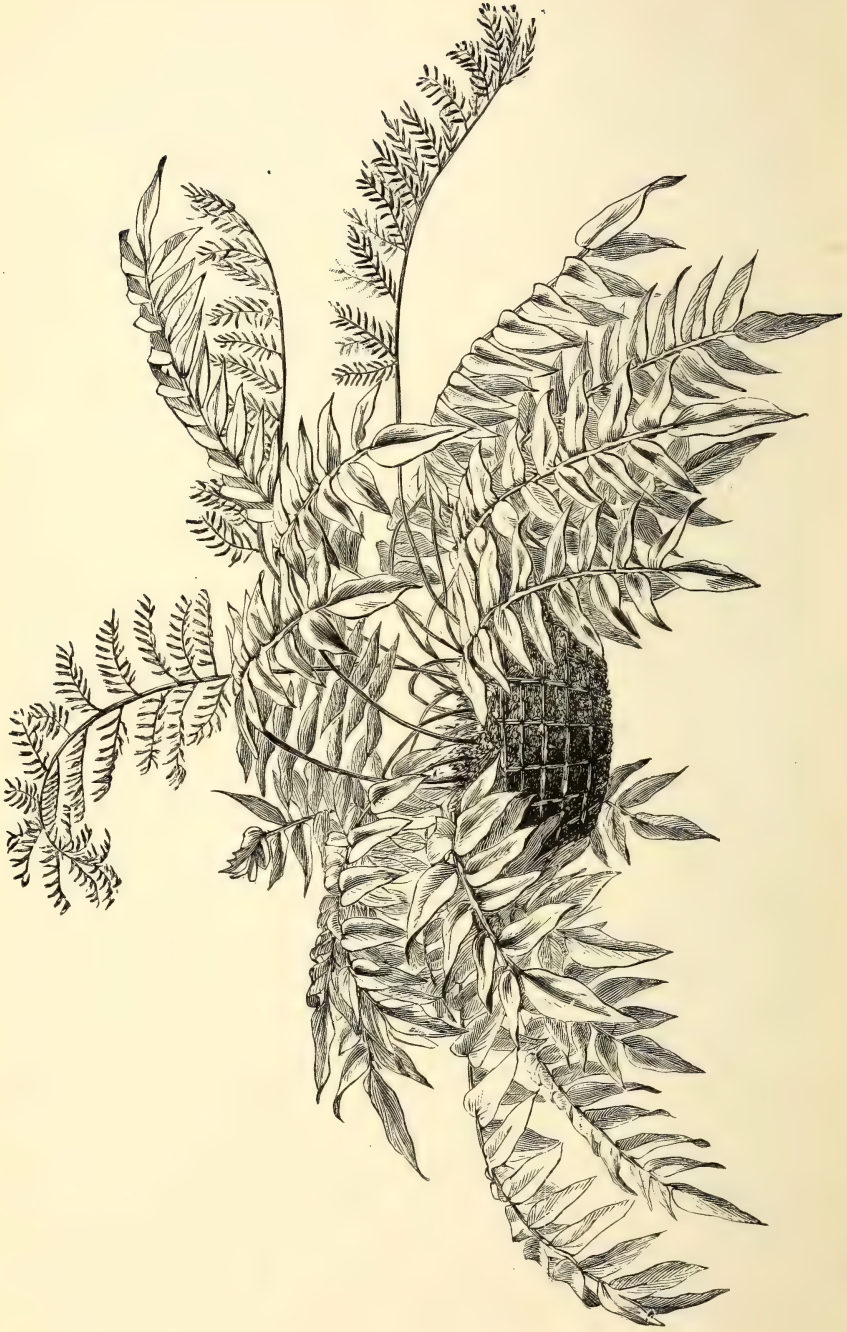


Fig. 11. A very handsome species of Stove Fern adapted for hanging-baskets—*Acrostichum cervinum*. The barren and fertile fronds being so very dissimilar, the plant has a most distinct appearance.

mentioned as a genus providing good material; while other genera are *Acrostichum*, *Adiantum*, *Blechnum*, *Lindsaya*, and *Oleandra*.



Fig. 12. A lovely drooping-froned Maidenhair (*Adiantum concinnum*), often used as a basket-plant in a stove.

Pendent-FronDED Ferns.

Ferns with graceful hanging fronds constitute another very decorative section for large hanging-baskets, Tree Fern trunks, or for Fern-cases. Genera like *Adiantum* (Fig. 12), *Asplenium*, *Davallia*,

Gymnogramme, *Nephrolepis*, *Polypodium*, *Pteris*, and *Woodwardia* are those to which the cultivator must look for individuals suited to these special requirements. The largest and handsomest of the whole group is *Polypodium subauriculatum*.



Fig. 13. A British representative of the delicate-fronded Filmy Ferns—*Hymenophyllum tunbridgense*.

Filmy Ferns.

Filmy Ferns constitute a most distinctive section, the popular name here given being in allusion to the transparent nature of the foliage—so transparent that it is possible to read the smallest type through it. Such Ferns belong to *Hymenophyllum*, *Todea*, and *Trichomanes*. They cannot, it is true, be described as popular, though more's the pity. Their great decorative value may best be gauged by referring to the fact that fronds of Filmy Ferns have been known to keep in good condition

for from eight to ten years or more. In nearly every part of the globe these Transparent Ferns are found. Britain, it is true, contributes but a very



Fig. 14. One of the so-called Flowering Ferns—*Anemia collina*, the "flower" spike appearance being merely due to a contraction of the fertile segments.

insignificant proportion compared with New Zealand, Tasmania, and Chili; still our native *Trichomanes radicans*, *Hymenophyllum tunbridgense* (Fig. 13), and *H. unilaterale* are so beautiful that they should not be overlooked. For years Filmies were "killed

with kindness," but now that their requirements are better understood they should find a place wherever extreme delicacy of texture combined with diversity and beauty of form are appreciated.

"Flowering Ferns."

As stated elsewhere, Ferns are Flowerless plants; but inasmuch as some of the species that will have to be enumerated are popularly known as Flowering Ferns, it will be necessary to offer some little explanation of what, at first sight, may appear a contradiction. It is fairly well known that Ferns generally produce their spore-cases on the under-surfaces of their fronds. There are, however, exceptions to even this general rule; but the more noteworthy are confined to those genera in which the spore-cases are produced erect after the manner of *Osmunda regalis*, *Anemia collina* (Fig. 14), and the like. To the casual observer such would have the appearance of a flower, a deception that would be heightened where such spore-cases stand well above the foliage. The species quoted furnish some of the most interesting examples of the so-called Flowering Ferns, but other genera contribute—*Botrychium*, *Ophioglossum*, *Struthiopteris*, and several others.

Viviparous and Proliferous Ferns.

Another very remarkable group of Ferns that may be briefly noted are those classed by botanists as Viviparous and Proliferous, both words very expressive of the habit such individuals have of reproducing themselves by means of bulbils or of young plants disposed upon different organs. Such characteristics belong to both giants and pigmies, and are not restricted to any particular genera. In some, even of the larger families, only one, or at most, two species, reproduce their kind in the manner giving rise to the names; while in

others they are fairly numerous—in *Asplenium* (Fig. 15) and *Woodwardia*, for example. Nor are the bulbils or young plants always found on one portion of the parents. On this account it is usual to separate Ferns possessing

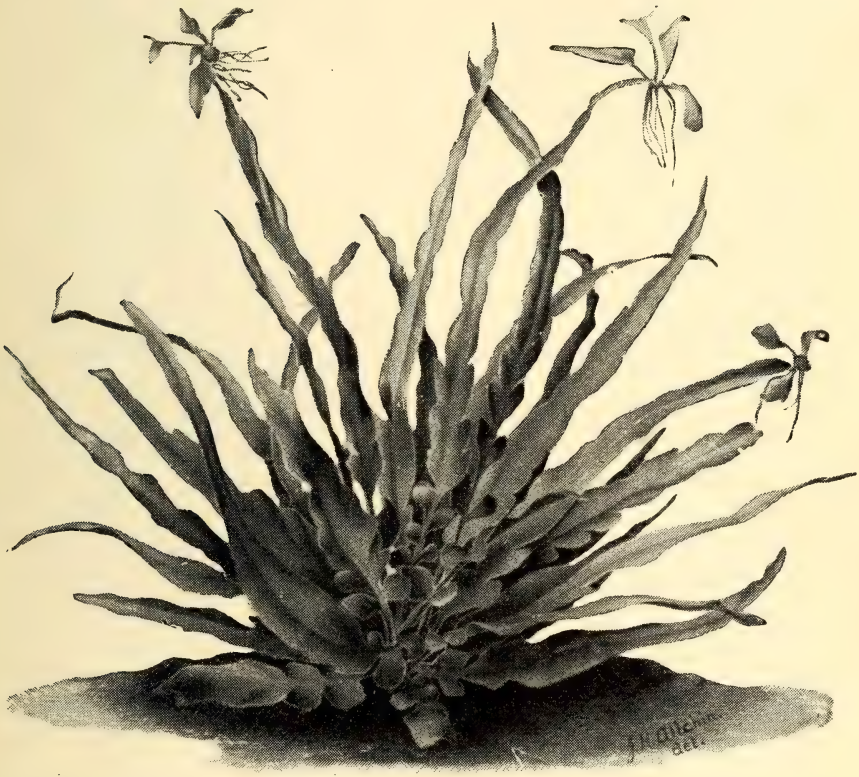


Fig. 15. A typical example of the Proliferous character of certain Ferns—*Asplenium attenuatum*, a native of Queensland and New South Wales.

the characteristics into four fairly well defined groups. First, there are Ferns in which the viviparous character extends over the whole or the greater part of the surface of the leafy portion of the fronds. Secondly, we have those in which the proliferous character is confined to the stalk, which is covered with such (adventitious) accidental

growths. Thirdly, there are Ferns whose fronds bear a solitary bulbil on or in the near vicinity of their extremity, or whose tailed appendage is formed by the production of a young plant partaking of the same character as its parent. Lastly, we have individuals the base of whose stalks are provided with either trailing stems (stolons), roots, or scales of a proliferous nature, each of these bearing one or more latent buds or bulbils that, given certain favourable conditions, never fail to reproduce the parent. Necessarily this is but an extremely brief survey of a group of Ferns exhibiting some singular characters, but it will probably suffice for the beginner, and serve to put him on the right road to success.

Life-History.

In order the better to understand the propagation of Ferns by the natural method of spores, it will be well first, briefly, to discuss the somewhat remarkable life-history of the plants. Already we have stated that Ferns belong to the class known as Cryptogams, in contradistinction to the Phanerogams, or Flowering Plants. In a Flowering Plant that produces seed the young plant generally speaking already exists, and all that is necessary to reproduce its kind is for the seed as it separates from the mother-plant to fall on congenial soil. With the Fern there is the same separation from the parent in the case of the spore-producing kinds, but the first growth is a very different one from that of the type. The fact is, Ferns belong to what are called prothallus-producing plants. In common, therefore, with the Horsetails, the Club-mosses, or Pillworts the first growth from the spore is a body, the product not of sexual reproduction, but of vegetative growth, and known as a prothallium, or prothallus. In appearance this body casually looked at, reminds one strongly of a common Liverwort. A more careful examination reveals a flattened, green, expanded body, like Fig. 16, showing an affinity for damp places, especially where

bricks exist. Amidst such an environment it rapidly makes headway, broadening until it eventually assumes a heart-shape (Fig. 17), but seldom more than $\frac{1}{4}$ in. At this stage its lower surface becomes partly covered with tiny root-hairs, each composed of a row of cells; there also, and along the edges are developed the sexual organs—antheridia being the male, and the archegonia (situated in the middle of the lower surface) the female organs. In this respect Ferns differ from most of their allies,

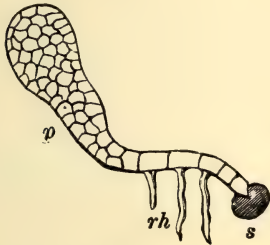


Fig. 16. First growth of Fern from spore, showing: p, prothallus; rh, root-hairs; and s, spore (much magnified).

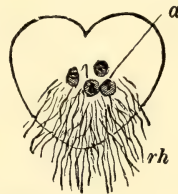


Fig. 17. Lower surface of mature prothallus, showing: a, female organs or archegonia; rh, root-hairs (much magnified).

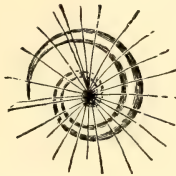


Fig. 18. Spirally coiled antherozoid (much magnified).

whose prothalli bear only male or only female organs.

The antheridia are small protuberances composed of three comparatively large cells, originating as outgrowths of cells of the epidermis; each outgrowth is cut off, as a new cell, by a cell-wall. In some prothalli, the contents of the cell thus formed, and containing a tissue of mucilaginous nature, break up into a number of small, rounded "parent cells," in each of which is formed an "antherozoid"

(Fig. 18), slender, but coiled spirally in two or three turns, and provided with a tuft of fine hairs, or cilia, at one end. These antherozoids somewhat resemble microscopic tadpoles, and more actively in the moisture surrounding them. Their function is to fecundate. This object is effected by means of a more or less rapid motion, to which the body is

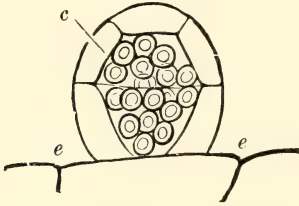


Fig. 19. Young antheridium showing: c, central cell, filled with parent cells of antherozoids; e, e, epidermis of prothallus (much magnified).

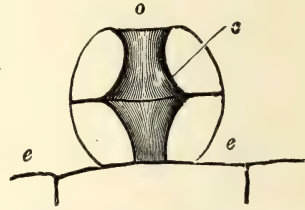


Fig. 20. Ripe antheridium from which antherozoids have been shed by opening at o.—c, empty cell; e, e, epidermis (much magnified).

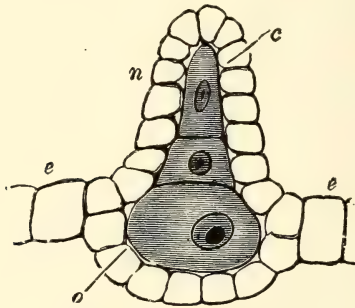


Fig. 21. Immature archegonium, showing c, canal, still closed above, and filled by the canal-cell; e, e, epidermis; n, neck-cells; o, oosphere (much magnified).

subjected by the action of a number of delicate and irritable hairs, situated at one of the extremities of a flattened helicoid-like thread, that always accompanies this club-shaped vesicle. In most prothalli, however, a process of cell-division goes on in the young antheridium, whereby it is finally made up of a layer of cells surrounding a central cell (Fig. 19), and in this the parent cells are developed, and produce antherozoids. The outer coat, formed by

the layer of cells, has to aid in expelling the antherozoids when ripe, and the cells do this by absorbing water rapidly, swelling, and compressing the contents of the central cell till its apex, which is not covered by the layer, is burst (Fig. 20), the "parent cells" are expelled, and, soon rupturing, set free the antherozoids, which have the faculty of moving rapidly in water or in a drop of dew or rain.

Archegonia (Fig. 21), as previously stated, are the female organs, in each of which lies the "oosphere"; the latter, fertilised by the "antherozoa," becomes the "oospore." This oospore develops into the Fern-plant bearing the well-known fronds, on the back of which are visible the groups (sori) of minute, brown spore-cases (sporangia), in which lie numerous spores, like the one with which the cycle began. Thus it will be seen that the prothallus and the leafy Fern-plant are two generations in the course of a single cycle. The archegonia, which are developed rather later than the antheridia, are situated in the middle of the lower surface of the prothallus, behind the notch seen in Fig. 17, and in the vicinity of the antheridia. Each of the archegonia—which are by no means so plentiful as the male organs, generally speaking, not more than two being produced on one prothallus, and then only one of them appearing fertile—originates, like the antheridia, from a cell of the epidermis, from which it grows out in a hemispherical form. These female organs are larger and more compact structures than the antheridia; their constitution is also totally different, for they are built with four tiers of cells and in a sort of columnal form. Their development is effected in this wise: A cell-wall forms, and cuts it off from the cell of the epidermis. It increases in size, and becomes further divided into three layers; and these are again subdivided by cell-walls. The result is the formation of a structure approximating to a flask with a long, narrow neck. The cavity at the base is occupied by a large cell, the oosphere, rich in protoplasm, terminating, when mature, in a kind of style

open at the top, and communicating with the cavity below by means of a central canal. The cavity or sac at the base further contains a globose utricle; it surrounds the oosphere, which is regarded as the object to be fecundated, or as the germ that, after impregnation, will set up a growth which ultimately assumes the form of the parent plant.

Careful observations have shown that the fecundation of the oosphere is effected as follows: The tube of the neck of the archegonium is at first filled with a narrow cell (the canal-cell), the cell-wall of

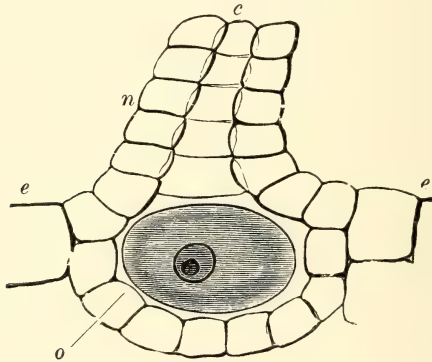


Fig. 22. Longitudinal section of mature archegonium of Fern, showing c, opening of canal down neck; e, e, epidermis of prothallus; n, neck-cells; o, oosphere (much magnified).

which becomes mucilaginous, swells, and is expelled from the outer opening of the tube, leaving a passage for the antherozoid down the tube, or central canal, to the oosphere, when the latter is ripe to be acted on by it (Fig. 22). The antherozoids are caught in the mucilage while moving over the prothallus; they wriggle down the tube, reach the oosphere, and fertilise it. The oosphere very soon begins to grow, and the final result is the development of the oospore into the leafy plant or Fern. It may be mentioned that the oospore, at a very early period, divides into eight cells, in two layers. Of these cells, four lie next the base, and four next the front, of the prothallus. Of the latter, the two

farthest from the neck of the archegonium give origin to the first leaf or frond; one, near the neck, to the growing point of the stem; and the fourth to hairs. Of the other four cells, one, opposite to the stem, develops into the root, one ultimately disappears, and the other two form the "foot" of a structure that remains sunk in the archegonium, which has grown so as still to surround the foot

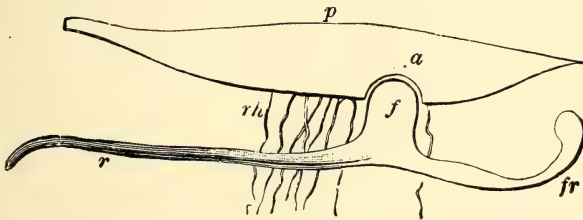


Fig. 23. Diagrammatic sketch of connection of young Fern with prothallus, showing *f*, foot of young Fern imbedded in hollow of enlarged archegonium (*a*); *fr*, very young frond of Fern; *p*, prothallus; *r*, root of Fern; *rh*, root-hairs of prothallus.

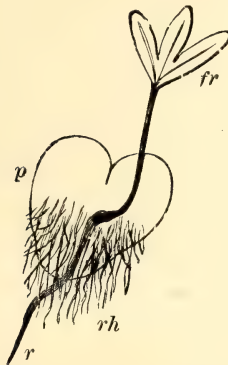


Fig. 24. Young Fern growing from prothallus, showing *fr*, young frond of Fern; *p*, lower surface of prothallus; *r*, root of Fern; *rh*, root-hairs of prothallus (slightly enlarged).

(Figs. 23 and 24). By means of this organ the young plant absorbs nourishment from the prothallus, which, for a time increases in size, but is gradually exhausted and withers away, and afterwards the young Fern is able to nourish itself by its own roots and leaves.

PROPAGATION.

Ferns may be propagated in several ways—by spores, which is the more usual and natural; by division of the crowns; by the rooting of the proliferous growths found upon the surface of the fronds in certain species; and by the development of the latent eyes or buds found at the base of some of the others, &c.

Spores.

To even the veriest novice, so soon as he be conversant with the habit of the different species of Ferns, it will be patent that for the majority, propagation by means of spores is the most natural method, while for others it is the only one—Tree Ferns, for example. No one having seen a Tree Fern (Fig. 25) could think that it could be propagated by division. One often hears complaints about “spores not germinating.” Usually this is the fault of the cultivator in not taking them at the proper time—*i.e.*, before the contents of the cases have been shed. Ordinarily one is told to wait until the sori have assumed a mature appearance—brown, black, or greenish, according to the species. This is sound enough generally, but with genera like *Todea* and *Osmunda*, and a few others, it would not hold good. If the capsules have burst, the cultivator may conclude that he is too late. The spore-bearing fronds should be cut, and be allowed to dry for two or three days in white paper bags, after which time the spores should be sown as soon as possible. Although Fern spores may be sown at any time, March and April are the most favourable months, as, if properly treated, seedlings raised then have sufficient time to form crowns strong enough to stand the following winter. With those sown later there is the risk of the resulting young plants being destroyed during winter, especially if heavy fogs are prevalent. Even those spores which naturally ripen during the autumn or winter, if collected and kept in paper, in a dry but



Fig. 25. A handsome Peruvian species of
Tree Fern—*Alsophila pycnocarpa*—having
a very thorny stem.

not warm place, may safely be preserved until the spring, when it will be found that their germinative power has not been materially affected.

Many ways of sowing Fern spores have been advocated; but the simpler the operation the better. A piece of turfy loam, or in some cases a piece of fibrous peat, or, again, a mixture of both is all that is required. To make sure that the material used is perfectly free from all impurity and from living organisms, it is well to sterilise it by baking or by gently pouring the contents of a kettleful of boiling water over it, and allowing it to cool and drain. When the sowing takes place on turfs of either peat or loam, these should be put in boiling water, and allowed to remain in it long enough to become perfectly saturated, after which they should be stood in an upright position, to drain. A still day should be chosen, and the spores should be scattered over them and not covered with soil; they should be put under a bell-glass, and remain there until the growth is sufficiently developed for pricking off.

If fibry loam is not procurable, it is best to sow in porous, shallow pans, or in pots partly filled with crocks covered with a layer of either fibrous peat or sphagnum, the rest of the pan or pot being filled to within half an inch of the rim with a mixture of peat, loam, silver sand, and soft brick broken very small; the surface may be rendered even by pressing it firmly with the bottom of another pot. This compost possesses a great advantage over all others, inasmuch as while spores of most species germinate on any material of a naturally moist nature, there are certain others that germinate only on either peat, crocks, or loam. When, therefore, it is not known positively which of these materials is the most suitable, the mixture above recommended gives the spores a fair chance of falling on the material for which they have a predilection. The soil should be treated with boiling water, and allowed to drain; for watering after the sowing, even with cold water, may result in the total destruction of the spores. The spores should be simply dropped on the surface

of the soil, and afterwards covered with a flat piece of glass. It is also necessary, while sowing, to hold the paper containing them very close to the surface of the pots, as, being so exceedingly light, they are liable to fly in all directions but the right one.

The watering of the pots or pans in which Fern spores are sown requires to be done with great care. Until the seedlings have formed a little crown, watering should always be done by allowing the lower part of the pots to stand in water till sufficient moisture has been absorbed—but the pots should not in any case remain altogether in water. To that effect, they should be stood in saucers, and disposed in places varying in temperature according to the nature of the species sown.

Spores of British and other hardy kinds, although germinating more rapidly, and taking less time in producing young characterised plants, when sown in heat, it is not at all necessary to have any artificially-heated place in which to sow and grow them. In their case, the pots or pans may be stood on a piece of slate in some damp, shady, but not dark corner, out of the way—under the stage of a greenhouse is a good situation for them. There they should remain, until the surface of the pots or pans become covered with a Lichen or Liverwort-like growth. From this they ultimately develop, according to the species, in from three to six months from the time of sowing. A certain state of apparent dormancy, lasting sometimes several weeks, may be observed between the production of the scaly growth, and the sudden appearance, here and there, and eventually in a crowd, of the fronds proper. It is principally during that time that, to encourage fertilisation, a uniform rate of moisture is of the greatest importance.

When Fern spores germinate freely, forming a dense mass of prothalli, it is indispensable that they should be several times “pricked off.” so that they may have room to develop; for, if allowed to crowd and overgrow each other in the seed-pan, they are

very liable to damp off. The operation consists in taking small tufts of prothalli, and putting them in pots filled with a material similar to the one in which the spores were sown; but great care must be taken that no bruises result. On that account, small patches should be taken on a stick having the least notch cut in the end, and they should be merely deposited, not pressed, into the new soil, and about lin. apart in all directions. For a few days after being pricked off the seedlings should be treated very much as they were previously; they should still be watered by partial immersion, and no water should be applied overhead until the young plants have produced fronds. They should be gradually inured to the air by tilting on one side the glass cover, which may in a short time be removed altogether. Until then, it is best to keep the pots or pans at all times well shaded during sunshine, but not during dull weather. This is most effectually done by means of pieces of paper; these may be laid on the outside of the frame, and removed when not required. When fronds have made their appearance, the seedlings will not require any other shading than that usually provided for the house. Having produced three or four rudimentary fronds, they should be sufficiently strong for being transferred, at first three in a pot, then separately in small pots. On account of their tenderness it will be found necessary to place them in a somewhat close atmosphere, well shaded and carefully watered, where they should remain until perfectly established, and where the air must be admitted gradually.

The foregoing details, though applying particularly to British and other hardy Ferns, suggest a mode of treatment that is equally suited to the propagation of greenhouse and stove species and varieties, exception being made simply as regards the temperature to which they should be subjected, as they will fare all the better if sown in a close case in which a temperature of from 70deg. to 75deg. can be evenly maintained. Fern spores vary greatly

as to the length of time they take to germinate—from a few days to many months. Nothing, therefore, can be said in respect thereof, as even individual spores from the same frond show considerable variation. Similarly, although Fern seedlings, when under suitable conditions, grow quickly during the spring and summer, it is impossible to state how long they will take to form little plants. Seedlings of *Adiantum*, *Pteris*, *Gymnogramme*, *Nephrodium*, &c., soon make little subjects requiring to be potted singly; whereas those of others, especially *Gleichenia* (Fig. 26) and *Marattia*, grow so slowly that their first fronds are not formed until the third year after the sowing.

There is another important reason why Ferns, whenever practicable, should be propagated from spores—the chance of obtaining some variation from the type worthy of perpetuating. To such we owe the brilliantly-coloured *Adiantum rhodophyllum* (which was produced from a batch of seedlings of *A. Victoriae*, itself a freak of nature or a natural hybrid, found amongst a quantity of *A. Ghiesbreghtii* (*scutum*) seedlings) and many another elegant Maidenhair; *Nephrolepis Bausei*, a seedling from *N. pluma*, from which it differs considerably, and on which it may be considered a very decided improvement, being, in fact, a delicately plumose form; *Davallia elegans polydactyla* and *D. Mariesii cristata*; *Gymnogramme schizophylla gloriosa*; and endless varieties of *Pteris*, but none so striking as *P. tremula grandiceps*.

Here it may be well to observe that on account of the minute nature of the phenomena observable in fertilisation in Ferns, systematic hybridisation as practised with plants provided with flowers, and consequently with visible organs, is impracticable. Still the fact remains that by sowing the spores of several varieties together offspring of mixed characteristics are produced, thus proving that crossing really takes place. In several of the cases of garden hybrids, for instance, none of which are known for certain to be the result of forethought, a connection

between the two parents is clearly shown. Among the most striking instances illustrative of satisfactory results in intentional crossing, that mentioned in Mr. Druery's book on "Choice British Ferns"

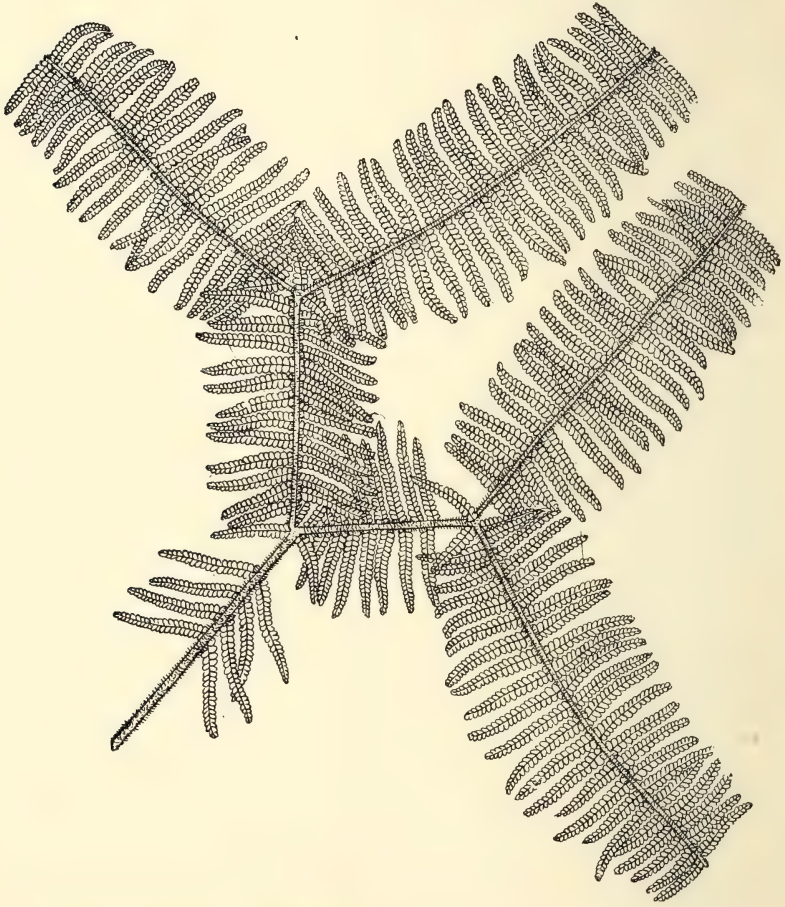


Fig. 26. Portion of Frond of *Gleichenia circinata semi-vestita*, a remarkably slow-growing variety.

(p. 44) as being Mr. Clapham's greatest success, and the result of a cross between a beautifully-crested Polypody (*Polypodium vulgare bifido-cristatum*) and a very finely-divided one (*P. elegantissimum*) is particularly remarkable and conclusive. In this

case, the result is the transference not only of the characteristic crestring of the former to the latter, but also of its peculiarities to the otherwise normal fronds which the latter is in the habit of producing occasionally—a feature which, of course, places the cross beyond a doubt. It does not, however, follow that operations of this kind are always successful, and failure at a first experiment must not prevent another attempt being made.

It is well nigh impossible to trace the parentage of certain crested varieties. Indeed, they can only be described as natural sports or accidental variations in seedlings, which may possibly later on produce numerous forms more or less crested, as is now the case with *Pteris serrulata*. As a general rule it may be taken that when the original form has once varied, it has a greater tendency to vary again.

Propagation by spores is not always the quickest means employed for the reproduction of certain species. Filmy Ferns, for instance, are exceedingly slow in producing their first fronds, and *Hymenophyllum demissum nitens* and *H. pulcherrimum* have been known to remain five years in the prothallus state. Hymenophyllums, therefore (and with them Trichomanes), must not be included amongst Ferns which are best propagated by spores: on the contrary, they increase more rapidly by means of division. Todeas, however, which belong to the same section, can only be propagated by spores. For a long time the stock of these lovely plants was only kept up by frequent importations. Now seedlings are freely raised, though they require several years of careful and constant nursing.

All growers for market raise their Ferns from spores: but their mode of procedure differs materially from the one recommended above. Their aim is not the formation of a collection, but simply the cultivation of showy species and varieties. Necessarily, therefore, they restrict their attention to a few genera, such as *Adiantum*, *Pteris*, *Nephrodium*, *Aspidium*, and *Polypodium*, and even of these they only grow the more vigorous, bringing them to

perfection in an incredibly short time. They sow the spores of the different species, when ripe, on the surface of pots containing plants of slower growth, such as Palms, which, as they do not often require fresh potting, give the spores a fair chance of germinating, and even of producing young plants. The latter are "pricked off" either in boxes or in pans; thence, when they have made five or six fronds, they are taken and potted at once into 2½ in. pots. In these pots, hundreds of thousands of Ferns are disposed of annually for the ornamentation of the dinner-table or of dwelling-rooms; for such purposes more Ferns are grown in this country than any other kind of plants, and all of them are raised from spores. This mode of reproduction is also frequently resorted to for covering naturally damp, bare stone or brick walls, on which the spores of certain species germinate promptly, and the plants grow apace for a long time without any other nourishment than moisture, and what little vegetable mould is naturally produced by the decaying of their lower fronds.

Division.

All Ferns that naturally form several crowns (and under careful culture there are many, especially among the British representatives, possessing that character) may be propagated by division of these adventitious crowns, which are produced, sometimes from buds situated at the base of the stalks, and at other times by a process of fission in the crowns themselves. This mode of propagation is particularly applicable, amongst our native kinds, to the numerous and beautiful deciduous forms of the Lady Fern, *Asplenium* (*Athyrium*) *Filix-fœmina*, and to those of the common Hartstongue, *Scolopendrium vulgare* (Fig. 27), in which the duplication of the crowns takes place much more readily than in other genera. It is undoubtedly the safest mode of increasing most of the crested, tasselled, cruciated, congested, or depauperated forms of these species, the faithful reproduction from spores of the endless, and in some cases confusing, varieties being, at

least, doubtful. When Ferns are to be propagated by the division of the crown, it is necessary to allow sufficient time for its full development into two or more distinct centres of growth, when it will be found that each of these is provided with its own set of roots, and is really a perfect plant. Though some advocate dividing the crowns with a knife, yet it will be far better for the plants if they are simply pulled in pieces, first having washed away the soil so that the roots may be readily seen. It is also



Fig. 27. *Scolopendrium vulgare Kelwayii*, one of the prettiest forms of the common Hartstongue known to cultivation.

sometimes deemed advisable by a similar means to regulate the growth of the plants which are of less graceful appearance, when through the multiplicity of crowns a perfect crowd, developing in all directions, is produced. Early spring (March), just before the plants start into fresh growth, is the best time to propagate Ferns by division; the young subjects then have plenty of time thoroughly to establish themselves during the ensuing season. British Ferns thus propagated should be kept in a cold frame after the operation has been performed, as artificial heat is not in any way beneficial to them,

and little or no water should be given until the first fronds make their appearance, which they generally do in from ten to fifteen days after separation. In the case of exotic Ferns of an ever-green nature, the divisions must, for a few weeks, be put under glass in a frame, to which air and light should be gradually admitted until the young plants are strong enough to stand outside the case. It will also be found advisable to subject to the same treatment the crested and other abnormal forms of the Male Fern, *Nephrodium (Lastrea) Filix-mas*, which are apt to develop several crowns, not by the process of fission, like the species above-named, but through the development of side buds. The removal of these buds is undoubtedly beneficial to the mother-plant, which then produces a more vigorous and more symmetrical growth, all its energies being concentrated in the development of its own growth. Like the divided crowns, the little plants produced from these buds are provided with a bunch of roots all ready to support the new subject as soon as it is separated from the parent. These young plants are then best pricked out round the edges of pots or small pans filled with a compost of an open and somewhat sandy nature.

Ferns with creeping rhizomes may generally be propagated freely by cutting these up into pieces, particularly while the plants are still at rest. It is thus that the Oak Fern (*Polypodium Dryopteris*, Fig. 28), the Beech Fern (*P. Phegopteris*), the common Polypody (*P. vulgare*), and our native Maidenhair (*Adiantum Capillus-Veneris*) are usually propagated. Every piece of creeping rootstock bearing a couple of fronds and a few roots, or even rudiments of roots, usually produces a plant, when firmly pegged to the ground, with the rootlets well covered. Exotic Polypodiums, as also the majority of Davallias, numerous Acrostichums, &c., are easily increased by the layering of the points of their rhizomes; or if these are cut into various lengths, they rapidly produce lateral growths, which in a short time form independent plants. Chopped sphagnum,

rough fibrous peat, and coarse silver sand, in equal proportions, form a mixture that gives the most satisfactory results. In this the cut-up rhizomes should be laid with but a very superficial covering of the same material, when the young growths will make headway in a remarkably short time, especially if the whole is subjected to the influence of a warm,



Fig. 28. Oak Fern (*Polypodium Dryopteris*), a familiar example of a species having creeping rhizomes.

moist atmosphere, such as that of an ordinary propagating-case, or of a melon- or forcing-pit.

Proliferous and Viviparous Species, &c.

To propagate the Proliferous and Viviparous Ferns is a very simple matter. With those species and varieties that produce solitary and terminal bulbils, the ends of the fronds should be securely pegged down to the soil, or else to the moss surrounding the plants. Soon an independent existence is set up. Similarly, when bulbils are produced on

the fronds, they may be allowed to drop on to the soil, or be removed with a view to their rooting, and ultimately becoming independent subjects. *Asplenium bulbiferum* is a good example of such Ferns; in fact, the genus is unusually prolific of such species



Fig. 29. The Ivy-leaved Fern, *Hemionitis palmata*, a dwarf-growing species for the stove.

and varieties. If such plantlets bearing no resemblance to the parent be picked off when three rudimentary fronds are made, and lightly placed on damp, sandy soil, they will emit roots, and may afterwards be pricked off singly. There are, however, exceptions even to this rule, and with these the bulbils must not be separated from the fronds, but be pegged to the soil in order that the adventive growth may develop. Well-known instances are *Hemionitis cordata* and *H. palmata* (Fig. 29), and *Ceratopteris thalictroides*. Again, in the Hartstongue,

some forms produce buds on their stalks, as also on the surface and on the edges of their fronds; in the latter case it is necessary to cut a small portion of the frond to fix them in the soil, and to hold them until the roots have developed. Even in the plumose sections of the Lady Fern a few forms have been found occasionally producing on the back of their fronds bulbils from which young plants can be produced by pegging down.

Latent Buds and Underground Stems.

A process of reproduction that is less generally known consists in artificially stimulating the development of buds which, if left to themselves, usually remain dormant at the base of the stalks of the fronds of certain species. This is particularly applicable, among exotic kinds, to *Angiopteris* and *Marattias*, whose fronds are surrounded at their base by fleshy appendages, each provided with two buds, which seldom, if ever, develop when left on the plant, but which, on being placed in a compost of an open nature, and subjected to heat and moisture, never fail to produce young plants. Among British kinds, this peculiar method may be applied with advantage in the reproduction of some varieties of the Male Fern, of the Hartstongue, and even of some forms of the Lady Fern; for it has been found that the basal portions of the old, decayed fronds, which for many years retain some vitality, contain such latent buds, and these usually develop when detached from the old fronds and treated in the same way as the scales of *Marattias*. As regards *Scolopendriums*, all may be readily increased by dividing the stool, or underground stem, with which every plant belonging to this genus, when sufficiently old, is provided. Cut up that portion which is below the ground into small fragments, lay these in a shallow pan half filled with crocks, and cover them with a thin layer of very sandy soil, which must be kept moderately, and also constantly, moist. In this way a crop of young plants, in all respects like the one from which the divisions have been obtained,

will be secured. Although these will come up under cold treatment, the influence of a little artificial heat greatly assists development.

Other Methods of Increase.

The tubercles produced at the roots of certain *Nephrolepis* offer another means of reproduction, and one that is most valuable in the propagation of *N. pluma*, *N. Bausei*, &c., which, being of a deciduous nature, would otherwise have to be increased exclusively from spores. Their tubercles, which are produced in abundance, remain in the ground at rest fully three months after the foliage has died down—in November or December—and if the soil in the meantime is kept moderately moist, but not wet, these tubercles retain their vitality until March, when, by being potted off singly (in small pots at first) they will, during the season, and with successive pottings, make very pretty young plants, similar to those produced from the stolons with which all tuberless and evergreen *Nephrolepis* are provided.

However great may be the advantages derived from the propagation of Ferns from spores, there are some instances in which that mode of increase is practically impossible, as there are species and varieties permanently barren, or at least so far as plants subjected to cultivation are concerned. Usually this character is most commonly exhibited in plumose forms of different species, British and exotic. "Plumation" may be considered the most beautiful type of variation. It consists in either a much more delicate division and growth of the ultimate sections of the frond than that of the common species, or in a greater leafy development. Ferns partaking of the plumose character are usually either partially or entirely barren, the reproductive vigour of the plant, exactly as is the case with flowering plants bearing double flowers, being apparently affected by such development. It is beyond dispute that if spores are not, or are only very sparingly, formed, the reproductive powers of such plants are much more

developed in the production of buds on various parts of their fronds. Experiments have conclusively proved that the barren *Scolopendrium crispum*, for instance, is much more readily propagated from sections of the underground stem than the fertile species and varieties. Among British Ferns naturally barren, the most striking instance is that of the Welsh Polypody (*Polypodium vulgare cambricum*), which, although grown in great quantities, and consequently under very different circumstances, and subjected to various climatic conditions and influences, has never been seen bearing any fertile fronds, either naturally or under cultivation. Permanent barrenness is equally well illustrated in the case of the lovely frilled or plumose form of the common Hartstongue, *Scolopendrium vulgare crispum*, which, although grown in enormous quantities and under various conditions, has invariably refrained from producing spores.

Numerous other instances of barren or partially-barren species and varieties might be adduced in exemplification of the characteristic referred to. Anyhow, it is only fair to assume that this absence of spores accounts for the rarity of such Ferns in collections, as well as the comparatively high figures asked for them. Their propagation is necessarily a very slow process, particularly that of the plumose form of *Aspidium* (*Polystichum*) *aculeatum*; this can only be increased by means of side growths, which are but sparingly produced at the base of the protracted trunk, and only after the plant has already attained a certain age. The barren forms of *Polypodium* and of *Scolopendrium* are more plentiful in collections, for this reason—that while, in the cases just described, one must patiently wait for the production of the offsets or of side buds, these species and their varieties may be—and, indeed, frequently are—propagated either by the sectioning of the underground stems, as previously explained, or by the division of the crowns, which are produced in greater abundance. In exotic Ferns, we find the same barren character affecting to a similar degree

the plumose forms of different species. A popular illustration of this character is undoubtedly the beautiful *Adiantum tenerum Farleyense*, or, as it is commonly called, *A. Farleyense* (Fig. 30), which is exclusively increased by division.

Two other modes of Fern propagation, each of them very little known to the public in general, but

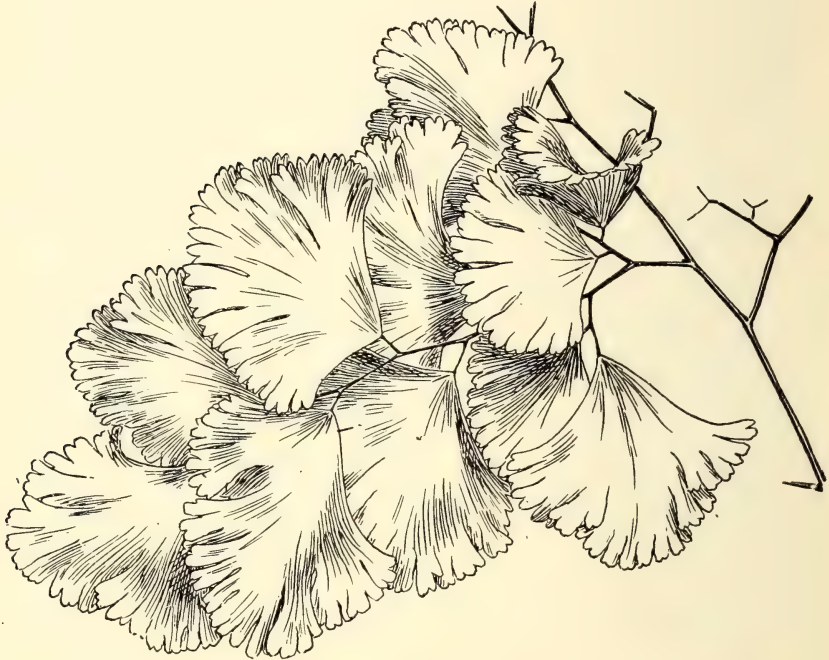


Fig. 30. Frond of the beautiful *Adiantum tenerum Farleyense*, a well-known plumose barren form.

which may be classed among the most important discoveries of recent years, must be briefly mentioned. One has been called Apogamy, which was first observed by Professor Farlow in connection with the well-known *Pteris cretica*, but which is now known to affect several other Ferns, notably *Nephrodium (Lastrea) Filix-mas cristata*. With these the young Fern is produced as a bud from certain parts of the prothallus, without the formation of sexual organs. The sexual process, as the name indicates, is in this

case completely abolished, the production of spores being suppressed. The other departure is Apospory, which was brought prominently before the public by Mr. Charles T. Druery, who discovered that in certain Ferns the prothalli were produced as out-growths from the pinnules of the Fern fronds, and not from the spores. With this method the sexual reproduction is not affected, and the leafy Ferns are developed from the prothalli in the usual way. But the prothallus, according to the variety in which Apospory was observed, is either modified sporangia or simply a structure of prothalloid nature, without any connection with sori or sporangia. Interesting to the scientist as these departures from the normal may be, they are without the scope of this work, which is intended purely as a guide to the amateur. Those, however, who wish to learn more concerning Apospory will find it fully described in "The Book of Choice Ferns."

CULTURAL CONDITIONS.

In order successfully to cultivate Ferns, it is necessary to remember the conditions under which, as a rule, they grow in a state of nature. The exact surroundings, of course, cannot more than be approximated to in the majority of cases. Therefore, whether dealing with the occupants of the hardy Fernery or those of the glass-house, this fact must not be lost sight of. Shade and moisture are absolutely necessary to the well-being of the many; while there are a few that thrive best in exposed and airy situations. For the purpose here we may broadly divide Ferns into those that are hardy and those that require protection. Aspect in each case must be studied. For instance, the hardy Fernery, whether it be a modest rockery or a more pretentious affair, should be constructed in a moist and cool spot, where strong light does not penetrate. Usually, therefore, one in the neighbourhood of tall deciduous trees, and having a north aspect, should be selected, as these would protect the plants alike from cold winds and scorching sun. There are

many such sites in numbers of gardens, and though for flowers generally they are for the most part quite unsuitable, yet for Ferns they are ideal quarters, and by careful selection of species they may be easily converted into a most interesting section of the garden beautiful.

Next to aspect comes drainage. Ferns are moisture-loving subjects, and in the growing season particularly require an abundance of water. It will, therefore, be obvious that a water-logged soil would soon sour, and prove disastrous to the occupants, no matter how enduring as individuals they may be.

Making the Hardy Fernery.

The shape of the rockery matters but little: it is the well-being of the plants that should be the guide, though the closer the general scheme is to Nature the more effective. Inasmuch, however, as she is never hard and fast, it would be inadvisable to attempt to give plans. Above all things, endeavour to avoid anything like a formal appearance, whether the rockwork be on the level or in an excavated position. First, roughly map out the paths or path and then proceed to fill in the details. In selecting the stone for the purpose the average amateur will have to depend largely upon what he finds locally to hand. Where, however, cost is not a consideration, then either limestone or sandstone should be employed, the latter preferably. Whether a large or a small Fernery is under consideration, the cultivator's aim must be to break up the view as it were, and this is best done by means of good-sized pieces of stone. Where stone is not get-at-able on account of expense, then the amateur must fall back upon brick-burrs from the kiln-yard. These are always obtainable at a cheap rate, and if not so natural in appearance as stone the rockery may be so constructed that it will give excellent results; and, after all, with the majority, the aim would be rather to preserve in vigorous health a certain number of species and varieties than to provide a show-place. Without doubt, the most natural way of growing Ferns is in

a kind of artificially-made ravine with, if possible, such paths thereto as one would find in nature. True, this is more easily said than done, but that it is possible we know from practical experience. If one



Fig. 31. An underground Fernery so arranged that light is readily accessible and that no pieces of rock are overhanging.

wishes to take a lesson from Nature as to the way Ferns grow, we would recommend a visit to the Downland Landslip between Lyme Regis and Seaton. There one finds the very hints that are required, but which are so difficult to convey in words. Or the "Nine Springs" at Yeovil may be cited

as a Fernery in a natural ravine with tortuous paths. These, however, are too extensive to be thought of except by the wealthy, still they are recorded as object-lessons. Very important in the case of an excavated hardy Fernery (Fig. 31), even on a small scale, is the provision for getting rid of the surplus moisture—it must be carried away by drains.

Even in making a Fernery on the level, the idea must be to provide good-sized pieces of rock, between the chinks and pathways of which certain suitable species may be introduced. No one would think of planting a Fernery on a dead-level for giving the best effect. That many have to confine their attention to a border or a bed is perfectly true; but neither the one nor the other is an ideal place for Ferns. The reason of this is that the ordinary occupants thereof require altogether different conditions from those suited to Fern life.

Sometimes it is possible to utilise very effectively old tree-stumps in combination with the stone; but after all, it is doubtful whether decaying wood, with its great liability to be attacked with many insidious fungoid diseases, offers even a good environment for Ferns. Therefore, while on the one hand we would scarcely advocate the removal of such stumps did they exist on the other we would prefer relying, had we to form an entirely fresh rock garden, upon stone alone. Here it may be as well to state that it is very necessary to make the pieces of rock used in the construction of a Fernery firm in the soil, otherwise a heavy storm might prove disastrous.

Our native Ferns alone provide sufficient variety to satisfy the tastes of even the most exacting; but if greater variety be required then some of the exotic species from Japan and North America may be employed, as their hardiness is undoubted. A mistake that is often made by amateurs is to plant without any idea as to the future development of the occupants. To take British Ferns as a guide, it is most certainly desirable to allow sufficient space for them at the outset. Another point is to plant the background in masses instead of singly. If, for instance,

such strong-growing species as the Male Fern (*Nephrodium Filix-mas*), the Prickly Shield Fern (*Aspidium aculeatum*, Fig. 32), and the Ostrich-Feather Fern (*Onoclea germanica* and *O. g. pennsylvanica*) are thus disposed, they will shelter less robust species. Important, too, is it to consider, when planting, the soil requirements of individuals, whether



Fig. 32. Prickly Shield Fern—*Aspidium aculeatum*—a very robust species, well suited to shelter more delicate Ferns.

singly or grouped; the character of such individuals—whether deciduous or evergreen, for, unless this be done a bare appearance would be presented at the “fall of the leaf” that would be undesirable.

As to the best time for making a hardy Fernery, this will depend upon circumstances. Such a place may safely be planted at any time from October to

March; but if it is tolerably sheltered, it will be found preferable to plant during the autumn, as root action in most hardy Ferns commences long before there are any visible outward signs of vegetation, and in that case the plants moved in the autumn will, if kept sufficiently moist, have made a quantity of fresh roots, upon which the new growth is mostly dependent. In an exposed situation it is best to plant early in spring, and just before vegetation commences—that is, about the end of March—as the plants are then in most vigorous state. Moreover, if any of the old fronds are injured through the operation, there is but little harm done; whereas if the planting takes place later, the injuries done to the young growths may result in a permanent disfigurement of the plants.

Once a hardy Fernery is established it requires very little attention. The whole work in connection with such a place is limited to occasional waterings during the summer, while during the winter a slight covering of old leaves or other light material placed over the crowns of the plants will enable the tenderer species to withstand our severest winters. Such protective material must be carefully removed as soon as the hard frosts are over, or its presence will prove detrimental to the plants, either by the breaking of the young fronds if the operation is performed when these are partly developed, or by their sudden exposure to drying winds and late frosts, if they have been allowed to make their growth under artificial protection.

In Pots under Glass.

For all Ferns requiring glass protection the houses should preferably be disposed from north to south, so as to avoid the strong rays of midday sun while at the same time retaining all the light possible. Exception to the rule as regards light should be made in the case of houses intended for Filmy Ferns, all of which thrive best when grown in a house with a north aspect and subdued light. Important, also, is the angle at which the roof is

pitched: 50deg. is not too great a one as there must not be the slightest chance of drip occurring. This is fatal to success. The warm-house Fernery should also be a little below the ground level, as this will ensure uniformity of temperature and permanency of moisture, both very difficult to obtain in houses built above ground, especially when they are supplied with shelves and open stages. Where a naturally shaded spot cannot conveniently be found for the Fernery, shading at certain times of the day from March to October will be necessary; but it should only be afforded with a view to preventing the scorching of the fronds, by breaking the rays of the sun, and not to keeping out all natural light. In this case it is preferable to shade by means of movable blinds. The texture of the material (scrim is best) will vary with the amount of shading called for. The blinds should be let down for a few hours when the sun is strong, but should be drawn up again as soon as there is no danger of burning. Shading by means of blinds may be successfully obviated by using green-tinted glass, as at Kew Gardens, where it gives perfect satisfaction. In the neighbourhood of large towns, more especially, it is decidedly necessary, periodically, to wash the glass both inside and outside during the dull seasons.

Houses in which Ferns are intended to be grown in pots should be low structures, sunk at least 1½ft. or 2ft. below the surface of the ground, and provided with solid beds bricked on their vertical outer surface. The walks should be made either of coarse gravel or of the natural earth, simply covered with a thickness of a couple of inches of coal cinders, these being the most porous and yet the best moisture-retaining materials that can be used in a house in which constant humidity is of the utmost importance. With Ferns grown in pots it is essential that they should stand on a solid, cool, moist bottom, the most suitable material consisting of a firm bed of ashes, or one of sand covered with a layer of coal cinders. A free and constant supply of fresh air, without a draught, must be maintained.

cool Fernery (devoted, say, to Japanese, New Zealand, Australian, and evergreen British kinds) in which the temperature during winter is only kept a little above freezing-point, ventilation from the roof is quite sufficient. Where, however, South American and East and West Indian species are



Fig. 33. A Northern Indian variety—*Aspidium triangulum ilicifolium*—in which the leaflets have pointed extremities, giving them the appearance of Holly-foliage, hence the specific name. A capital pot Fern.

grown, ventilators along the sides of the house should also be provided. These should be disposed a little below the level of the hot-water pipes, so that the air which, before escaping through the top ventilators, passes over and amongst the plants, should only do so after having been slightly warmed by its temporary contact with the hot-water pipes.

Ferns in pots (Fig. 33) require fresh potting more or less frequently, according to their size and also to their rate of growth, but over-potting is injurious. Such plants are most luxuriant when the inside surface of their pots is already covered with a network of their roots. Even a temporary absence of moisture will cause shrivelling of the fronds in Ferns, and once this has occurred it is seldom, indeed, that the plants ever regain their freshness, thus differing materially from flowering subjects.

Repotting may be safely performed at almost any time of the year, providing the after-treatment be correct; but it is best to commence in the warm-house about the beginning of February, and in the cool-house about the beginning of March, but in no case must it be undertaken before the plants have started into growth. Old pots should be clean and dry, otherwise the roots will adhere to their sides, and when next repotting is necessary numbers will be injured, to the great detriment of the plant. New pots, too, should first be thoroughly soaked, and then be well dried before using: if this be not done the fresh water will be absorbed by the pots on account of their porosity, and the roots of the plants will suffer.

Drainage is of the utmost importance; while the question of soil is almost as great a factor towards success. By far the greater number of Ferns grow naturally in partly-decayed vegetable matter, usually of a soft nature: they should therefore be made firm, but on no account potted hard. An excellent compost for most Ferns consists of two parts of sandy loam, one part of leaf mould, one part of fibrous peat, and one part of coarse sand.

Planted Out.

So far, our remarks have been confined to what may be termed a more or less artificial way of growing Ferns. We will now consider the natural Fernery, whether in a warm or in a cool structure (or, for that matter, outside). Here specimens (large or small growers), planted out without any regard to

regularity and symmetry, are allowed, so to speak, to run wild, thus showing to a greater degree of perfection their peculiar characters. Plants possessing broad and bold foliage are found, besides others of totally different characters, and a most pleasing and desirable contrast is formed (Fig. 34). Such combinations may be variously effected—by species of either totally different habits or those of distinct forms and colours. The variety of tints found in many species should be carefully studied in planting a natural Fernery, just as anything approaching formality in grouping or overcrowding should be strenuously avoided. Ferns planted in rockwork require far less attention than those grown in pots, and if provided with suitable soil at the outset they will flourish for years with the help of an occasional surfacing. Moreover, the amount of “material” furnished by an individual planted out as compared with one grown in a pot is so great as to need no special recommendation.

In the building of a natural Fernery the principal object is to secure, as far as practicable, an equal amount of light for all the occupants. The grottoes, arches, and masses of overhanging rock, that one often sees, are not to be recommended, as no Ferns can flourish under such conditions. Tufa, because of its very porous nature, is well adapted for the building of Ferneries. The Ferns should be planted on the sloping sides and on some little mounds made of turfy peat securely held together by means of wooden skewers, and covered with a layer of common moss, which at first requires pegging down, but which in such a position rapidly grows, and firmly binds the whole mass together. This is far preferable to, as well as more pleasing than “pockets,” which, after all, are only substitutes for pots. Planted in the way suggested, the advantages over the pocket system are: a smaller quantity of “material” is required, a greater amount of natural humidity, and a total absence of sourness in the soil through the air having free action all round the surface of the earth. Mounds are particularly



Fig. 34. A view in the Fernery at Nash Court, Faversham.

recommended for all species provided with running rhizomes, such as certain *Adiantums* and *Acrostichums*, but principally for the majority of *Davallias*, *Nephrolepis*, and *Polypodiums*, whose rhizomes soon take possession of the outer surface of the mound; this then becomes rapidly covered with foliage, all the more luxuriant in that the plants have more room allowed for the extension of their rhizomes.

All the year round the warm Fernery should be kept at a moderate and comfortable temperature; more artificial heat than the plants really require is highly injurious. It is of the utmost importance that no Ferns should be placed in close proximity to the hot-water pipes, which should be completely hidden by the rockwork. Air-shafts should be so managed that the heat generated by the pipes is diffused in the house by passing through and at the back of the rockwork. Tropical Ferns may be said to have a period of active growth extending from March to September. During that time all possible advantage should be taken of natural heat, which, even when somewhat strong, is not hurtful. The damage is generally due to the use of artificial heat, which should not be resorted to so long as the night temperature of the house does not fall below 60deg.; the solar heat may, without inconvenience to the plants, raise it to 75deg., or even 80deg., during the day. From September to March, a minimum night temperature of from 50deg. to 55deg. is all that is required, and until growth commences it need not be much higher during the day; after that time it should be gradually raised to the minimum point above-named.

Quite a large number of Ferns thrive as well in the cool as in the warm Fernery: their growth, however, is not so rapid, although with time they make quite as pretty specimens. The temperature of the cool Fernery need not at any time exceed 55deg. to 60deg., and it will be found best to keep it at a minimum of from 45deg. to 50deg. during the winter months.

Many cultivators object to the employment of

deciduous species and varieties; but there is absolutely no reason why the more ornamental deciduous Ferns that succeed well in the cool Fernery should not be planted among the evergreen ones, so that when the former are deprived of their fronds their places should not remain conspicuously bare. Although, when planted out, Ferns require comparatively little attention, yet the operation of watering requires to be performed with a good deal of discrimination. The use of a hose attached to a cold-water pipe (as is frequently seen in private establishments) for the purpose, must be condemned. Not only is such water generally far too cold, but by being poured among the roots of the plants in much greater volume than is needed, these get into a bad state of health, from which they take a long time to recover. A useful rule is not to use water at a lower temperature than that of the house in which it is to be employed. Moreover, frequently fronds, as well as roots, are dripping, which is highly injurious to the plants. Fern fronds taken generally are all the better for being kept dry. The fronds of Filmy Ferns are, however, an exception to this rule. The watering-can and the syringe alone should be employed, as with them the individual requirements of each plant may be studied, which is impossible with the hose.

As far as possible, watering should be performed on the morning of a bright day, so that the extra quantity of moisture incidental thereto may rapidly evaporate. Condensation on the foliage, if too frequently taking place, will invariably discolour, and eventually rot the fronds. To avoid frequent waterings (which must necessarily impoverish the soil), it is advisable, on bright mornings and all through the summer, slightly to damp the surface of the ground among the plants with the syringe. This helps to maintain the surface of the soil, where the majority of the young roots are found, in a uniform state of moisture.

It should be scarcely necessary to state that at no season of the year should Ferns be allowed to

become dry. The fact, however, remains that many novices treat Ferns as if they were plants that would be likely prematurely to start into growth were they kept moist. No greater mistake could be made. Granted that during the resting period the majority of Ferns require considerably less water than in the active season, yet with a few exceptions that will be noted as the families in which they occur are enumerated, the majority must be kept moist the year through. The aim of the Fern-grower, as stated elsewhere, should be to approximate as closely as possible to the conditions found in Nature. He certainly will not be doing so if he attempt to "dry them off."

Popular Ways of Growing Ferns.

Besides, the methods of cultivating Ferns already dealt with, they may be grown on cork bark, on hanging blocks, in suspended baskets, in window-cases, and, above all, in glass cases in the dwelling-room. Whether in window-cases, on a rustic stand with a propagating-glass to cover the plants, or in a Fern-case, they are always attractive when well grown. Filmy Ferns are especially amenable to such treatment, but other Ferns in variety are equally adapted for the purpose. As regards the latter, however, they require replanting oftener, for, being of more vigorous, or rather of quicker, growth, they more rapidly overgrow the case. In favour of Filmy Ferns, it may be said that while their transparent fronds remain uninjured through a prolonged contact with the glass, those of nearly all, if not of all, other kinds soon deteriorate when subjected for any length of time to the influences of the moisture more or less permanent in a Fern-case. Under all circumstances, therefore, the Filmies, though more expensive as regards first cost, are the better.

Fern-cases vary alike as to form and size (Figs. 35 and 36). At one time they were more popularly known as Wardian cases, after their inventor, Nathaniel B. Ward. The oblong-shaped Victoria is the most ornamental of them all.

In this ventilation is provided by means of a movable or sliding strip of glass at the upper part, where the two bent pieces of glass meet, and also through both the ends, which, being hung on hinges, can be opened to admit the exact amount of air required. In this structure all possible light is saved, as there are neither cross-bars nor uprights in the way, each side and each end, as well as each half of the curved top, being individually of only one piece of glass. The base part of the case is separated from the soil by a false bottom made of perforated zinc, the intervening space serving as a receptacle for the



Fig. 35. A favourite shaped Fern-case for Ferns made by Eade and Son.

water that is applied to the plants. At one end is a small tap or hole, through which, by a slight tilting of the case from the opposite end, all superfluous water is easily disposed of. On the perforated zinc bottom should be arranged a couple of inches of crocks, and these covered with a layer of sphagnum, or (better still) of very fibrous peat, to prevent the drainage from becoming choked. The bottom of the case is then filled to a depth of about 6in., with a mixture of soil suitable to the species and varieties to be planted. For Filmy Ferns two parts peat, one

part silver sand, and one of partly-decomposed sphagnum, will satisfy all species having either crowns or slender rhizomes which delight in running into loose and decayed vegetable matter. If, however, *Trichomanes radicans* is alone to be grown, then equal parts of peat and porous sandstone roughly broken into pieces of various sizes should be supplied. To the latter the hairy rhizomes cling, while the fleshy roots run freely amongst the pieces, from which they derive all the nourishment they require. Where a commoner class

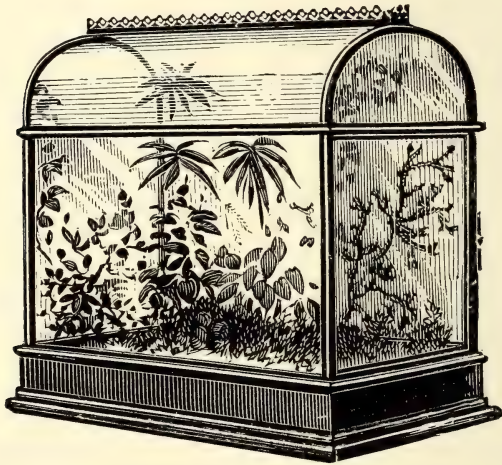


Fig. 36. Semicircular-topped Fern-case made by Eade and Son.

of Ferns is to be grown, two parts peat or leaf-mould, one part fibrous loam, and one part silver sand, will be found the most satisfactory compost. In these, as in Filmy Fern cases, a miniature rockery may be prepared. The material for this, whether consisting of tufa or natural stone, should be firmly embedded in the soil; they need only be stood up, and their base may with advantage be planted with small pieces of *Ficus repens minima*, which in time covers them, and may easily be kept within bounds by occasional pruning. Some small-growing Selaginellas may also be planted in close proximity

to the stones, whence they will extend and cover the surface of the ground. A less pretentious case is the octagonal structure; while plain glass shades may be procured of various heights and dimensions, so as to suit plants of different sizes and habits. In all cases, the mode of planting and after-treatment are the same. Whenever possible, the Fern-case should be placed as near the window as practicable, and should be shaded from the sun when necessary. Filmy Ferns are all the better if placed near a window with a north aspect, where, although receiving a good deal of light, which shows their transparency to great advantage, the sun never troubles them. When grown in a room, they require but very little ventilation; and, unless there happen to be an excess of condensed moisture, it is best to keep the case closed, for, if exposed for any length of time to the influence of the dry air of a dwelling-room, the delicate fronds soon shrivel up, and are eventually destroyed. Should there be, however, any accumulation of condensed moisture on the glass, it is well to give a little air: but the case should be closed again as soon as the glass is dry. When filled with other Ferns of mixed characters, the case requires a greater amount of ventilation; and, when thoroughly established in it, the plants derive much benefit from a change of air, which should be frequently given with a view to preventing the glass from becoming dim and slimy through the condensation of moisture upon it. Watering requires a certain amount of tact, and no hard-and-fast rule can possibly be laid down; but a great deal of irreparable mischief frequently results from a too liberal use of the watering-pot. After being planted in the case, the Ferns should be watered gently until the soil is uniformly damp, and the case being then closed, no more water will be required until the surface of the soil gets dry, when a gentle watering over the ground only, as before, should be given to the extent required. In any case, it is most advisable to keep the foliage of the plants dry.

One of the most popular ways of growing Ferns is in suspended wire or other baskets (Fig. 37) lined with



Fig. 37. A favourite Polypody (*Polypodium sub-auriculatum*) for growing as a basket subject.

fresh, living moss; this, being firmly pressed against the sides, is sufficient to retain the soil, in which the

Ferns should be planted a little below the surface of the wire, so as to allow sufficient room for the water to permeate the whole ball. If baskets are planted too high, the difficulties in keeping the Ferns in good order are greatly increased, and nothing short of frequently-repeated soakings will answer; whereas, if filled only below the level of the rim, ordinary waterings, with occasional dip-pings, will be found quite sufficient to keep the plants in good condition. Baskets manufactured of cork bark may also be made very ornamental and rustic, and should be treated in the way stated above, with this difference—that they do not require any lining. The effect of suspended baskets is greatly enhanced by the introduction of a few foliage plants of creeping habit, such as *Ficus repens*, *Saxifraga sarmetosa*, green and variegated forms of *Tradescantia*, &c. These, if planted near the edge, soon take possession of the outer surface, covering it more efficiently than the Ferns themselves could do, while the same treatment is applicable to them.

Another very effective way of growing Ferns is one adopted with marked success by Messrs. W. and J. Birkenhead, Sale, near Manchester. According to their "Hints on the Cultivation of Ferns," it consists in fastening to a piece of cork bark a laver of living moss larger than the cork itself, and roots upwards; on this the Fern is placed, and its own roots are surrounded with suitable compost, in quantity according to size of plant and cork. Over this compost and the roots of the Fern the edges of the moss are drawn so as to cover up all the soil; then the moss and Fern are fastened on to the cork by means of thin copper wire, worked across in different directions, and twisted round copper tacks at the edges of the cork. The whole is then suspended by one hooked wire if to hang against a wall, or by three or four wires and a hook if to hang like a basket from the roof of a greenhouse or of a conservatory. The moss should be kept constantly moist, and the body of moss and soil soaked

occasionally in water, to ensure thorough saturation. With this treatment the moss may be made to grow as well as the Fern, forming altogether a most charming object. Such Ferns as Davallias especially



Fig. 38. An effective method of utilising the stem of a dead Tree Fern for the accommodation of living plants.

delight in having their rhizomes among the damp moss, their roots going through the moss into the compost. Virgin cork may, indeed, be used in many ways, and always with the greatest effect.

Stems of dead Tree Ferns may be utilised with

advantage for Ferns. By scooping out the upper part, and filling it with soil, a good-sized plant may be inserted in the top, while the sides may be planted with seedlings, which, as is shown in our illustration (Fig. 38), eventually take possession of the whole surface. For this purpose the several species of *Davallia*, the trailing *Acrostichums*, *Nephrolepis*, and some of the *Polypodiums* are all suitable. Such Tree-Fern stems require to be watered, like Tree Ferns, from the top; and, to keep the artificial growth upon them in good order, the waterings must be both copious and frequent during the growing season, gradually lessening them as the winter approaches.

Especially useful for Fern-growing are the ornamental pans manufactured by Mr. Conway G. Warne, Royal Potteries, Weston-super-Mare. The Fern-leaf patterns in no less than a dozen sizes are most effective; so also are the Italian Fern-baskets. With these and a few bell-glasses, some exceedingly pretty Ferns may be grown by those who have not the space to indulge in the more pretentious methods.

Ferns may also be grown on the porous bottles sold for the purpose; while of late years the practice of twisting the rhizomes of certain species of *Davallia*, usually *D. bullata* and *D. Mariesii*, has become very popular. Sometimes they take the form of balls, and at others that of various animals—monkeys, and the like. The dried roots are readily started in spring by immersing them in a vessel of rain water for two or three hours, allowing them to drain, and then hanging them up in a shady window. They make capital subjects for porches, &c., and are easily kept in good health by watering them once or twice a week, and very occasionally substituting for the plain rain water, some very weak manure water. At the beginning of winter the Fern-balls should be allowed to rest, by keeping them in a cool place until spring, when they may be started as already advised. The second season start them in weak cow-manure water.

Then, too, many species of Ferns are sufficiently accommodating to be grown as room plants. The stout-fronded species and varieties are those best adapted for such heroic treatment; their greatest enemies are dust and draught, with overdoses of water. Dust should be sponged off carefully, otherwise no Fern can long remain healthy.

Rustic window-boxes may be usefully employed for Fern culture so long as ample means of drainage have been provided, and that they do not rest with their boxes upon the sills. An inch or two of space should intervene between the sill and the bottom of the window-box.

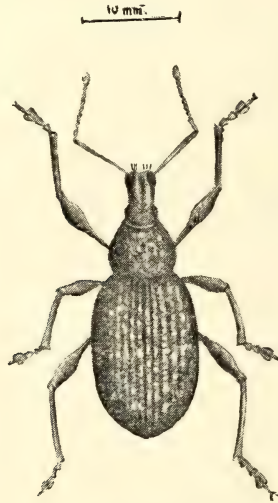


Fig. 39. The Black Vine Weevil (*Otiorrhynchus sulcatus*), a very destructive Fern pest alike as a beetle and as a grub.

Fern Enemies.

Ferns in their native habitats are seldom attacked by any animal pests; but under cultivation they are liable to be injured by many insect and other foes. Woodlice, Slugs, Snails, Cockroaches, Crickets, and other pests are particularly fond of the young growths, especially those of a succulent nature; Black Vine Weevils (*Otiorrhynchus sulcatus*) in both the grub and beetle states (Fig. 39); Surface

Caterpillars (*Agrotidæ*), Aphides (Greenfly and Black Fly), Snowy Fly, Thrips, Scale, Mealy Bug are, however, other marauders that must be guarded against. Thanks to the introduction of vaporising insecticides, most of these pests may be summarily dealt with. Still, care must be exercised, otherwise the young fronds will be injured. At the same time, these do not avail against Scale, Surface Caterpillars, Crickets, Cockroaches (Fig. 40), Beetles, Woodlice, Slugs, and Snails. Cockroaches, Crickets,



Fig. 40. An American species of Cockroach (*Periplaneta americana*) that is frequently found in our glass-houses, and is greatly on the increase.

and Woodlice may be trapped or poisoned with phosphorus paste or Vall's Beetlecute, Birkenhead's Beetle Trap will catch hundreds of Cockroaches. Surface Caterpillars must be searched for at night by the aid of a light.

The very destructive Black Vine Weevil must also be sought for at night. Being a wily insect, the cultivator must proceed with care. Having noted the Ferns on which the insects have bestowed their attention, mark them off and surround them with

sheets of white paper smeared with some sticky substance. At night go into the house, and suddenly turn on the light in the direction of the infested plants, at the same time giving them a shake. Immediately the Beetles will drop, and many of them will be caught by the adhesive, when they may be destroyed. For Slugs and Snails traps of bran and brewer's grains, laid in heaps, are best. They should be frequently examined at night, and the creatures picked off and destroyed. Then there is also Slugicide, a very effectual preparation. Mealy Bug and Scale are both difficult to deal with, as although there are several excellent insecticides that may be effectively employed in the case of hard-wooded plants, they must not be used upon Ferns. Hand-rubbing and sponging with warm water, in which just a little soft-soap has been dissolved, must be largely relied upon for ridding the plants of their enemies, but too much sponging may be harmful. As a preventive measure it will be found a good plan to remove any of the fronds that are showing signs of maturity and burning them. Ants are also undesirable, and may be got rid of by means of Vall's Beetlecute or Cross's "Ballikinrain" Ant Destroyer.

Fortunately for the Fern-cultivator his plants are not liable to be attacked by many species of fungi. Still, there are one or two that must be noted, more especially as Fern Rust is a very common disease. *Cystopteris fragilis* is the greatest sufferer from Rust; and many species succumb owing to the gardener not diagnosing the cause. Ferns attacked have a very sickly look, and if the under-surfaces of the fronds be examined there will be found numerous yellow often rounded pustules. Any plants that are diseased should be removed, and a spraying with a claret-red solution of Condy's Fluid be given the remainder. All diseased fronds should be burnt. Ferns in the prothallus stage often "damp off" mysteriously, and by many this is thought to be due to the fungus responsible for the destruction of many flowering plants in the seedling stage—*Pythium de Baryanum*, or a very near ally.

II.—A DICTIONARY OF CHOICE FERNS.

ACONIOPTERIS. *See Acrostichum.*

ACROPHORUS.

Moore's name for a genus at one time kept up, but not now considered botanically distinct from *Davallia*. In catalogues the name is usually found.

ACROSTICHUM.

As at present constituted, the genus *Acrostichum* is a very extensive one, and as diversified as it is extensive. The majority of the species are of tropical origin, and they are markedly different in habit; they comprise individuals that are of extremely small size, and others that may be fairly classed as gigantic; while the veining, and the way the fronds are "cut" or divided, constitute a very interesting feature. To the sori must be looked for the distinguishing characters of the genus: these are spread over the whole under-surface of the fertile fronds, or of their upper leaflets, or occasionally over both surfaces, and not confined to the veins only. The ways in which *Acrostichums* may be employed as decorative subjects are numerous. The strongest-growing species and varieties are useful for covering the stems of Tree Ferns, as well as unsightly walls,

columns, &c.; those with long fronds are well adapted for hanging-baskets; and those having entire or simple fronds for culture in pots.

All the members of this family require plenty of water at the roots, and therefore due regard must be paid to this when providing a compost. It must be of a very porous nature. Two parts fibrous peat, one part chopped sphagnum, and one part coarse silver sand will be found the most suitable mixture. Though these Ferns generally, as suggested at the outset, require a stove temperature in which to grow, there are one or two that are sufficiently accommodating to flourish in an intermediate temperature. For instance, *A. scandens* will succeed in a house the winter temperature of which occasionally does not reach 50deg. Fahr. This, too, is one of the species that requires an even more than ordinary open compost, and therefore the cultivator will do well to provide for it equal parts of fibrous loam, fibrous peat, partially rotten leaf soil, and silver sand. Throughout the year there must be plenty of water at the roots.

As in all large families of Ferns, there are a few individuals that may be classed as somewhat fastidious, and these will have to be considered. *A. aureum*, rightly regarded as the finest species, is a semi-aquatic. Its potting mixture should consist of equal parts fibrous peat and loam, it should be allocated a position in the warm house, and the lower part of the pot should be kept in water. The Elephant's Ear Fern (*A. crinitum*, Fig. 41) requires to be treated carefully in the matter of water, otherwise the fleshy fronds get disfigured with oily-looking spots. For this Fern, two parts peat and one part chopped and partly-decayed sphagnum is the best compost that can be recommended. Despite every care, should the unsightly spots referred to appear, the best way of dealing with the plants is to remove the soil from the roots by washing them, and then repotting in a smaller size should be undertaken. Very little water should be given after this; indeed, this species, even when healthy, unless growing

in a very high temperature, should only be watered when it shows signs of flagging.

Another species that requires special treatment is *A. peltatum*. This should be allocated a naturally moist position, should be provided with plenty of



Fig. 41. The Elephant Ear's Fern, *Acrostichum crinitum*, is one of the most curious species in the large family.

water the year through, and should have its roots disturbed as little as possible. In a place where a permanently moist atmosphere obtains it grows freely enough in a mixture of about equal parts fairly rotten leaf soil, fibrous peat, and silver sand.

Impatient of disturbance is the distinct *A. scolopendrifolium*: indeed, so long as watering is carefully performed it succeeds best when pot-bound. It must also be remembered that this family is one in which certain species are met with having running rhizomes. Such are best provided with mounds, which the rhizomes soon cover. Generally speaking, these prostrate stems require to be kept on the surface. At first a few wooden pegs are necessary to fasten them thereto; but the necessity for this disappears directly the plants make headway. Where fronds have been sparingly produced on the rhizomes a system of "pinching" is frequently adopted. This consists in nipping out the extremity of the rhizome during active growth, but never while the plants are at rest.

Propagation may be effected by spores; by division of the crowns in the case of those species showing such a characteristic; or by cutting up those species having creeping rhizomes while the plants are at rest, and pegging each piece bearing a couple of fronds and a few roots upon a mixture made of equal parts of chopped sphagnum, rough fibrous peat, and coarse sand. In a genial warmth such as that of an ordinary propagating-case the young plants will soon develop. When propagating Ferns by division, it is necessary first to wait until at least two centres of growth have been developed. All that remains to be done is to pull the crowns apart just before growth commences—middle of March to the middle of April. By this means a long season of growth is available for the young plants.

Botanists now include under this family the following: *Aconiopteris*, *Chrysodium*, *Egenolfia*, *Elaphoglossum*, *Gymnopteris*, *Hymenolepis*, *Olfersia*, *Photinopteris*, *Polybotrya*, *Rhipidopteris*, *Soromanes*, and *Stenochlæna*.

A. acuminatum.

On account of the gracefully drooping character of its light green, firm-textured fronds, produced from a thick, climbing rhizome, this Brazilian stove species is considered one of the most decorative in the genus. The barren fronds,

ACROSTICHUM—*continued.*

borne on firm, erect stalks, 4in. to 6in. long, and scaly throughout, are from 1ft. to 2ft. long and fully 1ft. broad, deltoid in form, and simply pinnate, with their upper leaflets slightly lobed, truncate on the lower side at the base, 6in. to 8in. long, and 4in. to 6in. broad, usually furnished with small leaflets on each side. The fertile fronds are 1ft. long, deltoid, and thrice pinnate. Fig. 42.



Fig. 42. *Acrostichum acuminatum*, one of the most graceful and decorative species in the genus.

A. apiifolium.

A pretty, very dwarf, stove species, from the Philippines, with an *Anemia*-like habit that renders it distinctive. The barren fronds, 4in. to 6in. each way, are borne on stems about 2in. long, erect, and densely clothed with short, woolly hairs; they are tripinnate, with leaflets close, the lowest pair only having leaflets divided not quite to the midrib, while the ultimate divisions are oblong-rhomboidal, their outer edge being slightly toothed. The fertile fronds are borne on a slender and entirely naked stem, 6in. to 8in. long; they have distinct, branching peduncles, with a few distant, slender, either simple or compound branches. Both are produced on a stout, woody, upright stem. The specific name is in reference to the Parsley-like fronds.

ACROSTICHUM—*continued.***A. appendiculatum.**

From a firm, woody, prostrate stem this highly decorative stove species produces barren fronds, 1½ ft. to 2 ft. long and 6 in. to 8 in. broad, simply pinnate, with a stalk having on each side membranous expansions, and proliferous at their apex; they are borne on erect stems, 4 in. to 6 in. long, naked or slightly scaly. The leaflets, 3 in. to 4 in. long and nearly 1 in. broad, are very variable, some being nearly entire, while others are cut half-way down to



Fig. 43. *Acrostichum Aubertii*, a distinct and well characterised species for the stove.

the midrib of the blunt lobes, the upper side being frequently eared, the lower one terminating abruptly, and dark green. The fertile fronds, besides being narrower, are on a longer spike, with roundish or oblong, often distinctly-stalked leaflets. A free-growing species, found in various parts of India.

A. Aubertii.

This very distinct and well-marked stove species is a native of Bourbon, Natal, Guatemala, Venezuela, &c. The barren fronds, 1 ft. or more in length, are borne on stems 4 in. to 6 in. long, clothed with rough, linear, brown scales. The fertile ones, only 2 in. to 3 in. long, are suddenly

ACROSTICHUM—*continued.*

narrowed at the base, and borne on stems 6in. to 9in. long. They are produced on a woody, short-creeping, prostrate stem, densely covered with scales similar to those clothing the stems. Fig. 43.



Fig. 44. *Acrostichum aureum*, an evergreen species that needs to be treated as a semi-aquatic.

A. aureum.

A noble, strong-growing warm-house Fern, found naturally in swampy places all over the tropics of both hemispheres. The ample evergreen fronds are borne on strong, erect stems, 1ft. to 2ft. high, and their leafy portion frequently measures 4ft. to 5ft. in length; they are of a leathery texture, and of a particularly brilliant and pleasing green colour, pinnate, with barren and usually stalked leaflets, 3in. to 9in. long, and sometimes 3in. broad. In

ACROSTICHUM—*continued.*

this species, considered the best of all those so far introduced, the fructification is limited to the upper leaflets, which are only a little smaller than the barren ones, and bear their spore-cases on the under-sides. Fig. 44.

A. auritum.

One of the few *Acrostichums* producing young plants on the upper surface of their fronds. These spring from an upright, woody stem, are deltoid in shape, and papery as to texture. The barren ones, borne on stems 6in. to 9in. long, are from 8in. to 12in. each way; their central segment is deeply pinnatifid, with spear-shaped entire lobes, the lateral ones of which are unequal-sided, with elongated-lobed lower leaflets, which do not reach quite down to the stalk. The deltoid fertile fronds are borne on stems 1ft. to 1½ft. long, but their distant, linear leaflets are barely ½in. broad, the upper ones being simple, the lower ones pinnatifid. The proliferous character of the plant is shown by a pair of bulbils disposed at the base of the lower leaflets of the barren fronds. The species requires stove treatment, being a native of the Philippines, Malay, and Solomon Islands.

A. Blumeanum.

Blume named this greenhouse species *Leptochilus lomarioides*. It is a native of Assam, Java, Samoa, and the Philippines, where it grows on trees, its thick, wide-climbing, woody rhizomes readily taking possession. Its barren fronds, which measure from 2ft. to 3ft. in length and about 1ft. in breadth, are borne on scaly stalks, not more than 6in. long, and are furnished on each side with numerous membranous or soft-textured leaflets; these are stalkless, and from 4in. to 6in. long, with their extremity tapering to a point; they have their edge slightly toothed, and their base rounded. The fertile fronds are equally pinnate; but the leaflets, 4in. to 8in. long, are less closely set, and never more than ¼in. broad.

A. canaliculatum.

A gigantic Venezuelan species, that succeeds equally well under either stove or greenhouse treatment. On account of its climbing habit, it is well adapted for running up a Tree Fern stem, or for covering the stump of a dead tree. Its barren fronds, which are produced from a wide-climbing woody rhizome, covered with spines or short scales, are of a dark, glossy green, and a somewhat leathery texture; they frequently attain from 3ft. to 4ft. in length, and 1½ft. in breadth, are tripinnate, and borne on stalks 1ft. or more

ACROSTICHUM—*continued.*

in length. The lower barren leaflets usually measure from 6in. to 9in. in length and quite 4in. in breadth, and are furnished with numerous spear-shaped leaflets, borne on short stalks, and whose segments are naked on both surfaces. The segments of the fertile leaflets, barely $\frac{1}{4}$ in. long, spread at right angles, and bear three or four stalkless clusters of spore-cases.

A. cervinum.

In this truly handsome stove species, whose habitat extends from Cuba and Mexico to South Brazil and Peru, the barren and fertile fronds are entirely dissimilar. The former, simply pinnate, proceed from a creeping, woody rhizome, that is thickly covered with shining light brown scales. The fronds are borne on stalks 1ft. or more long, densely clothed with scales similar to those covering the rhizome; they are of a weeping habit, and measure from 3ft. to 4ft. long, while their practically entire, leathery-textured, pale shining green leaflets are from 6in. to 9in. long and frequently 2in. broad, and unequal at the base. The fertile fronds are bipinnate, with linear leaflets, distant, and furnished with short, spreading leaflets, entirely covered with spore-cases. Fig. 11, p. 16.

A. Cænopteris.

Although more luxuriant under stove treatment, this strong-growing Mexican species may be successfully cultivated in the greenhouse, but is better adapted for growing on partly-decayed branches of trees than for pots. Its woody rhizomes, densely clothed with rusty-coloured scales, soon take possession of either wood or Tree Fern stem with which they are brought into contact. These trailing stems, as thick as a finger, produce two distinct sorts of fronds, barren and fertile, both of which are borne on straw-coloured stalks, 6in. to 12in. long, scaly below. The barren ones, 2ft. to 3ft. long and about 1ft. broad, are simply pinnate; the leaflets are of an almost leathery texture, shining green, and frequently measure from 4in. to 8in. long and $1\frac{1}{2}$ in. broad; they are entire and toothed, especially towards the point. The fertile fronds are smaller, narrower, and bipinnate. This species, of easy cultivation, is identical with *Soromanes serratifolium*. Fig. 45.

A. conforme.

A handsome, evergreen, stove species, of dwarf habit, with very thick, shining fronds, produced from a creeping and scaly rhizome. Contrary to the general rule, the barren

ACROSTICHUM—*continued.*

ones are narrower than those bearing fructification; they are erect, from 6in. to 9in. long, and borne on short, slightly scaly stalks. To this species—found in Mexico and Brazil, in the Sandwich and Fiji Islands, on the Himalayas and the Neilgherries—many other species are closely related—*A. laurifolium*, *A. marginatum*, and *A. obtusifolium* being the chief.



Fig. 45. *Acrostichum Cœnopteris*, a useful species for clothing a dead Tree Fern stem, and one of the easiest of the genus to cultivate.

A. crinitum.

Of all stove Ferns in cultivation, this West Indian species is undoubtedly the most curious, as also, when well grown, one of the handsomest of the genus to which it

ACROSTICHUM—*continued.*

belongs. The name of Elephant's Ear Fern, under which it is commonly known, conveys an idea of the extraordinary shape of its fronds. Fig. 41. The barren ones are of a leathery, yet succulent, texture, and dull green; when fully developed, they frequently measure from $1\frac{1}{4}$ ft. to $1\frac{1}{2}$ ft.



Fig. 46. *Acrostichum drynarioides*, a species remarkable for its lengthy fronds being quite stalkless.

long and from 8in. to 10in. broad. The fertile ones, of similar shape and texture, are smaller and contracted, their edges are turned inwards, and the whole of their underside, with the exception of a narrow margin, is densely covered with brownish-black spore-cases, from which the spores escape at an early date. The barren and fertile

ACROSTICHUM—*continued.*

fronds are both borne on firm, erect stalks, 6in. to 8in. long, which are densely clothed with long and very narrow, black silky scales. This interesting Fern is a general favourite. The long black hairs which cover both surfaces but more abundantly the margins of the barren fronds, are the characteristic that is responsible for the specific name.

A. decoratum.

In this handsome stove species, native of the West Indies, Guiana, and Peru, which is totally distinct from all others in cultivation, the barren fronds, 1ft. or more long by 3in. to 4in. broad, are of a leathery texture and of a bright green colour; they are sharp-pointed at their extremity, rounded at their base, and their edges are densely-fringed with rough scales nearly $\frac{1}{4}$ in. long and of a bright brown colour. The fertile fronds are nearly as large as the others; both are produced from a very stout stem, furnished with scales of the same bright colour, but fully $\frac{3}{4}$ in. in length.

A. drynarioides.

This stove species, from Penang and the Solomon Islands, is very peculiar on account of its fronds, several feet long and 1ft. or more broad, being stalkless; it also differs from most other known kinds in the upper part of the fronds being furnished with Lomaria-like leaflets quite 1ft. long; these, although attached throughout their length to the stalk, break away from it readily. Fig. 46.

A. flagelliferum.

In this free-growing, East Indian stove species, the barren fronds are of a somewhat succulent texture, and the terminal leaflets, at least 1ft. long, become narrower towards the extremity of the frond, where it becomes proliferous. Such fronds average about 2ft. in length, and are borne on stems 6in. to 12in. long, are usually furnished with three pairs of leaflets, 3in. to 6in. long and 1in. to 2in. broad, borne on short wavy stalks, and of a dull green colour. The fertile fronds are from 1ft. to 1 $\frac{1}{2}$ ft. long, and their leaflets, 2in. to 3in. long, are seldom more than $\frac{1}{2}$ in. in breadth. Both are produced from a creeping, scaly, woody, prostrate stem. The specific name, meaning rod-bearing, is in allusion to the manner of growth of the barren fronds. Fig. 47.

A. Herminieri.

This stove species, whose habitat extends from Cuba to Brazil, is very handsome, and easily distinguished from all others through the striking appearance resulting from its

Fig. 47. *Acrostichum flagelliferum*, a distinctive Fern, having long rod-shaped barren fronds, proliferous at the extremities.



ACROSTICHUM—*continued.*

two very dissimilar kinds of fronds. Its barren ones are sword-shaped, and measure from 2ft. to 3ft. in length and about $1\frac{1}{2}$ in. in breadth, are of a leathery texture, and terminate in a long, taper point, while their lower part is very gradually narrowed; both their surfaces are naked, but the upper one has quite a peculiar metallic gloss. The fertile fronds are small, seldom measuring more than 4in. long, and short-stalked. The rhizome on which the fronds are



Fig. 48. *Acrostichum muscosum*, a tropical American species with leathery-textured fronds.

produced is stout, short-creeping, and of a woody nature, densely covered with linear reddish-brown scales, and quite 1in. in length.

A. magnum.

This very handsome stove species, native of British Guiana, is a very decorative Fern, although its fronds are undivided. The barren ones, from 2ft. to 3ft. long and from $1\frac{1}{2}$ in. to 2in. wide, are spear-shaped, being gradually narrowed to both ends; they are of a leathery texture and light as to colour, their upper surface being covered with

ACROSTICHUM—*continued.*

minute, whitish, chaffy scales, while on the under-surface these are of a rusty colour, and very dense. These fronds are borne on tufted stalks 3in. to 4in. long, which proceed from a nearly upright stem; this is also densely clothed with small, nearly black, chaffy scales.

A. muscosum.

In this very distinct, stove species, which is a native of tropical America, from Mexico and the West Indies to Peru and Brazil, the barren fronds, 8in. to 12in. long, and about 1½in. broad, are narrowed at both ends; they are leathery as to texture, and their upper surface is naked, while their lower surface is quite hidden by imbricated or overlapping scales, shortly fringed with hairs, of a rusty colour, and frequently dark chestnut-brown in the middle; they are borne on firm stalks, 4in. to 6in. long, clothed with large, egg-shaped, pale brown scales, and are produced from a woody, short rhizome, equally covered with bright chestnut-brown scales. The fertile fronds are much smaller than the barren ones, but their stalks are longer. Fig. 48.

A. nicotianæfolium.

Cuba is the home of this stove species, which is of very easy culture and highly decorative. Its barren fronds, which are from 1ft. to 3ft. in length, frequently measure 1ft. in breadth, and are usually composed of a large, terminal leaflet and two or three pairs of lateral leaflets, 6in. to 12in. long and sometimes 3in. broad, of a paper-like texture, shining, and with both surfaces naked; these barren fronds are borne on stalks 1½ft. to 2ft. long, scaly below, and are produced from a woody, wide-creeping or long-trailing, scaly rhizome. The fertile leaflets are set far apart, 3in. to 4in. long and about 1in. broad, the lower ones being borne on stalks, and the upper ones closely attached to the stalk.

A. osmundaceum.

This evergreen, stove species, native of Ecuador and South Brazil, may justly be considered as the handsomest of all the *Acrostichums* of scandent habit, climbing as it does, in St. Catharine Island, more than 20ft. up the trunks of trees, of which it eventually takes entire possession. The barren and the fertile fronds are markedly different, though both are produced in abundance from a dark, scaly, stout, creeping, woody rhizome. The barren ones are ample, tripinnate, and their lower leaflets, 1½ft. to 2ft. long and 6in. to 8in. broad, are of a leathery texture, with both sides naked. The barren leaflets are stalked, spear-

ACROSTICHUM—*continued.*

shaped, and cut down nearly or quite to the stalk below into close, nearly entire lobes; they are quite smooth, of a dark green colour, and have much the appearance of *Aspidium aculeatum*. The fertile fronds, also tripinnate, are of dimensions nearly equal to those of the barren ones, and erect in habit; but the leaflets are contracted, and their segments are linear, cylindrical, $\frac{1}{4}$ in. to $\frac{1}{2}$ in. long, with a space between them, and wholly covered with sori. Fig. 49.



Fig. 49. *Acrostichum osmundaceum*, an evergreen species, considered the handsomest of all the scandent members of the genus.

A. paleaceum.

This is identical with *A. squamosum*.

A. peltatum.

This exceedingly pretty, dwarf-growing, stove species, whose habitat extends from Mexico and the West Indies to Peru and Brazil, where it is found growing luxuriantly in decayed vegetable matter and on trunks of trees, is one of the most distinct, as also one of the most attractive, of the genus. As the specific name implies, its little barren

ACROSTICHUM—*continued.*

leathery fronds, from 1½ in. to 2 in. each way, are attached by their centre, or nearly so, to slender stalks 2 in. to 4 in. long and scaly throughout. These barren fronds, which are produced in great abundance, are essentially different from those of any other member of the genus; not only is each portion of them forked, but each forked part is subdivided into two branches, and each of these again into two others, thus producing an agglomeration of divisions linear in form, or of about equal width throughout their length, and seldom more than half a line broad. The fertile fronds, which are totally distinct, nearly circular, generally entire, and barely lin. broad, though occasionally two-lobed, are borne much more sparingly on the same slender rhizome



Fig. 50. *Acrostichum peltatum*, one of the smaller growing species of the genus, but very attractive.

that produces the barren ones. Fig. 50. There is a variety of this (*gracillimum*) that is larger and more finely divided, as well as easier to grow.

A. scandens.

As a decorative fern, this stove species, from South China, Ceylon, Fiji, and the Himalayas, is valuable. Its elegant, drooping fronds are from 2 ft. to 3 ft. long, besides the firm, naked stalks, 4 in. to 6 in. long, on which they are borne; they are 1 ft. or more broad, and simply pinnate. The leaflets, which are of a very leathery texture, although sometimes slightly stalked and articulated, are usually stalkless; they generally measure from 6 in. to 8 in. long and from lin. to 1½ in. broad, and have their edge thickened and serrated. The fertile leaflets, which are very seldom seen

ACROSTICHUM—*continued.*

on plants under artificial cultivation, though from 8in. to 12in. long, are so contracted that they are seldom more than two lines broad. This is more generally known as *Stenochlæna scandens*.

A. scolopendrifolium.

A stove, Brazilian species, and one of the most decorative of all those having simple fronds, for its singular barren fronds, often more than 1ft. in length and from 2in. to 3in. in breadth, are produced in great abundance from a very short-creeping or short-trailing rhizome, which is densely covered with long and very narrow chestnut-brown scales. These fronds, of a leathery texture, are pale green, and their stalks, from 8in. to 12in. long, their midrib, and their margin are densely covered with long, heart-shaped brown scales. Unlike the barren fronds, which are pendulous, the fertile ones, much smaller and more sparingly produced, are erect and jointed near the base of the stalks. The general aspect of the plant is that of a gigantic downy *Scolopendrium*—hence the specific name.

A. squamosum.

Although not attaining very large dimensions, this singular species, which thrives equally well under either stove or greenhouse treatment, and which is also known under the name of *A. paleaceum*, deserves a special notice. It is a native of Sumatra, Ceylon, and the Sandwich Islands, also of Madeira and the Azores; while, according to Beddome, it is abundant on trees on the Neilgherries, about Nediwattan, and on the Sisparah Ghat. The barren fronds, of a thick but not leathery texture, are from 8in. to 12in. long, and about 1in. broad, undivided, gradually narrowed at the base, and densely covered on both sides with reddish, velvety scales, extending to the edge, which appears fringed with hairs all round. These curious fronds are borne on dark, scaly stalks, proceeding from a prostrate, woody, and equally scaly stem—a characteristic that gives rise to the specific name.

A. virens.

A particularly robust and decorative stove species, native of Fernando Po, Sierra Leone, and also found from the Himalayas to Ceylon, Formosa, and Moulmein. Its barren, leathery fronds, which have both surfaces naked, are from 2ft. to 3ft. long, often 1ft. broad, and furnished on each side with stalkless leaflets, 6in. to 8in. long and about 1in. broad, the edge of which is usually bluntly lobed, though it sometimes has a tendency to become wavy;

ACROSTICHUM—*continued.*

the terminal leaflet, twice as long as the lateral ones and frequently longer, is generally rooting at the point. These large fronds are borne on firm, upright, scaleless stalks, and proceed from a short-creeping, hard, woody rhizome. This handsome species appears to be connected with several equally decorative forms which are not possessed of characters sufficiently distinctive in themselves to be separated from it—*A. contaminans*, *A. costatum*, and *A. crispatum*, Wallich; and *A. proliferum*, Hooker.

A. viscosum.

This stove species, of easy cultivation and very distinct and ornamental, has a particularly wide range of habitat, for it is found from Cuba to Brazil and Peru, also on the Himalayas. It is very variable in size, as also in nature, according to the influence of the habitat in which it is found, and also to the age of the fronds: these are often quite naked, and then there is great difficulty in identifying the plant, whose foliage is usually scaly, and often of a viscous nature—whence the specific name. There are some very large-growing forms, from which it is a matter of difficulty clearly to distinguish the type—*A. curvans*, *A. dissimile*, *A. Karstenianum*, and *A. xanthoneuron* of Kunze. In the commonest form under cultivation, *A. viscosum* is of medium size. Its barren fronds are entire and spear-shaped, pointed at their summit, but gradually narrowed towards their lower part, from 8in. to 12in. long only, and about 1in. broad in their widest portion: these are of a leathery texture, and both their surfaces are more or less covered with very small sticky scales. The stalks on which the barren fronds are borne are from 3in. to 4in. long, firm, upright, and equally scaly; while the rhizome, from which they proceed, besides being densely covered with long and very fine chestnut-brown scales, shows very little inclination to creep as in most other species. The fertile fronds, though smaller, are borne on longer stems than the barren ones.

ACTINIOPTERIS.

A small but select genus composed of one beautiful and distinct species of Indian origin, and an Australian variety of it. Both plants are recognisable by their habit resembling that of a miniature Fan Palm—hence the popular name of Fan Palm Fern. These pretty little plants are erroneously considered as very difficult to manage; consequently they are not grown as extensively as they really

deserve. Failure in their culture must, in many cases, be attributed to the excessive heat to which they are subjected, which causes them to get "thrippy" and lose their vitality; but when kept in a temperature of 60deg. in the winter, raising to 70deg. in the summer, with constant moisture around them, they remain perfectly clean and healthy; they then seldom give any trouble to the cultivator. They thrive best in fibrous peat, fibrous loam, broken in small pieces, coarse silver sand, and small



Fig. 51. Actiniopteris radiata australis, the Australian variety of the very distinctive Fan Palm Fern.

crocks, in about equal proportions. It is also absolutely necessary that the pots should be half-filled with crocks, so as to insure perfect drainage, for they require frequent and abundant waterings to keep their roots in a permanently moist state. Being devoid of rhizomes or stems of any kind Actiniopteris are usually propagated from spores, which germinate very freely when sown on a compost of brickdust mixed with a little loam, and kept in a warm, close case. They may also be increased by the division of the crowns; but this operation, which should be done not later than the beginning of March, is somewhat risky. The variety *australis*

thrives in a lower temperature than that suggested above for the type.

A. radiata.

This charming little Fern is found throughout India. It is of tufted habit, producing from a close, compact crown a quantity of fronds borne on slender and naked stalks 2in. to 6in. long. The leafy portion of the frond itself is fan-shaped, and seldom exceeds 1½in. each way; it consists of numerous sub-divisions of a rush-like texture. They are divided about half the distance down, of a bright green colour, and very glossy. The segments of the fertile fronds are longer than those of the barren ones, and these fronds are also borne on longer stalks.

A. r. australis.

In all respects this is a stronger and more vigorous grower than the type. The habit of the plant, though quite as compact, is not so stiff, the fronds frequently attaining a height of 8in. The segments are less numerous, much more deeply divided, larger, and in the fertile fronds are awl-shaped at the points; they are also of a darker green colour and very glossy. Fig. 51.

ADIANTOPSIS. See *Cheilanthes*.

ADIANTUM.

Linnaeus himself stands sponsor for this genus, which is said to have its headquarters in tropical America, although a good many species are natives of more temperate climates. Most of the known species are recognisable from all other Ferns but the typical *Lindsayas* by the texture, as also by the one-sidedness of their sub-divisions, and by the absence of an apparent and distinct midrib in the segments. The stalks of most *Adiantums* are black, and have a glossy appearance. The fronds vary from simple to decompose; while the leaflets usually terminate abruptly, or are dimidiate, and bear their sori on the upper margin only; the veins generally are simple, radiating, and forked, coalescing in only four species (section *Hewardia*). As now made up the genus numbers upwards of eighty species.

It is in this extensive and varied genus that most of the Ferns best adapted for decoration are to be found. *Adiantums* are popularly known as

Maidenhair Ferns, on account of the black, shining stalks common to most of them. Apart, too, from their utility in bouquet-making, &c., there are many species grown for the varied tints that their fronds assume; while as basket-plants there are few more beautiful subjects than *A. caudatum* and *A. lunulatum*. There are dwarf forms of our native Maidenhair that may be utilised as edgings in the Fernery, as there are giant forms alluded to elsewhere, and deservedly popular species like *A. peruvianum* and *A. trapeziforme*. The latter and several other tall-growing species and varieties—*A. concinnum latum*, *A. Williamsii*, &c.—are usually supported with stakes disposed round the pot-rims, and ties.

With the exception of *A. pedatum*, none of the Adiantums are truly hardy. They are, as a rule, easy to manage. Plenty of light should be allowed to all, but the full rays of the sun should be carefully avoided. A mixture of fibrous peat, or of partly-decayed leaf mould, loam, and silver sand in about equal parts, will suit most of them. None of them like to be potted very hard, and watering or syringing overhead, unless it be in a very airy, light, and warm house, is injurious to most of them.

All Adiantums having running rhizomes may, with advantage, be divided from February to April. Species with tufted crowns may also be increased by division, but in their case, and especially when quantities of plants are required, it is safer and more advantageous to depend on spores, which germinate freely, and which usually produce stronger and more shapely plants than those resulting from divisions. Spores may be sown at all times of the year, although the most favourable season is from January to April, as in that case the seedlings have ample time to produce crowns sufficiently strong to withstand the effects of the following winter.

Before proceeding to an enumeration of species and varieties, we must refer to a few individuals that stand out prominently for certain purposes, or that require special treatment. For instance, it is generally acknowledged that the deciduous *A. lucidum* is

one of the finest basket Ferns in cultivation. Owing, however, to the fact that it is deciduous, it is frequently forgotten in winter by being allowed to get dry, and eventually to die. As a matter of fact, it needs to be kept fairly moist at the roots the year through. Thus treated, it starts away much stronger in spring than if it were regarded as a deciduous subject. Another extremely effective basket species is *A. Williamsii*; and the same may be said of *A. palmatum*, also a deciduous species that



Fig. 52. *Adiantum reniforme*, a small-growing but very handsome and distinct species having kidney-shaped leathery fronds.

must never be allowed to get dust-dry in winter, after it has lost its fronds.

Of species requiring a little extra attention, *A. reniforme* (Fig. 52) is one. Failures to grow it may usually be attributed to one of two causes—too warm a temperature or too loamy a soil. When it is accorded greenhouse treatment, and is potted in a compost of two parts peat, one part fibrous loam, and one part coarse silver sand or old lime rubbish, it flourishes. Another species having a partiality for lime rubbish is *A. cristatum*; while, unlike the family generally, it requires comparatively little

water, and to be allocated a dry position. One often hears complaints about the difficulties in connection with the culture of the lovely *A. tenerum Farleyense*. Heat and moisture are the essential requirements, and where either is deficient this plant will fail to flourish. For all that it may be safely wintered in a temperature of 60deg., occasionally falling to 55deg. Fastidious it is also supposed to be in regard to compost; but two parts fibry peat and one part fibry loam and silver sand constitute an ideal potting mixture.

Many unsuccessful attempts have been made to grow the North American Maidenhair (*A. pedatum*) outside in this country. They are due to the fact that the rhizomes are kept too close to the surface, and have no protective covering—snow, for instance—as in their native country. To see it in its beauty it must receive glass protection. Even our native *A. Capillus-Veneris* will not withstand a very cold temperature. Still it is one of the most accommodating Ferns known, flourishing alike in a heated frame, in a greenhouse, or in the moist shady part of a stove. When growing it as a pot-plant, provide ample drainage, and a compost of equal parts turfy peat, leaf mould, and lime rubbish, keeping the rhizomes *on the surface* of the soil.

Of species easy to manage *A. cuneatum* is very high on the list. Almost any rich light compost will suit it, and the temperature matters but little so long as its roots are kept well supplied with moisture. Properly treated, it will furnish an immense quantity of fronds; while so readily does it reproduce itself from spores that young plants may always be found in the vicinity. When dividing this species it is a good plan to discard the old centres; water carefully the newly potted-up pieces until growth is evident. Worthy also of mention on account of its ease of culture is *A. Henslovianum*: its chief requirement is a period of rest from November to February. A word of warning here may be uttered against the pernicious practice of weakening Maidenheads by robbing them of prac-

tically all their fronds. The fewer fronds removed the better for the general health of the plants. Probably no family suffers so much as *Adiantum* from this evil wrought by want of thought. Another point in connection with Maidenhairs generally is their unsuitability to withstand the heroic treatment meted out to them in gas-heated rooms by people who have not the proper means to recuperate them when they become exhausted. There is, we know, a great temptation to include some *Adiantums* in the list of room plants; and if it cannot be resisted then the most enduring species may be found in *A. cuneatum*, *A. c. gracillimum*, and *A. Williamsii*. Still, we do not recommend any of the family as particularly well adapted for keeping even in rooms that are not gas-heated. Usually such places are far too dusty and draughty, and the temperature is too fluctuating to maintain the plants long in health.

A. æmulum.

In this species the fronds are very light and elegant in structure, but very dark as to colour, and freely produced from a close, tufted crown; they are borne on very slender stalks 4in. to 5in. long, and the foliaged part at most does not exceed 10in. in length and is triangular in form, as are also the distinct lateral leaflets. These latter are also wedge-shaped. The sori, which number from two to four on each segment, are nearly round. A Brazilian species, suited for either stove or greenhouse, and one of the most useful of small-foliaged Ferns.

A. æthiopicum.

A species that thrives equally well in either the intermediate or the warm house. It has a very wide range, being found on the Cameroons, at an elevation of 7000ft., in Natal, Cape Colony, Bourbon, Madagascar; also on the Neilgherries, in New Zealand, in tropical as in temperate parts of Australia; in America, from Texas and California southward to Valparaiso and Monte Video, &c. Its fronds, 1ft. to 1½ft. long and 6in. to 9in. broad, triangular in shape, three or four times divided to the midrib, are of a soft, herbaceous texture, and are borne on stalks 6in. to 9in. long, produced from slender rhizomes. They are furnished with numerous leaflets, the lower ones 3in. to 4in. long and 2in. to 3in. broad; these are again divided into nearly round transparent leaflets, from ¼in. to ½in. across,

ADIANTUM—*continued*.

and the upper part of which is deeply lobed. The sori are disposed in several roundish patches.

Several popular kinds, usually given as species, are here regarded simply as forms. The most striking are:

A. æ. assimile.

This beautiful Maidenhair thrives best under cool treatment. It is a common Fern in Australia, and one that appears to vary considerably in different situations. The form generally met with in cultivation here is that found growing in low, damp situations. Its delicate fronds, which are slender, measure, with the stalks on which they are borne, 10in. to 12in. in length; they are smooth, three times divided to the rachis, and furnished with numerous oblong leaflets of a peculiarly vivid green colour, wedge-shaped at the base, and slightly toothed at the edge. These fronds are produced from a thin, wiry rhizome. For that reason the plant is well adapted for growing in suspended wire baskets. The fronds generally disappear about November, and the plant starts growing afresh about February. It is almost, if not quite, hardy in sheltered situations.

A. æ. chilense.

The fronds of this greenhouse, Chilian form are about 1ft. long, including the stalks on which they are borne. They are furnished with roundish, bluish-green, leathery leaflets, thus differing essentially from the type. The fronds, too, are produced from a very short, woody rhizome.

A. æ. emarginatum.

This very handsome, greenhouse Fern is known as the Californian Maidenhair. It resembles *A. Capillus-Veneris*. It differs from the species to which it is said to be related through the shape of its leaflets, which are sometimes roundish, but more frequently broader than long, so as to be semi-circular, or even slightly kidney-shaped.

A. æ. scabrum.

Popularly known as the Silver Maidenhair, this lovely little greenhouse Fern, native of Chili, is of very compact habit. Its very interesting fronds, which are produced in great quantities from a tufted crown, seldom attain more than 9in. in length, including the slender stalks on which they are borne. They are tripinnate, triangular, and furnished with kidney-shaped leaflets, dusted on both sides with a white meal-like substance. This little gem, which is now seldom met with in cultivation, is generally considered to be a difficult plant to grow; but it is only on account of

ADIANTUM—*continued*.

its being kept in too great heat and with too much moisture around it. It may be grown on a dry shelf with Cacti, and with a very little water during winter, in the cold house.

A. æ. sulphureum.

To Chili, Concepcion, and Peru belongs this beautiful dwarf, evergreen kind, popularly known as the Golden Maidenhair. As is the case with the Silver Maidenhair, the fronds of this golden one are produced in great abundance from a tufted crown, and neither of the plants shows any signs of the running rhizomes characteristic of the type. The fronds seldom attain more than 8in. in length, including their stalks, and are three times divided to the rachis; they are furnished with leaflets, roundish when barren, but slightly notched on their edges when fertile, of a deep green colour on their upper surface, and thickly covered on their under surface with bright golden powder. It will succeed under similar treatment to that suggested for the Silver Maidenhair.

A. affine.

Very decorative greenhouse species, commonly known as *A. Cunninghamii*, and quite distinct from *A. affine* of Hooker. It is a variable plant, both in the branching and in the size of the segments, and is not likely to be mistaken for any other, as it is known only in the Northern Island of New Zealand, where it is found in damp woods at a high elevation. Its bipinnate fronds measure from 10in. to 12in. long, and are borne on stalks 6in. to 9in. long, and furnished with long, red scales; they have one terminal leaflet, 4in. to 6in. long and 1in. to 1½in. broad, and several smaller lateral ones, the lowest of which are again branched. The leaflets, slightly leathery, of a dark, dull green above, and bluish-green underneath, are ½in. to ¾in. long and ¼in. deep. The fronds are produced in abundance from a creeping rhizome covered with rough dark brown scales. The sori are numerous and nearly round.

A. amabile.

A garden name for *A. Moorei*.

A. aneitense.

From the Aneitum Island comes this decorative species, that succeeds equally well under greenhouse or stove treatment. Its fronds, 1½ft. to 2ft. long, and three times pinnate, are deltoid in shape, and are furnished with numerous rhomboidal, nearly stalkless leaflets, about ½in. long, whose inner side is close to the midrib; the lower ones

ADIANTUM—*continued*.

are shallowly lobed. The fronds are borne on particularly rigid stalks, proceeding from a short-creeping scaly rhizome. The sori, from four to six to a pinnule, are roundish or kidney-shaped, and disposed in the centre of the lobes.



Fig. 53. *Adiantum Birkenheadii*, a fine Fern, of garden origin, having a tufted habit.

A. Bausei.

Moore suggests that this beautiful Fern, of garden origin, is a possible hybrid between *A. trapeziforme* and *A. Wagneri* (*A. decorum*). It thrives equally well in either the intermediate or the warm house. Although partaking of some of the characters of both species above named, it

ADIANTUM—*continued*.

is quite distinct from either of them, as indeed from any other *Adiantum*, through the contracted and deflexed character of its foliage.

A. Birkenheadii.

Undoubtedly one of the handsomest of the numerous Ferns of garden origin, and it thrives equally well in the intermediate or in the warm house. Its handsome fronds, produced from a tufted crown, about 2½ft. long, are borne on slender rough-natured stalks, similar in that respect to those of *A. diaphanum* (*A. setulosum* of commerce). Indeed, the plant resembles a much-enlarged edition of that lovely species, from which it is supposed to have originated, and the peculiar way in which it reproduces itself from the bulbils formed on its fibrous roots seems to point to its origin. It has, until now, proved quite barren. Fig. 53.

A. Capillus-Veneris.

To this species the popular appellation of Maidenhair, common to all *Adiantums*, owes its origin. The running rhizomes of this species, and of its varieties, are easily distinguishable from all others, not only by the dark brown scales, but by their habit of firmly attaching themselves to any material with which they are brought into contact. This peculiarity is, in the case of *A. Capillus-Veneris* and varieties, developed to such an extent that it may be safely stated that the presence of soil in their culture is only a matter of secondary importance; for, if young seedlings originate on a perfectly bare brick wall, or on rockwork, there is not the slightest difficulty in establishing them in such a situation, and, provided a constantly moist atmosphere and a temperature of 50deg. to 55deg. can be depended upon, they soon form a complete mass of foliage, springing from their matted rhizomes, which have no other food than the moisture they derive from the walls.

This lovely species may be said to be world-wide in its distribution, though, so far as this country is concerned, tourists and Fern hawkers have greatly reduced the number of places where the Maidenhair grew.

The fronds, 8in. to 18in. long, are generally of a lengthened triangular or ovate form, occasionally spear-shaped or oblong; they are of a more or less transparent texture, sometimes twice, but at other times thrice, divided to the midrib, and furnished with numerous segments or pinnules of a bright green colour, perfectly smooth, ½in. to 1in. broad, with the base wedge-shaped, the outer edge rounded, deeply lobed from the circumference in the direction of the centre, and the lobes again bluntly toothed, and borne on very slender,

ADIANTUM—*continued.*

thread-like, short stalks. The lower sides of the leaflets are entire, and usually slightly concave; the upper, or outer, margin is more or less incised or lobed; and the lobes in the American form are usually toothed, and sometimes very sharply so, especially in those from Utah and California. In the fertile fronds, the teeth either disappear or are seen only on the upper part of the sides of the lobes,



Fig. 54. Adiantum Capillus-Veneris daphnites, a distinct form having a semi-crested appearance.

while the ends or summits of these lobes are occupied by the crescent-shaped or oblong sori, which vary in length according to the width of the lobe. The fronds are borne on stalks of a rather slender nature, 4in. to 9in. long, polished, of a purplish-black colour, and furnished with a few scales near the base, whereas the rest of them is quite naked and smooth. The kidney-shaped sori are placed in the roundish depressions of the crenations. Whenever it grows luxuriantly, this Fern is more or less pendent in

ADIANTUM—*continued.*

habit; but plants of moderate size commonly have their fronds erect, or but very slightly recurved. Certain forms, which by some authors are considered as distinct species, though varying only in their increased size, owe their more robust character no doubt to the warmer atmosphere to which they are naturally subjected, and it is very doubtful whether they are really distinct.

This useful species has produced, either spontaneously or under cultivation, many varieties, some of which are remarkably handsome: all of them share the comparatively hardy character of the species. Some of the most interesting are:—

A. C.=V. cornubiense.

This is one of the prettiest of all forms in cultivation. It is of dwarf and compact habit, and its fronds, seldom more than 8in. long, including the stalks, are produced in abundance; they are more or less oblong in general outline, and are furnished with leaflets of a deep green colour, of firm texture, though nearly transparent and prettily undulated at the edges.

A. C.=V. daphnites.

This is a most distinct form, with fronds 8in. to 12in. high, and of erect habit. The leaflets as well as the extremity of the fronds, which terminate in a flattened crest some 2in. in breadth, are of a dull green colour, and curiously crisped and dilated, giving the plant a singular, semi-crested appearance. Fig. 54.

A. C.=V. fissum.

A very elegant form, of dwarf habit, having erect fronds, furnished with leaflets rather broader than those of the type, but deeply cut into segments of various sizes and forms, which give the plant an appearance distinct from all other known varieties. It is a most pleasing Fern for the conservatory, as not only is it neat in habit, but the pinnules are of a bright green colour, and they last a very long time on the plant.

A. C.=V. grande.

In this variety, which is much bushier than the type, although the foliage is quite as long, the fronds have a feathery appearance, produced by the much larger size of their leaflets, which are undulated and conspicuously serrated at their edges; they are of a very light green colour, and gracefully pendulous.

A. C.=V. imbricatum.

By far the handsomest of all varieties at present known. The appearance of the plant, as far as size, colour, and

ADIANTUM—*continued*.

disposition of leaflets are concerned, is exactly that of the popular *A. Farleyense*; but it is essentially a cool-house variety, and is of dwarfer habit. It is interesting to note that this plumose form of the common Maidenhair Fern, like most other plumose forms, is entirely barren.

A. C.=V. magnificum.

In this fine form the fronds often attain $1\frac{3}{4}$ ft. in length and upwards of 4in. in breadth, while their arching character gives the plant a most distinct appearance. They are furnished with leaflets much larger than those of the type, and of a softer, rich green colour. Their edges are prettily fringed, and overlap.

A. C.=V. Mairisii.

In order to develop its foliage perfectly, this variety requires stove temperature. It has all the appearance of a hybrid between *A. Capillus-Veneris* and *A. cuneatum*. It is of particularly robust constitution and somewhat erect habit, and possesses the property of reproducing itself true from spores.

A. C.=V. Moritzianum.

By some authors this handsome variety is given as native of South America, and by others as coming from Madeira. It appears to be the most gigantic form known. The fronds attain a length of 2ft. or even more, and are twice or thrice divided to the midrib. They are furnished with large leaflets, rather distant, of a bright green colour, fan-shaped at their summit, and wedge-shaped at the base, and they are of an elegant and pendulous habit.

A. caudatum.

An evergreen, stove species, very different from the majority of Maidenheads, and one that is exceedingly useful for growing in suspended baskets. It is found wild nearly everywhere through the tropics. The usual length of the fronds, which are simply pinnate, is from 1ft. to $1\frac{1}{2}$ ft., when they generally root at the extremity. They are provided on each side of the midrib with leaflets about in. long, dimidiate, nearly stalkless, with the lower line straight and horizontal, while the upper, rounded, one is more or less cut, the point generally blunt, the lower ones slightly stalked and wedge-shaped at the base. The leaflets are pale dull green or greyish, and, like the stalks, are covered with short, pale brown hairs, more abundant as they approach the crown. The roundish or transversely oblong sori are disposed on the edge of the lobes.

ADIANTUM—*continued.***A. c. Edgeworthii.**

This plant, which is also known in commerce as *A. ciliatum*, is a native of China and the Himalayas. It chiefly differs from the type in the smooth nature of both surfaces of its leaflets. Its fronds are also slenderer, shorter, and produced in greater abundance; while the



Fig. 55. *Adiantum caudatum* Edgeworthii, a lovely basket Fern that often shows three generations of plants in one individual.

colour of their leaflets is of a bright, soft bluish-green. Fig. 55, for which we are indebted to Messrs. W. and J. Birkenhead.

A. ciliatum.

This is identical with *A. caudatum* Edgeworthii.

A. Collisii.

This highly-decorative, home-raised, stove Maidenhair, of fine proportions and graceful habit, was, when first

ADIANTUM—*continued.*

described, given as a hybrid between *A. tenerum* and *A. gracillimum*, a theory which receives considerable support from the general appearance of the plant.

A. colpodes.

An elegant species from Tropical America, most useful for basket culture or for planting in the wall of the stove, where its long, slender, and pendulous fronds can show themselves to advantage. These fronds are from 1ft. to 1½ft. long, 4in. to 8in. broad, tripinnate, and borne on slender stalks, covered with long but very narrow, light brown scales. The lower leaflets spread at right angles from the stalk, and are about 4in. long by 1½in. broad, slightly branched below. The leaflets, with which the pinnæ are abundantly furnished, although of a very rich green when matured, are of a very delicate pink when young; they are nearly or quite stalkless, about ½in. long and ¼in. broad, with their upper margin rounded, lobed, and toothed. The sori are disposed on the teeth of the outer edge of the leaflets.

A. concinnum.

On account of its decorative qualities, this tropical American species is well worthy of a place in every collection. The fronds are of about an equal width for two-thirds of their length, then gradually tapering to their extremity. Being of a semi-transparent nature and the sori being numerous, the latter are shown to great advantage, especially when the plant is grown in a basket and suspended from the roof of a warm house. A distinctive character lies in the disposition of the lowest pinnules, which are upright and pressed flat against the stalk, almost covering it. Fig. 12, p. 17.

A. c. latum.

A most valuable and distinct stove *Adiantum* from the East Indies. It differs essentially from the type by its stiff, upright habit, and by the size of its leaflets, which are twice as large and set much farther apart. Fig. 56.

A. cristatum.

It is difficult to say how this plant came to receive such a specific name, as it has never been seen crested in cultivation: it is also known as *A. Kunzeanum*. Though found in the West Indies, Venezuela, Cuba, and Caracas, it is most plentiful in Jamaica. The fronds are borne on strong, upright, somewhat woolly stalks, 6in. to 12in. long, are from 2ft. to 3ft. long, 9in. to 12in. broad, and furnished with a terminal central leaflet fully 9in. long and 1½in.

ADIANTUM—*continued*.

broad. Besides this there are numerous rather distant lateral spear-shaped ones on each side. The leaflets are $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long and $\frac{1}{4}$ in. broad, horizontal, and close together, somewhat sickle-shaped, and blunt at the point; they are of a leathery texture, dark green, smooth, very shiny, and gradually become smaller as they approach the summit of



Fig. 56. *Adiantum concinnum latum*, an upright-habited variety of a popular species having large leaflets.

the pinnæ. The semi-oval sori are generally confined to the superior margin, where they are disposed in several oblong patches.

A. cuneatum.

This very old favourite, native of Brazil, is perhaps better known and more generally cultivated than any other

ADIANTUM—*continued.*

Maidenhair Fern. Nothing can surpass the elegance of its foliage for bouquets; and this excellent quality is so fully appreciated by growers in general that hundreds of thousands change hands in our markets yearly; in private gardens it is equally in demand. The fact of its being ever-green, and consequently very useful in winter, greatly adds to its value. The fronds are from 1ft. to 1½ft. long, 6in. to 9in. broad, of a more or less upright habit, and borne on erect, slender stalks 6in. to 9in. long: they are triangular, three or four times divided to the midrib, and furnished with numerous leaflets ¼in. or a little more broad, wedge-shaped at the base, with their upper edge deeply lobed. The sori, which are of moderate size and from four to six to each leaflet, are disposed all round the upper edge.

This species has produced under cultivation more forms or variations which have received distinctive names than any other exotic Fern. Although most of them are deserving of attention, we must confine ourselves to the following selection:—

A. c. deflexum.

This very distinct form, of garden origin, with its triangular fronds, three or four times divided to the midrib, furnished with lobed and deflexed segments, attracted the attention of the late Mr. Thomas Moore, who thus wrote to the *Gardeners' Chronicle* for 8th Dec., 1883: "This goes far to support the ideas of those who believe in the crossing of Ferns, whether the process is truly described by the term hybridisation or not. It was raised between *A. cuneatum* and *A. Bausei*, the latter also a so-called hybrid Fern." Like both its supposed parents, it reproduces itself perfectly true from spores.

A. c. dissectum.

A very pretty variety, of garden origin, with fronds shorter and more triangular than those of *A. cuneatum*, and furnished with leaflets more deeply cut than in that species. It is also of more compact habit, but does not reproduce itself true from spores, and can only be propagated by the division of the crowns.

A. c. elegans.

In this pretty variety, of garden origin, the triangular fronds are of a particularly slender nature; they are about 9in. long, besides the glossy stalks, about 6in. long, on which they are borne, and are furnished with numerous wedge-shaped, very light green leaflets, whose dimensions are intermediate between those of the typical species and those of

ADIANTUM—*continued.*

the popular *A. c. gracillimum*. Its habit is more erect than that of the type; it is also of quicker growth and reproduces itself freely from spores.

A. c. gracillimum.

One of the first really distinct variations observed in the popular *A. cuneatum*, and one which has very few rivals. The fronds—which, like those of the typical species, are produced in profusion from a densely-tufted crown, and measure from 1½ft. to 2ft. in length, and about 9in. across—are many times divided, thin and fragile in spite of their massive appearance, and furnished with minute rich green leaflets, which are distinctly stalked and two- or three-lobed, the sterile lobes blunt. It is a most elegant Fern, with light and graceful fronds. The multiplicity of the minute leaflets, and the almost invisible ramification of the stalk, give to a well-grown plant a particularly charming appearance. The slightly kidney-shaped sori are solitary on the entire pinnules and two or three on the larger lobed ones. This variety reproduces itself true from spores, although seedlings do not show their characters until they have attained a certain size.

A. c. grandiceps.

One of the most distinct and by far the most attractive of the numerous home-raised forms of the popular species, from which it differs in several striking particulars. It is more robust in habit; its fronds, produced in great numbers from a densely-tufted crown, are more elongated and terminate in a dense tassel of finger-like growths; the leaflets also terminate in similar, but smaller, branched tassels, which by their weight give the fronds a very elegant, arching habit, rendering the plant one of the most suitable Ferns for suspended baskets, in which position it thrives apace, and soon makes a very handsome object. It freely reproduces itself true from spores. Fig. 57.

A. c. Lawsonianum.

A distinct variety, as it differs from the type in having more rigid fronds, which frequently attain 1½ft. in height, and are abundantly furnished with curiously and finely-cut dark green leaflets, of a peculiarly narrow wedge-shape; these, being set further apart than in the species, and borne on short, thread-like stalks, give the whole of the plant a very light and decorative appearance. Unfortunately this form does not reproduce itself true from spores, and consequently remains comparatively scarce.

ADIANTUM—*continued*.**A. c. Luddemannianum.**

This curious and very striking variety, of garden origin, is quite different from any other Maidenhair in cultivation. The peculiarity which distinguishes this *Adiantum* from all others consists in its leaflets being crested, usually clustered at the extremities of the erect fronds, which are produced



Fig. 57. *Adiantum cuneatum grandiceps*, an attractive form with tasseled leaflets.

from a tufted crown, and branch about a third of the way up. These pinnules, which are much curled, and borne on short stalks, are generally fan-shaped and deep green. It is a very elegant variety, of small dimensions, rarely exceeding 10in. in height, and completely sterile. Its parentage as a hybrid would be difficult to trace, as it is the first

ADIANTUM—*continued.*

crested form on record, a character which it cannot have inherited from any known source.

A. c. mundulum.

This charmingly pretty and compact-growing variety, of garden origin, may reasonably be termed a perfect miniature, and quite a gem among *Adiantums*. It forms a very elegant little subject, seldom more than 8in. high. Its fronds, which are produced in profusion from a densely-tufted crown, are tripinnate, triangular, and furnished with numerous leaflets, which are narrowly wedge-shaped, a few of the larger ones among them being three-lobed. The sori are roundish, and disposed one in each notch of the lobes. The fronds are remarkably stiff, of good substance, and particularly well adapted for mixing with small flowers. This form reproduces itself true from spores.

A. Cunninghamii.

Synonymous with *A. affine*.

A. curvatum.

A beautiful and entirely distinct Brazilian stove species. Its handsome fronds, which rise from a short-creeping rhizome, are borne on black, shining stalks, 8in. to 12in. long, and are dichotomous. Their leaflets, 8in. to 12in. long and about 3in. broad, are furnished with leaflets nearly 1½in. long, curved, overlapping, with their superior margin and point finely toothed: these pinnules are of a light green colour, and are attached to the midrib by a very short foot-stalk. The sori are oblong and disposed singly, about seven of them on a pinnule. This Fern requires shade and a very moderate amount of moisture.

A. cyclosorum.

This grand, well-marked, evergreen, stove species, from New Guinea, is very effective. Its triangular fronds, which are borne on upright, stout, glossy-black stalks, 8in. to 12in. long, are three times divided to the midrib, and furnished with spreading leaflets. They possess a very feathery appearance through their rhomboid leaflets, being borne on short stalks and set far apart. These leaflets are gracefully arched, and of a beautiful bronzy-pink when in a young state, whereas when matured they are of a pleasing light green. The sori are circular and disposed eight to ten round the margin of each pinnule.

A. diaphanum.

A lovely dwarf species, thriving equally well under greenhouse or stove treatment, being a native of Java, Fiji, New Caledonia, Norfolk Island, New South Wales, and

ADIANTUM—*continued.*

New Zealand. It is much better known and extensively grown under the name of *A. setulosum*. In general habit it shows a tendency towards the *A. pedatum* group, for its fronds, which seldom attain more than 10in. in height, are once divided to the midrib, or provided with one to three branches at the base. These leaflets or branches are furnished with leaflets of a thin texture, $\frac{1}{2}$ in. long and $\frac{1}{4}$ in.



Fig 58. *Adiantum diaphanum*, a most useful Maidenhair for employing as an edging for the conservatory.

broad, the lower line rather decurved, the upper one nearly parallel with it, notched like the blunt outer edge. The kidney-shaped sori are numerous, and disposed singly, five to seven on each pinnule. Fig. 58. This pretty species is of easy culture, and very useful for cutting. It is also of

ADIANTUM—*continued.*

great value as an edging for the conservatory, for not only are the fronds produced in abundance, but the slender rhizomes possess the peculiarity of forming young plants on all their parts, thus making compact little specimens, of great interest and utility.

A. digitatum.

In general appearance this species, from Peru and New Granada, reminds one but very little of a Maidenhair Fern, as it is of semi-scandent habit, and its large tripinnate fronds are of a soft, fleshy texture and deciduous; they are borne on thick, fleshy, pale green stalks, woolly and transparent, from 1ft. to 1½ft. long; their foliated portion, which frequently attains 3ft. in length and 20in. in width at the lower part, gradually shortens upwards. The leaflets vary in form from deflexed to wedge shape at the base; they are very symmetrically set, borne on short stalks, often measure 1¼in. across, have their upper edge rounded and deeply cut, and are densely covered with short hairs, which give the foliage a woolly feeling when touched. The sori are disposed in lines along the edge of the lobes. A very distinct and ornamental Fern, sometimes known as *A. speciosum*.

A. excisum.

This pretty, greenhouse species, native of Chili, though of smaller growth and of slenderer habit, is closely allied to *A. athiopicum*, and, like that species, has also produced several distinct varieties. In the type the fronds, 6in. to 12in. long and 3in. to 4in. broad, are borne on stalks 2in. to 3in. long, of a wiry nature and chestnut-brown colour, rising from a tufted crown. They are furnished on each side with numerous zigzag, short leaflets, the lowest of which are slightly branched again; their leaflets are about three lines broad, wedge-shaped at the base, while their upper edge is rounded and bluntly lobed. The sori are large for the size of the plant, kidney-shaped, and situated in distinct hollows on the lobes.

A. e. multifidum.

This handsome, garden variety partakes somewhat of the character of *A. concinnum*, both as regards the way in which its fronds are produced and by the peculiar manner in which their stalk is covered by deeply-cut leaflets closely pressed against it. The fronds, of a drooping habit, are four times divided to the midrib, and their deeply-cut subdivisions give the plant a very graceful appearance: these fronds grow from 1ft. to 1½ft. in length, and are usually divided at their summit into several branches, which very

ADIANTUM—*continued.*

often are again divided, forming a beautiful tassel 2in. to 3in. long.

A. e. nanum.

This variety, also of garden origin, is very useful where dwarf Ferns are required for edging or for pot culture, or where small fronds for mixing with flowers are in demand. Its rigid fronds, which are produced in great abundance from a densely-tufted crown, are three times divided to the midrib, and furnished with wedge-shaped and closely-set leaflets: they seldom attain more than 8in. in height.

A. Farleyense.

By far the most beautiful of the whole genus, and not inappropriately called the "Queen of Maidenhair Ferns," It is a native of Farley Hill, Barbados, and has attained such a degree of popularity and is so extensively known under the above name that, although classed in botanical works as simply a form of *A. tenerum*, is here accorded specific rank. For exhibition purposes this evergreen Fern is unrivalled: it always attracts a deal of attention, and shows the gardener's skill to great advantage, with its broad, massive, yet gracefully-drooping fronds, four times divided to the midrib, from 2½ft. to 3ft. in length and frequently 2ft. broad. When grown near the glass and under the influence of abundant light, the leaflets, often 1½in. broad, deeply fringed, and with almost crispy lobes are very prettily edged with a delicate pale crimson tint, which turns to a pleasing rich, light green colour when quite mature. Fig. 30.

A. Fergusoni.

An elegant, stove species, native of Ceylon, with fronds stiffly erect, 2ft. to 2½ft. high, including the glossy purplish-black stalks. They are tripinnate, and furnished with long-stalked leaflets, which in their turn are subdivided into large, overlapping leaflets, variable in form; but where sterile neatly-toothed and notched along the outer margin: the terminal one is generally three-lobed. On account of the light colour of its foliage, the aspect of this Fern is particularly pleasing. The sori, of oblong form, are situated at the top of the lobes of the pinnules.

A. formosum.

One of the most ornamental Ferns in existence, and on that account grown in immense quantities. It is a native of Australia. The fronds, which are produced abundantly from slender, underground, creeping rhizomes, are branching and four times divided to the midrib. They are erect or nearly so, and from 1½ft. to 3ft. in height, one-half of

Fig. 59. *Adiantum formosum*, one of the finest of Maidenheads, and one of the most ornamental Ferns in cultivation.



ADIANTUM—*continued.*

which, the stalk, is naked. The foliaged part, triangular in outline, is copiously furnished with small leaflets, whose lower edge is straight, whereas the upper and outer are rather rounded and deeply lobed, the lower ones being distinctly stalked. These sub-divisions are pale green, the barren ones being finely dented. The spore masses, nearly kidney-shaped, are usually disposed six to eight to each fertile pinnule. Of very easy culture, it succeeds admirably in a greenhouse; yet, when cultivated in a stove, the sub-divisions of the fronds become larger, and the plant forms in all respects a handsomer specimen. It is very readily propagated by spores, and also by the division of the creeping rhizome. No particular care is required with regard to its propagation, as one is almost certain to find seedlings of it coming up amongst the different plants in the house in which it is cultivated. Fig. 59. There is a nicely variegated form (*variegatum*).

A. fragrantissimum.

This handsome Fern is quite distinct from anything previously known in cultivation. It is of garden origin, and possibly a natural hybrid from *A. cuneatum* and *A. Moorei* (*A. amabile* of commerce). Its fronds, which last much longer than those of any other *Adiantum* with wedge-shaped leaflets. The characteristic feature is the large size of the ultimate divisions, which at once appears peculiar, presenting as it does a novel aspect among the forms with wedge-shaped pinnules. Despite its specific name the fronds are scentless.

A. fulvum.

This pretty and very compact-growing, greenhouse species, native of New Zealand, Norfolk Island, New South Wales, and Fiji, is of great value as a pot-plant, also where Ferns are required for edging, as its habit is very symmetrical. Its elegant fronds, borne on stiff yet slender stalks of a rough nature, and produced from a central tufted crown in great abundance, are from 8in. to 12in. long and 6in. to 8in. broad; they are formed of a terminal leaflet 4in. to 6in. long and about 1½in. broad, and of several branches, the lower of which are branched again and furnished with leaflets of a parchment-like texture, about ¾in. long and ¼in. broad, dimidiate, the lower edge nearly straight, the upper almost parallel, sharply toothed like the outer edge, of a bright bronzy or metallic hue when in a young state, and dark green when fully developed. The sori are large and numerous, roundish, almost heart-shaped, and disposed from eight to twelve round a pinnule.

ADIANTUM—*continued.***A. Ghiesbreghtii.**

This very handsome, stove plant, which is much more extensively known under the name of *A. scutum*, originated in Mr. B. S. Williams's nursery, where it sprang up without anyone being able to say whence it came, or if it were merely an altered and improved form—a sport—of some species already in cultivation. Anyhow, it possesses the power of reproducing itself true from spores, as may be seen by the immense quantities of it which yearly find their way into our flower markets. It is a very fine Fern, of remarkably good constitution, with the habit of *A. Farleyense*, but less dense, and undoubtedly a variety of *A. tenerum*: it also makes one of the finest known Maidenhairs for decoration or for exhibition purposes. There is a lovely form of this (*ramosum*), with fan-shaped fronds and deep green leaflets.

A. Henslovianum.

This beautiful and most distinct, stove species, also known as *A. latum*, *A. Reichenbachii*, and *A. sessilifolium*, is a native of Columbia and Peru, and is of quite a different appearance from all other Adiantums, as the stalks, instead of being, as usual, thin, black, and polished, are thick, green, and gradually become of a dark chestnut-brown colour and slightly hairy. It is also readily distinguished from most others by the peculiarity possessed by its pinnules, the inner edge of which usually overlaps the midrib.

A. hispidulum.

Very handsome, greenhouse species, native of Australia and New Zealand; it is extensively known and cultivated under the name of *A. pubescens* (which see).

A. Kunzeanum.

This is synonymous with *A. cristatum*.

A. lætum.

Synonymous with *A. Henslovianum*.

A. Lathomii.

A beautiful, garden variety, possibly a natural sport from *A. Ghiesbreghtii* (*A. scutum* of commerce), which it somewhat resembles, though it differs from that species in having a gracefully-drooping instead of a semi-erect habit. One of the most ornamental of the large-growing Maidenhairs in cultivation, and quite as useful in its way as the smaller *A. cuneatum* and varieties.

A. lucidum.

A distinct, stove species, of medium growth, native of the West Indian Islands, Panama, and Brazil. The fronds,

ADIANTUM—*continued.*

9in. to 15in. long and 4in. to 8in. broad, are produced from a creeping rhizome and borne on strong, upright stalks 6in. to 9in. long, which are densely covered with short hairs of a rusty colour: they are simply pinnate, and consist of a large terminal leaflet and six to ten lateral ones on each side. These leaflets are 3in. to 4in. long and about 1in. broad, nearly equal-sided, slightly dented towards the point, wedge-shaped at the base, of a bright olive-green colour, and shining on both sides. The lower leaflets are sometimes slightly branched. The oblong sori are disposed in a continuous row along each side. A lovely basket subject.

A. lunulatum.

A very distinct and handsome, stove species, found in Hong-Kong, in Cochin China, on the Himalayas at an elevation of 4000ft., southward to the Polynesian Islands and Tropical Australia, Madagascar, Angola, Guinea, in Tropical America from Mexico southward to the Organ Mountains in Brazil, &c. It is an easily-recognised species, of deciduous habit, losing its fronds about December and starting into growth again about the beginning of March. It has a peculiarly slender, pendulous habit, and is prolific at the end of its fronds—so much so, that it is not rare to see produced from their apices three generations of plants. When the fronds are mature, the stalks are of a beautiful shining black colour, while those in course of development are of a deep pink, and then of a light brown tint, quite different from those of all other species.

A. macrophyllum.

This elegant, stove species, native of Mexico, the West Indian Islands, Brazil, and Ecuador, is one of the most distinct Ferns in cultivation. Its large, equal-sided leaflets, which in the young and partly-developed fronds are beautifully tinged with red, change with age to a most pleasing bright green. The handsome fronds, borne on erect, nearly black stalks 6in. to 12in. long, are produced in great abundance from an underground rhizome; they are of a particularly upright habit, 9in. to 15in. long and 4in. to 8in. broad, and only once divided to the midrib. Fig. 60. One of the most decorative of our stove Ferns, but it requires a liberal supply of water and a shady situation, or it soon becomes spotted. *Albo-striatum* is a lovely variegated form.

A. monochlamys.

This exceedingly pretty and entirely distinct, dwarf, greenhouse species, native of Japan, though closely related to the Himalayan *A. venustum*, is clearly distinct through

ADIANTUM—*continued.*

its compact habit and bluish-green foliage. The pleasing aspect of this plant renders it a most valuable Adiantum, the more so that it requires but little or no artificial heat for its cultivation. On that account it ranks as one of the best dwarf Ferns for the cool conservatory and the greenhouse. It has proved perfectly hardy in Cornwall and Devonshire. Fig. 5, p. 8.



Fig. 60. Adiantum macrophyllum, a very elegant Stove Fern of upright habit.

A. Moorei.

A remarkably elegant, stove species, native of Peru, much more generally known in gardens as *A. amabile*. Its handsome fronds, which frequently attain 2ft. in length by 1ft. or more in breadth, are borne on slender, black,

ADIANTUM—*continued*.

shining stalks 6in. to 9in. long. They are deltoid, twice or thrice divided to the midrib, and are furnished with numerous leaflets, borne on short footstalks, and set somewhat far apart, which gives the fronds a peculiarly light and feathery appearance, the more so that they are deeply lobed on their outer margin, where the sori, round or nearly so, are situated at the extremity of the lobes. *A. Moorei*, which has proved very variable, possesses the peculiarity of reproducing itself freely by means of the little bulbils borne on its fine, fibrous roots.

A. palmatum.

A very beautiful and graceful Fern, native of Peru, which thrives equally well under either greenhouse or stove treatment. Its handsome and particularly light fronds, produced from a stout, underground, prostrate stem, are borne on very slender stalks 9in. to 12in. long, shining black, but rather downy at the base; they are three times divided to the midrib, often reaching 3½ft. in length by 10in. in breadth. The leaflets, which are distinctly stalked, are of comparatively large dimensions, being 1in. to 1¾in. broad; they are of a thin texture, smooth, set far apart, and vary in shape; but all are deeply cut down into from three to five large lobes, which are again more or less divided. The sori, oblong in shape and of variable length, are disposed at the tips of the lobes, usually one to each.

A. pedatum.

This thoroughly distinct and magnificent species, although given as a native of British India by Beddome, is essentially a Fern from North America, where it is extensively distributed. North American Ferns are mostly valued for their hardiness and usefulness, producing as they do in the outdoor Fernery a contrast which could not possibly be obtained by planting British species and varieties alone. Some of them, too, are individually interesting, and foremost among these is *A. pedatum*, on account of its unique appearance, robust growth, and distinctive character. Fig. 61. In its native country it will bear over 20deg. of frost. There, it is true, it is naturally protected by a thick layer of leaves, which annually covers its crowns when at rest; it is also protected each year by a covering of snow.

A. peruvianum.

A well-marked, Peruvian, stove species, undoubtedly one of the most ornamental of all the known large-growing Maidenhairs. Its ample and gracefully-pendent fronds, which are produced from a thick, underground, running rhizome, are borne on stout, upright, black, polished stalks,

ADIANTUM—*continued.*

9in. to 18in. long, and of a very wiry nature. Their leafy portion grows to a length of from 2ft. to 3ft., and is almost triangular in outline and elegantly arched. These fronds are simply pinnate on two-thirds of their total length, but they usually have at the base from one to three branches, some of which are occasionally again slightly divided. The leaflets are 2in. or more broad, $1\frac{1}{2}$ in. deep, unequally ovate,



Fig. 61. Adiantum pedatum, a distinct and very hardy North American Maidenhair.

wedge-shaped at the base, and finely-toothed and lobed round the upper and outer edges. When mature, these leaflets, which are borne on short though perfectly distinct footstalks, are of a beautiful dark green colour, contrasting agreeably with the soft metallic hue of the fronds in course of development and the pale green tint of those newly

ADIANTUM—*continued.*

expanded. The sori, somewhat varying in length but usually oblong in form, are disposed in interrupted patches along the whole of the anterior margins of the fertile pinnules.

A. populifolium.

Synonymous with *A. Seemannii*.

A. prispnophyllum.

Synonymous with *A. tetraphyllum*.

A. pubescens.

This greenhouse Fern, native of New Zealand and Australia, though sometimes regarded as synonymous with *A. hispidulum*, is, from a decorative point of view, sufficiently distinct to be separated from it. Lowe says: "This fern has been correctly named *pubescens*: indeed it is as pubescent as it is possible for a Fern to be, the stem being quite rough with the vast number of short brown hairs with which it is entirely covered." *A. pubescens* is of much larger dimensions than *A. hispidulum*, as usually seen, the leaflets being much larger, deep green, bluntly oblong, wedge-shaped at the base, with their margin slightly dented. The fronds are nearly all fertile, from 1ft. to 1½ft. long, produced from a tufted central crown, and are very persistent. The kidney-shaped and hairy sori are small, and are disposed from twelve to sixteen to a leaflet, along the upper and outer edges only.

A. reginæ.

One of the most distinct, and undoubtedly the most decorative, of a series of seedlings or supposed hybrids of garden origin, comprising the better-known *A. rhodophyllum*, *A. Victoriae*, &c. The general appearance of all these warrants the assumption that they are issue from *A. Ghiesbreghtii* (*A. scutum* of commerce); but they essentially differ in the colour of their young growths and in their habit, which latter in all cases is dwarfer and much more compact.

A. Reichenbachii.

Synonymous with *A. Henslovianum*.

A. reniforme.

In the shape of its fronds, this very interesting and exceedingly distinct, greenhouse species differs from all other Adiantums. It has a very limited geographical range, for it is not known to have been gathered in a wild state in any other places than Madeira, Teneriffe, and the Azores. It is an evergreen Fern of comparatively small

ADIANTUM—*continued*.

dimensions, having as little as possible the appearance of an Adiantum; but its great distinctness alone is sufficient to make it indispensable in any collection. Its singular, leathery fronds, which are abundantly produced from a close, tufted crown, and borne on slender, shining, bright chestnut-brown stalks, 4in. to 6in. long, are essentially kidney-shaped—hence the specific name; they are of a brilliant shining-green, smooth, when fully developed, frequently $1\frac{1}{2}$ in. across, and their leafy portion is, at the point of junction with the stalk, provided with a broad, shallow depression (Fig. 52). The venation of the fronds is very delicate, conspicuous, and interesting, the main veins which start from the basal depression being repeatedly forked until they reach the outer margin, by which time they have been four times forked. The oblong sori are produced abundantly, and are disposed in a continuous row all around the margin.

A. r. asarifolium.

Compared with the typical plant, this scarce variety, sometimes given specific rank, is always stouter and coarser, and its fronds, instead of being truly kidney-shaped are quite round and of a much thicker texture; they usually measure $2\frac{1}{2}$ in. across, and are produced from a stout, single crown, the stalks and the base of the frond itself being very woolly.

A. rhodophyllum.

This beautiful, stove Fern, of dwarf and compact habit, is a supposed hybrid of garden origin: it has the appearance of having issued from *A. Ghiesbreghtii* (*A. scutum* of commerce), to which it is far superior in its ornamental qualities. The fronds, which are abundantly produced from a densely-tufted crown and borne on very slender, black, shining stalks, have their leafy portion about 1ft. long, triangular in shape, tripinnate, and elegantly spreading. The leaflets, when first developed, are of a beautiful rosy-purple, but gradually take on a soft, pale green. The sori are sparingly produced, oblong in form, and disposed singly at the extremities of the lobes on the outer or superior margin only. The remarkable diversity of colours presented by the pinnules at different stages of their growth, which are all to be seen on the plant at the same time, renders this Adiantum one of the most effective decorative Ferns in cultivation. To this striking characteristic must also be added its compact habit and the elegant contour of its tufted fronds. All these characters are faithfully reproduced in young plants obtained from spores.

ADIANTUM—*continued*.**A. roseum.**

A greenhouse Fern, of dwarf habit, whose fronds, scarcely 5in. long, are of a lovely pinkish tint when young. It is of garden origin.

A. rubellum.

This very pretty, stove species, closely allied to and intermediate between *A. Wagneri* (*A. decorum* of commerce) and *A. tinctum*, is a native of the Andes of Bolivia: it is of dwarf but elegant habit. The fronds, which are abundantly produced from a close, tufted crown, and borne on exceedingly slender, black, shining stalks, 4in. to 6in. long, have their leafy portion of similar length; they are deltoid and bipinnate. The numerous leaflets are fan-shaped at their summit, wedge-shaped at their base, and their outer margin is lobed and finely toothed: they are almost stalkless, and when young are of a beautiful purplish-crimson, changing with age to a light bluish-green tint, but even then tinged with pink. The sori are round or slightly kidney-shaped, and are disposed singly in the tips of the lobes.

A. scutum.

A popular name for *A. Ghiesbreghtii*.

A. Seemannii.

This very handsome and totally distinct, stove species, also known under the names of *A. populifolium* and *A. Zahnii*, is a native of Guatemala and Brazil. It is of very peculiar growth, inasmuch as while in a young state the plant only produces simple fronds of extraordinary dimensions, which are then heart-shaped, with an elongated point, and often measure as much as 3in. in breadth: they are produced from a thick, underground rhizome, and are borne on upright, black, shining stalks 6in. to 9in. long. With maturity the fronds become pinnate, the lower pair of pinnæ being occasionally divided again. The pinnæ, which are larger than even those of the popular *A. macrophyllum*, and have black, polished footstalks often 1in. long, are then ovate, acuminate, unequal-sided, and drooping at right angles from the stalk. The barren pinnæ are usually finely dented, while the fertile ones show on their outer margin an uninterrupted line of oblong sori. The foliage, of a particularly leathery texture, is, when only partly developed, of a bronzy or metallic hue, turning with age to a deep glossy-green above, and a pretty bluish colour beneath.

A. sessilifolium.

This is synonymous with *A. Henslovianum*.

ADIANTUM—*continued*.**A. setulosum.**

A synonym of *A. diaphanum*.

A. speciosum.

Synonymous with *A. digitatum*.

A. tenerum.

This very fine, evergreen, stove species is admittedly a general favourite: its beautiful fronds, which are abundantly produced from a slowly-creeping, underground rhizome, about as thick as a goose-quill, and covered with dark brown hairs and dented scales of the same colour, grow from 3ft. to 4ft. in length, nearly one-third of which is naked. These fronds, of a very elegant character, are three or four times divided to the midrib, and 1ft. to 1½ft. broad. The ebeneous-black and glossy character of the stalks extends to the footstalks of the numerous leaflets, and this produces a great and pleasing contrast to the brilliant green of the latter. These leaflets are all borne on short footstalks, from which they readily fall when dry: their upper edge is rounded, broadly, and often also deeply lobed; the barren lobes are finely dented, and the fertile ones are entire. The sori are kidney-shaped, and disposed from ten to thirteen in roundish or transversely-oblong patches in the lobes of the upper margin of each fertile pinnule. A grand exhibition species. It is the Brittle Fern of North America, and is found also in the West Indies, Mexico, and South America.

A. t. Farleyense.

The correct name of the plant usually called *A. Farleyense*.

A. tetraphyllum.

A handsome, but very variable, stove species, also known under the name of *A. prionophyllum*. It is a native of Tropical America, where it is found from Mexico and the West Indies southward to Brazil. Its massive yet elegant fronds, borne on strong, upright, downy stalks rising from a slowly-creeping, underground rhizome, are of a very peculiar shape. They consist of a long terminal leaflet, 6in. to 9in. long and 1in. to 1½in. broad, and of numerous spreading lateral ones nearly as large on both sides; consequently, the leafy portion of the frond is frequently 1½ft. long and almost as much broad. The leaflets are of a leathery texture, ½in. to ¾in. broad and ¼in. deep, sub-dimidiated, their lower line straight or somewhat de-

ADIANTUM—*continued.*

curved, the upper line nearly parallel, finely toothed, and the outer edge very oblique. The sori, usually of oblong form, sometimes kidney-shaped, are disposed in broken lines round the upper and outer margin.

A. t. acuminatum.

The long, narrow-pointed shape of the leaflets distinguishes this garden form from the type.

A. t. gracile.

A closely-growing variety, introduced from Tropical America, having fronds similarly produced from an underground, slowly-creeping rhizome, and borne on slender, black stalks of a downy nature; but these fronds are much shorter than those of the type, and elegantly arching. This is a very distinct and specially striking Fern, remarkable for the beautiful reddish hue assumed by its fronds when first developed, a characteristic they retain until they are fully expanded.

A. tinctum.

This pretty, dwarf species, which thrives equally well in greenhouse or in stove temperature, is a native of the Andes of Peru. It is intermediate between *A. rubellum* and *A. Wagneri* (*A. decorum* of commerce); but its elegant fronds, 6in. to 9in. long, borne on slender, black stalks, 4in. to 6in. long, and produced in profusion from a central, tufted crown, are less divided than those of the latter species. They are also much narrower, bipinnate, and their lower leaflets are closely wrapped over the stalk. When in a young state the pinnules are of a delicate rosy-red, and they change with age to a bright green colour. This is the smallest of the known Adiantums with coloured foliage.

A. trapeziforme.

A delicate-looking, yet bold-growing, stove species, from Tropical America. Its handsome fronds, which are produced from a slowly-creeping, underground rhizome, and borne on firm, upright, black, shining stalks, 6in. to 12in. long, and furnished near their base with a few narrow scales, vary in length from 1½ft. to 2½ft. They consist of a central leaflet, 6in. to 9in. long and 2in. to 3in. broad, and three or four large, spreading ones on each side, the lowest of which are frequently branched again. The leaflets are of papery texture and a brilliant green, 1½in. to 2in. long, ½in. to ¾in. broad, dimidiate, and have their sides nearly parallel, the outer and the upper edges being bluntly lobed. The sori are oblong, large, prominent, and numerous, and are

ADIANTUM—*continued*.

disposed close together round the upper and outer edges of the fertile pinnules. This Fern is readily distinguished from all others by its peculiar-shaped pinnules. Fig. 62. It is also a free grower, which quality no doubt accounts for its



Fig. 62. Adiantum trapeziforme, a very bold-growing species with handsome fronds.

popularity. Like *A. tetraphyllum*, this species is very variable and several handsome varieties of it are in cultivation, including

A. t. Sanctæ-Catherinæ.

A garden name for very ornamental Brazilian form of much dwarfer and more compact habit than the

ADIANTUM—*continued.*

species. A place with a smaller amount of light than is required by other varieties of the same species, suits this plant admirably.

A. Veitchianum.

No doubt the most highly-coloured as well as the largest-foliaged of the known tinted *Adiantums* (with the exception of *A. macrophyllum*). It is a stove species from the Andes of Peru. Its very attractive fronds, abundantly produced from a slender, underground rhizome, and borne on thin, wiry, black, shining stalks 4in. to 6in. long, are from 8in. to 12in. long, deltoid, and bipinnate in their lower half. They are particularly upright, and are furnished with numerous leaflets about $\frac{1}{2}$ in. broad, semicircular on their upper margin, where they are also shallowly lobed. The round and small sori are disposed about eight along the upper margin of the fertile pinnules. The pinnules are of a remarkably bright red tint in their young state, and with age change to a soft pale green; they are also of a thicker texture than most *Adiantums* of the same section.

A. venustum.

This very rare, distinct, dwarf species, thrives best in the cool greenhouse or frame, and is nearly hardy in sheltered places. It should not be confused with a totally different plant that is extensively grown as *A. venustum*, and found in most collections as well as in many trade catalogues under that name, but which is only a dwarf form of *A. æthiopicum*. The true *A. venustum* also produces its elegant fronds from a creeping rhizome, but in this latter organ the power of ramification is not much developed; consequently the fronds are produced more sparingly than in the variety just mentioned. The more rigid texture, the numerous small, scarcely-lobed segments, and the few large sori, clearly distinguish the true species from the spurious form, as also from its allies—*A. glaucophyllum* and *A. monochlamys*.

A. Victoriae.

In this pretty, dwarf Maidenhair, of garden origin, which has all the appearance of a very dwarf form of *A. Farleyense*, the fronds, abundantly produced from a central, tufted crown, are crowded, bipinnate, and form close, low tufts, 4in. to 6in. high, of rich, bright green foliage. The rather large leaflets are peculiarly crisped or undulated, deeply lobed around the upper and outer margins, and the oblong sori are disposed one on the tip of each lobe of the fertile pinnules.

ADIANTUM—*continued.***A. Weigandii.**

This very pretty, stove Fern, of particularly neat habit and pleasing colour, originated in American gardens, whence it was brought to Europe under the above name, but without any authority for it. Mr. Moore, however, retained the name, and published an extensive description, from which the following are the most important passages: "We regard



Fig. 63. Adiantum Weigandii, a pretty neat-habited stove species that is extremely decorative.

this as a very distinct plant, one of pleasing character likely to be used for decorative purposes. The fronds have about the same size and outline of the useful *A. decorum*, and the habit is similar, but the pinnules are quite different. These organs have a peculiar aspect, being very freely and conspicuously lobate at the edge, and yet appearing to be but little divided, on account of the very narrow sinuses between the lobes. The lobes are large and few, and in consequence the pinnules in some instances have very much the cutting to be observed in the leaves of the Hawthorn. The apical

ADIANTUM—*continued*.

portions of the fronds and of the pinnæ are crowded." The fronds are triangular in shape and tripinnate, are about 1ft. long, and, being produced from a close crown, they form a neat tufted mass of foliage; while the numerous large, nearly circular sori are disposed one or two on each lobe, at the tip of which they are situated. Fig. 63.

A. Williamsii.

One of the most beautiful of all known Maidenhairs, and one which thrives well under cool treatment, as it is a native of the mountains of Peru, where it is found at a great elevation. It may possibly be a form of the very variable *A. æthiopicum*, and has somewhat the general aspect of *A. æ. chilense*, although its growth is not so dense; it is also of a free and more vigorous constitution.

A. Zahnii.

Synonymous with *A. Seemannii*.

ADIANTOPSIS. See *Cheilanthes*.

AGLAOMORPHA. See *Polypodium*.

ALEURITOPTERIS. See *Cheilanthes*.

ALLOSORUS. See *Cheilanthes*, *Cryptogramme*, and *Pellaea*.

ALSOPHILA.

The genus *Alsophila* is composed exclusively of species of Tree Ferns from either tropical or temperate quarters of the globe. The distinguishing characters reside in the globose sori, which are situated at the back of the fronds, and disposed on a vein or in the forking of a vein. These sori mostly stand out conspicuously from the leafy portion of the fronds, and are frequently downy, and destitute of involucre or covering.

Alsophilas, as well as all other Tree Ferns, should have an abundant supply of water, which is best distributed over the stems with a syringe, liberally during the summer, but moderately during winter—without, however, suspending it altogether. The plants also require a good quantity of moisture at the roots, and occasional waterings with weak liquid manure are beneficial, especially in the spring, when unfolding their new fronds. Although *Alsophilas* grow well in a light conservatory, where

they produce fronds of a hardier and more substantial texture, it is under the combined influences of shade and moisture that their most vigorous growth is produced; they should therefore be sufficiently shaded to prevent the sun from burning the fronds as they unfold, as also to keep them from being discoloured when fully developed. Like all other Tree Ferns, very little pot-room suffices. They should be potted, tubbed, or, better still, planted out in the houses, in a compost of three parts of peat, one part of fibrous loam, and one part of sand as coarse as procurable; in this they will grow luxuriantly for years without requiring further attention than constant moistening. *A. excelsa* is grown in large quantities for market. It is also a useful species for sub-tropical gardening.

A. Van Geertii, and perhaps a few other species, produce young growths on their stems, from which they can be propagated; but generally speaking, Alsophilas are increased from spores, which are abundantly produced and germinate freely under warm treatment.

A. aspera.

A very handsome, stove species, also known as *A. nitens*, native of the West Indies, and readily identified through the large, glossy, spear-shaped scales, lin. or more in length, found at the base of the stalks. The trunk is 10ft. to 30ft. high, slender, and covered with short, stout spines, which also extend to the stalk and to the rachis or stalk of the leafy portion of the fronds. These fronds, which reach some 10ft. to 12ft. in length and are gracefully arched (Fig. 64) and of a very light and pleasing green colour, are bipinnate. The oblong leaflets are borne on short footstalks; they are cut down from half to two-thirds of the way to their midrib; their lobes are oblong-egg-shaped, often sharply toothed, and their midrib shows on the under-surface some blister-like scales. The sori of a very deciduous nature, are situated half-way between the midrib and the margin of the fertile pinnules.

A. atrovirens.

South Brazil is the home of this gigantic species. Its large tripinnatifid fronds are borne on stalks about equal in length to their leafy portion, stout and slightly scaly. Their rachis, of a dark straw-colour, sometimes

ALSOPHILA—*continued*.

perfectly smooth, at other times slightly covered with short, hard excrescences, is furnished with spear-shaped leaflets 9in. to 15in. long and 3in. to 4in. broad; the leaflets, cut about half-way down to the midrib, are nearly stalkless, of a somewhat leathery texture, dark green on both sides, and without scales; their ascending and entire segments are $\frac{1}{8}$ in. broad, and blunt. The small and numerous sori are disposed on the forking of the veins but close to the midrib.



Fig. 64. *Alsophila aspera*, a West Indian species having large, glossy, spear-shaped scales.

A. australis.

Undoubtedly one of the handsomest *Alsophilas* in cultivation. It is a greenhouse species, native of Tasmania and Australia, especially in the South. A trunk of 15ft. or 18ft. high generally measures from 2ft. to 2½ft. in circumference, and produces a somewhat flat or spreading head of numerous fronds, 8ft. to 13ft. long and borne on naked stalks about 1½ft. long. Their principal leaflets, spear-shaped, about 1½ft. long and 6in. to 10in. broad, are furnished with numerous leaflets, light green above and bluish below, 3in. to 4in. long, sharply pointed, and divided nearly to their midrib, or towards the base even sometimes pinnate. The stalk and rachis, although not exactly spiny, are very rough to the

ALSOPHILA—*continued*.

touch and are covered at their base with dark brown, chaffy scales; the foliage is also altogether of a more leathery texture than that of most other Tree Ferns. The small, round sori are disposed from one to four at the basal portion of the fertile pinnules.

A. Colensoi.

Of comparatively small dimensions, this species is a native of New Zealand and Otago. Unlike most *Alsophilas*, its trunk, only 4ft. to 5ft. high, is totally devoid of spines, and the fronds, slightly hairy, 2ft. to 4ft. long and 1ft. or more broad, are borne on short stalks densely clothed with silvery-white scales 1in. long, and with copious dark brown ones of smaller dimensions. The principal leaflets are 12in. to 14in. long, oblong, and terminate in a long, tapering point; their leaflets are 2in. long and 4in. to 5in. broad, deeply pinnatifid, being divided nearly to the midrib. The lobes, only two to three lines long, are strongly toothed, and the small and round sori are disposed nearer the midrib than the margin of the fertile segments.

A. Cooperi.

From Queensland hails this handsome species, which is in the way of the better-known *A. excelsa*, but of smaller dimensions: it thrives equally well under either stove or greenhouse treatment. The ample fronds are tripinnate, and have their rachis densely clothed at the base with large pale brown scales. Their somewhat spear-shaped leaflets are 1½ft. to 2ft. long, and are furnished with strap-shaped leaflets 4in. to 5in. long and ¾in. to 1in. broad, the segments of which, equally strap-shaped, are ⅕in. to ⅙in. broad and bright green on both sides. The small sori are disposed almost on the midrib of the fertile segments.

A. excelsa.

Norfolk Island is the home of this splendid greenhouse species which proves nearly hardy in the neighbourhood of Cornwall, and is a very rapid grower. In its native habitat it is said to have trunks from 60ft. to 80ft. high. Its ample fronds, of a dark green above and paler green beneath, are borne on stalks of a rough nature, and their principal leaflets, 1½ft. to 2ft. long and 6in. to 10in. broad, are, when young, densely clothed with rusty-coloured hairs intermixed with small scales of a darker colour. The numerous leaflets are set close together, oblong-spear-shaped, acuminate, and so deeply pinnatifid that they are frequently cut down to their midrib; the segments which are thus formed are narrow, sickle-shaped, and have their margins recurved and toothed like a saw, those of the barren fronds being larger

ALSOPHILA—*continued*.

and of a paler green than those of the fertile ones, which are also of a more leathery texture. The sori are plentifully disposed close to the midrib of the fertile segments.

A. infesta Van-Geertii.

Under this name is known to commerce a variety of the Tropical American species *A. infesta*. It is a distinct and highly-ornamental Tree Fern, whose stem or trunk never attains a great height; it is slender, tortuous, of a bright brown colour, and possesses the peculiarity—very rare in *Alsophilas*—of producing on its surface lateral growths or young plants, which, when sufficiently furnished with roots, may be safely detached and soon form independent subjects. Although the trunk is of comparatively short stature, it produces very fine broad, spear-shaped fronds 5ft. to 6ft. long, including the stalk, which are bipinnate. The leaflets, also spear-shaped, are 1ft. to 1½ft. long and 5in. to 6in. broad, and are furnished with leaflets of a dark, shining green colour and deeply toothed. The light brown stalks are covered with numerous short, black spines. The whole plant is of a particularly elegant habit, its fronds being gracefully arched.

A. nitens.

Synonymous with *A. aspera*.

A. pruinata.

Although scarce in cultivation, this beautiful species, suited to either the stove or the greenhouse, deserves every attention, if only on account of its distinctive and ornamental characters, for its fronds, of a particularly elegant habit, are quite as silvery underneath as those of the better-known *Cyathea dealbata*; while the stem or trunk from which they are produced, and which under cultivation seldom attains great dimensions, usually produces several crowns or heads, and by the division of these the plant can be increased. It is a native of Tropical America and the West Indies, and has been aptly likened to a small pine-tree, leafy at the top. Its stem varies from 3ft. to 8ft. in height, with a perfectly smooth stalk.

A. Rebeccæ.

A Queensland species, whose habit is distinct from all others. Its stem, about 8ft. in height, is smooth, and comparatively slender, yet it is well furnished with broad, arching fronds 2ft. to 3ft. in length, and of a leathery texture. They are bipinnate, and their stalks being nearly black, form a striking contrast to the glossy, deep green colour of their upper surface. The lower leaflets are 1ft. to 1¼ft. long and 4in. to 5in. broad: they are furnished on each side with

ALSOPHILA—*continued*.

from twenty to thirty leaflets, the lower ones of which are distinctly stalked, 2in. to 3in. long and about $\frac{1}{2}$ in. broad, terminating in a tapering point, while their base, rounded on both sides, is slightly eared above. The small and numerous sori are disposed in two rows situated half-way between the midrib and the edge of the fertile pinnules.

A. Van-Geertii.

Synonymous with *A. infesta Van-Geertii*.

ANEMIA.

A well-marked genus, exclusively composed of Ferns of comparatively dwarf habit, distinguished from nearly all others by having, like our native *Osmunda*, their fructification disposed in a conspicuous "panicle" standing well above the leafy portion of the frond. Through their fertile segments being always wholly contracted, a peculiarity which gives them the appearance of flowering spikes (Fig. 14, p. 19), these interesting plants are popularly known as "Flowering Ferns." As now understood, the genus includes *Anemidictyon*. Most of, if not all, the known Anemias are possessed of a certain decorative value, and their peculiar mode of fructification gives them an additional attraction, and entitles them to general cultivation.

Although many very interesting species have at different times been introduced, comparatively few have survived the effects of the treatment first received. For all that, provided heat and plenty of light are at the disposal of the cultivator, these Ferns are not difficult to manage. Anemias will be found to thrive best in a mixture of two parts good fibrous peat, one part leaf-mould, and one part sharp, coarse silver sand, the plants being kept on a shelf if in a spacious house, or near the glass if in a warm pit or low house. Watering overhead is very injurious to all of them. They prefer being grown in small pots to being planted out, and although they cannot well be regarded as the ideal of decorative Ferns, as they cannot be used for general purposes

on account of their vegetation being too slow, still, when grouped by themselves or with other Ferns of dwarf habit or of medium dimensions, they present a very striking appearance. Anemias are usually propagated from their spores, which germinate very freely, though some species of a naturally tufted habit may be successfully increased by division of the crowns, between the middle of March and the end of April.

A. adiantifolia.

This very handsome, evergreen, stove species is perhaps the best-known of the whole genus. It is a native of the West Indies, Central and South America, Southern Florida, Guatemala, Mexico, &c. Its fronds, which seldom exceed 1½ft. in height, including the very slender and very hairy stalks on which they are borne, are produced from a creeping rhizome, and have their veins repeatedly forked but not intermixed. They are bipinnate, except at the base, where they are thrice pinnate: their barren portion is shortly stalked, 6in. to 9in. long, 4in. to 6in. broad, deltoid, and furnished with spear-shaped leaflets, the lower pair of which are opposite and the others alternate. Their leaflets are of a leathery texture, dark green on both sides, wedge-shaped at the base, and sharply toothed on the margin, the basal ones being again divided to the midrib. The fertile panicle, situated at the base of the leafy or barren portion of the frond, consists of two upright, contracted segments 3in. to 4in. long, and borne on slender stalks 2in. to 3in. long: they are flattened, and bear two rows of acorn-shaped spore cases, provided with a terminal transverse ring—a character which is shared by all the species belonging to the same section.

A. cheilanthoides.

A popular appellation for *A. tomentosa*, and one for which there is no authority.

A. collina.

This very rare, stove species, also known as *A. hirta* of J. Smith, is a native of Brazil. It is quite distinct from most other known species owing to the rusty colour of the spreading hairs which densely clothe the firm, upright stalks 8in. to 12in. long. The fronds have their barren portion 6in. to 12in. long, 2in. to 3in. broad, and are composed of about twelve pairs of stalkless leaflets, which are about 1½in. long by ½in. broad, unequal-sided, blunt, and nearly entire: these are of an almost leathery texture, set further apart than in most other species, and the stalk of the leafy portion is,

ANEMIA—*continued*.

like the stalk proper, covered with spreading hairs of a rusty colour. The fertile portion, disposed at the base of the barren one, consists of contracted segments 2in. to 3in. long, disposed in a panicle, and borne on slightly hairy foot-stalks 4in. to 6in. long.

A. deltoidea.

Synonymous with *A. tomentosa*.



Fig. 65. *Anemia Dregeana*, a Natal species having a "panicle" 3in. to 4in. long.

A. Dregeana.

A stove species, native of Natal. Its fronds are borne on firm, slightly hairy stalks, 8in. to 12in. long; their barren portion, 8in. to 12in. long and 2in. to 3in. broad, is formed of from eight to twelve pairs of leaflets, which are 1½in. long, ½in. to ¾in. broad, unequal at the base, with their upper side somewhat heart-shaped, and their margin conspicuously toothed. These leaflets are of almost leathery

ANEMIA—*continued*.

texture, and their surfaces and rachis are covered with fine hairs: they show a distinct midrib often half-way to their summit. The fertile portion, situated at the base of the barren one, is composed of contracted segments, disposed in a panicle 3in. to 4in. long, with lower branches stretched out, and is borne on a stalk 3in. to 4in. long. Fig. 65.

A. flexuosa.

Synonymous with *A. tomentosa*.

A. hirta.

Synonymous with *A. collina*.

A. Langsdorffiana.

This stove species, native of South Brazil and Venezuela, has somewhat the general appearance of the popular *A. Phillitidis*, from which it differs in several respects, notably in having its veins free instead of intermixed.

A. Phillitidis.

This species, native of Cuba, Peru, and South Brazil, thrives equally well under either greenhouse or stove treatment. It is of much stronger constitution than most other species, for it produces from a single crown fronds frequently reaching 2½ft. in height, including the naked, light green stalks, 1ft. to 1½ft. long, on which they are borne. Their barren portion, 8in. to 12in. long and 4in. to 8in. broad, consists of a terminal leaflet and from four to twelve pairs of lateral ones, all stalkless, the lowest the largest, 2in. to 6in. long, 1in. to 2in. broad, pointed at their extremity, their base rounded or heart-shaped, they are bright green and of a tolerably tough texture, and have a distinct midvein extending to their extremity. The fertile portion, borne on a stalk 3in. to 8in. long, is composed of short, contracted segments, disposed in a dense panicle 4in. to 9in. long. *A. P. frazinifolia* is a variety with fronds seldom exceeding 1½ft. in length, including the somewhat hairy stalks, on which they are borne. Their barren part consists of a terminal leaflet and of eight or nine pairs of lateral ones; these are entire egg-shaped, 2½in. long, 1in. broad, and closely set together. The fertile portion, composed of short, contracted segments produced in pairs from the base of the lower leaflets, forms a very dense panicle about 9in. high, light green in its young stage, but turning with age to a peculiar light brown colour.

A. rotundifolia.

A stove species, native of South Brazil, having fronds borne on upright, slender stalks, which are 6in. to 9in. long

ANEMIA—*continued.*

and hairy in their young state. It is also distinct from nearly all other known species through the barren portion of the frond, 8in. to 12in. long and 1in. to 2in. broad, being frequently prolonged and rooting at its extremity. This barren portion consists of from eight to twelve pairs of distantly-placed, almost leathery leaflets 1in. long, $\frac{3}{4}$ in. broad, very blunt, with their lower side terminating abruptly at the base, their outer edge finely toothed, and their surfaces and rachis finely hairy. The fertile portion is composed of short, contracted segments, disposed in a panicle 2in. to 3in. long, borne on a slender stalk 3in. to 4in. long. One of the finest of "Flowering Ferns."

A. tomentosa.

In gardens this handsome species is also known as *A. cheilanthoides*, *A. deltoidea*, *A. flexuosa*, and *A. villosa*. It thrives equally well under either greenhouse or stove treatment. Its habitat extends from Mexico and the West Indies to Peru and Monte Video. It has a very singular appearance, produced by the rusty-coloured hairs with which its strong, upright stalks, 6in. to 12in. long, are densely clothed. The barren portion of the frond is 6in. to 12in. long, and about half as broad, sometimes bipinnatifid, and furnished with leaflets of almost leathery texture and densely hairy on both surfaces, a character which is also shared by their rachis. The lowest leaflets are the largest, and show blunt lobes often $\frac{3}{4}$ in. long and $\frac{1}{4}$ in. broad, nearly uncut. The fertile portion is composed of contracted segments disposed in a loose panicle 4in. to 9in. long, and borne on a stalk only 1in. to 2in. in length.

A. villosa.

Synonymous with *A. tomentosa*.

ANEMIDICTYON.

The plants formerly included under this genus are now referred to *Anemia*.

ANGIOPTERIS.

Although above sixty species are enumerated by Moore, only one of these has been recognised by Hooker and Baker as possessing sufficiently defined characters to rank as a species: all others usually known in gardens as distinct species are simply varieties of it. All the known forms of *Angiopteris* are of particularly robust habit, and are found

growing naturally in swampy places, most of them all over Ceylon, Java, and the Pacific Islands. They are therefore exceedingly useful for adorning the warm Fernery all the year round, and the cool Fernery during summer. Whether grown in pots or planted out, they should be kept in a mixture of two parts fibrous loam, two parts rough peat, one part chopped sphagnum, and one part coarse sand: in this compost they thrive luxuriantly, provided that at all times they receive a liberal supply of water at the roots and are allowed plenty of room fully to expand their gigantic foliage. When they are grown in pots, the same mixture should be used, but it is a good plan to keep the pots in water to the depth of 2in. or 3in.

Although spores of *Angiopteris* are frequently and freely produced, there is no record of any seedlings of these noble Ferns having ever been raised in England, or indeed in any other country in Europe. Propagation is, therefore, usually left to their natural disposition of frequently producing at the base of their fronds young plants, which, when sufficiently developed, may be detached without trouble. The most expeditious way of increasing *Angiopteris*, however, is by means of the scaly appendages with which the base of each frond is surrounded. Each of these fleshy scales contains at least two dormant buds, which, under the influence of heat and constant moisture, soon develop into subjects in all respects similar to the parent plant. The scales should be detached in their entirety, and not cut up, then laid in silver sand, covered with chopped sphagnum, and kept in a close propagating-case. Though this may be done at almost any season, February and March are the best months. According to the season in which this operation is performed, it is known that from three to five months usually elapse before the first indications of growth may be noticed; but after they have made a decided start, the young bulbils rapidly gain in strength, and may soon be considered as so many independent subjects.

ANGIOPTERIS—*continued.***A. evecta.**

This, the only recognised species, is found all over the tropics of the Old World, in Madagascar, in New Caledonia, in Queensland, and from Japan to Ceylon. Its fronds impart to a Fernery of sufficient size to accommodate them a noble and tropical appearance, but it is very unlike a Fern in general aspect. The fronds, with their stalks, attain a length of 18ft. and a breadth of 10ft.; they are produced from a thick, fleshy crown, forming in time a sort of stem $2\frac{1}{2}$ ft. high and $1\frac{1}{2}$ ft. to 2ft. thick, and are borne on stout, blackish, fleshy stalks. The base of the stalk is swollen, often measuring 8in. in circumference, and is furnished with two large, leathery ear-like flaps, which remain attached to the stem after the fronds have fallen. The fronds are bipinnate; with spreading leaflets 1ft. to 3ft. long, the lowest the largest, and have their rachis swollen at the base. The leaflets are of a leathery texture, bright shining green on both sides, from 4in. to 12in. long and from 1in. to $1\frac{1}{2}$ in. broad, boat-shaped, and either stalkless or very short-stalked (Fig. 66); their edge is entire or slightly toothed, and they terminate in a tapering point. The sori are oblong in form, and consist of from eight to fifteen capsules to each pinnule; they are disposed near the edge, where they form a broad marginal, and laterally continuous row. Fig. 66.

ANTIGRAMME. See *Scolopendrium*.

ARTHROPTERIS. See *Nephrodium* and *Nephrolepis*.

ASPIDIUM.

Buckler or Shield Ferns are the common names for this popular genus, and are in allusion to the form the covering of its sori, which may be fancifully likened to the Buckler or Shield of history. The distinguishing characters of the genus *Aspidium* reside partly in the disposition of the sori, which are almost spherical, dorsal, and terminal on the veinlets, and partly in the presence of a roundish covering common to all the species alike, which is fixed to the frond by the centre. The genus is thus subdivided: *Cyclodium*, *Cyrtomium*, *Euaspidium*, and *Polystichum*.

Very few *Aspidiums* are fastidious in their habits. The exotic species belonging to the *Polystichum* section are particularly robust; and

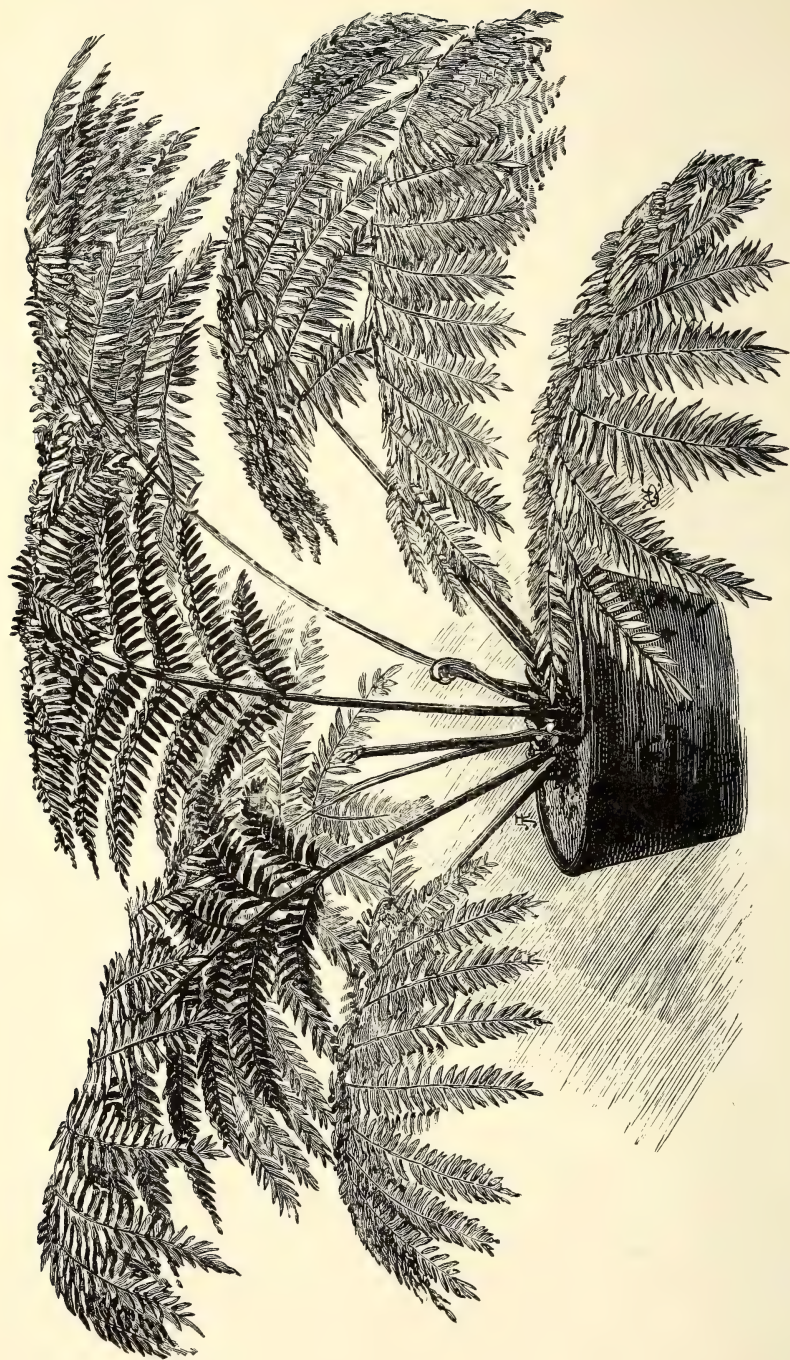


Fig. 66. *Angiopteris evecta*, a robust-growing species that imparts to a Fernery a tropical appearance.

whether adapted to stove or to greenhouse treatment, all thrive in a mixture of three parts sandy peat and one part fibrous loam. They also succeed admirably in places where light is not abundant, and where few other Ferns would hold their own. The British portion of this group is represented by the Prickly Shield Fern and its numerous varieties, all of which are free-growing, easily managed, and very desirable either for the outdoor rockery, for the indoor Fernery, or for pot culture. All are evergreen, delighting in a mixture of sandy loam and fibrous peat in equal parts, resting on a sound drainage. Although, when once established, the influence of strong slight is not injurious to them, they produce much finer fronds when given a shady situation. During the growing season they require to be freely supplied with water at the roots, and to be kept constantly moist during the winter. British *Aspidiums* are also excellent Ferns for pot culture, as they bear indoor treatment much better than most native Ferns. Except in cases of rare varieties, which are only increased by division of the crowns, their propagation is usually effected by means of spores; these are abundantly produced. If sown as they ripen, at the end of the summer, they germinate rapidly, and make, during the following summer, young plants which are very valuable for the decoration of the greenhouse and of the conservatory during the ensuing winters.

The deservedly popular Ferns belonging to the section *Cyrtomium*, and of which *A. falcatum* is the best, are amongst the most useful known decorative plants, on account of their rapid growth and their firm, leathery texture; while all are distinct and handsome. They thrive even in rooms and on staircases, where their leathery foliage seems to defy draughts, smoke, and gas better than any other Ferns. On that account such Ferns as *A. (Cyrtomium) falcatum* and its varieties (Fig. 67) are grown in immense quantities to supply the market. Their bold and shining foliage forms a striking contrast to that of finer-cut species when planted out in the cool Fernery. For that special purpose such plants are of

the greatest value, as by their use additional charm may be given to the rockery not heated artificially, but simply protected by glass, where they, being of an evergreen nature, retain their beauty all winter. Their culture is very simple, and their requirements



Fig. 67. *Aspidium falcatum pendulum*, a beautiful and enduring variety much in request for growing in rooms.

are particularly limited. The best compost is one consisting of about equal parts fibrous loam, peat, and silver sand; but care must be taken that they are not potted hard, or, if planted out, that the soil round them is kept moderately loose. They require

an abundant supply of water at the roots during the growing season, and frequent syringings overhead are beneficial during that time, but during winter they should be watered sparingly. Like most other *Aspidiums*, propagation of the *Cyrtomium* section is best effected by spores, which are abundantly produced, and which germinate very freely if sown as soon as gathered.

A. acrostichoides.

When fully developed, the leafy portion of the fronds is 1ft. to 2ft. long, and rarely as much as 5in. broad. On each side of the midrib are from twenty-four to thirty leaflets, the uppermost of which become gradually smaller, the frond ending in a short, serrated point. The largest of the barren leaflets are 2in. to 3in. long, $\frac{1}{2}$ in. broad in the middle, oblong or oblong-spear-shaped from a very unequal base, being suddenly narrowed to a short stalk on the lower side of the base, but furnished on their upper side with a well-developed, triangular, bristle-tipped ear; their margin is finely dented with incurved bristle-tipped teeth. They are tough as to texture, deep green, very smooth and shining on their upper surface, paler and minutely chaffy beneath. In the fertile fronds, which are usually taller, the upper third part is suddenly contracted, so that the lowest fertile leaflet is not more than two-thirds as long or as broad as the barren one next below it. The sori occupy the whole under-side of the fertile pinnæ. Though hardy in most parts of this country, this highly decorative Fern proves most useful when grown in either the cold house or the conservatory; its fronds last there much longer than on plants outside. This is the Christmas Fern of the United States.

A. a grandiceps.

A very handsome variety, of garden origin, and the only crested North American Fern at present in commerce. It is smaller and altogether more compact than the type, from which it also differs by the large crests formed at the end of the fronds, and the crests of smaller dimensions with which their leaflets are ornamented. It is equally desirable for the hardy Fernery or for the conservatory.

A. a incisum.

A pretty form, having broader fronds than the type; the leaflets also are wider, deeply cut, and sharply pointed.

A. aculeatum.

Known by the popular name of Prickly Shield Fern, this handsome hardy species, whose brilliant, shining fronds are

ASPIDIUM—*continued.*

of quite an evergreen nature, is a Fern of the most cosmopolitan character. It is recognised as a native of North America and India alike, also of all parts of Europe, where it is found in situations varying from the sea-level to an altitude of above 3000ft. As a British species it is being widely distributed, but generally found on damp, shady banks, along hedgerows, or in woods, and usually in somewhat stiff, loamy soil. As will be seen from Fig. 32, it is a particularly strong, bold-growing species. It has produced comparatively few striking varieties.

A. amabile.

This very pretty species thrives in either the intermediate or the warm house. It is a native of Nepaul, Ceylon, the Malaccas, Formosa, and Japan. It is of medium growth, for its spear-shaped fronds, 1ft. or more long and 6in. to 9in. broad, are borne on slender, polished stalks slightly scaly below. The leafy portion is composed of a long terminal leaflet and from six to nine lateral ones, disposed on each side of the midrib; these are leathery, and of a soft green colour, 6in. to 8in. long and 1in. to 1½in. broad; sometimes the lowest are slightly compound at the base. The subdivisions, ½in. to ¾in. long, are of a peculiar shape, having at least half their lower side cut away, the upper side and the outer part of the lower one being lobed and sharply saw-toothed. The sori are disposed close to the margin of the fertile leaflets.

A. angulare.

Botanically this very handsome Fern, popularly known as the Soft Prickly Shield Fern, is but a form of *A. aculeatum*. To the cultivator, however, it is abundantly distinct. It is evergreen, its elegant foliage remaining in perfect condition until long after the new growth is developed. In habit it is more pendulous than *A. aculeatum*, and its fronds, which frequently attain 3ft. in length and 6in. to 9in. in width, are usually lax, spear-shaped, and bipinnate: they are produced from a stout, tufted, short stem, are numerous, spreading, and arched, and, like the stalks and the crown itself, are covered with reddish-brown, chaffy scales. The plant is very widely distributed, being found in Sweden, Norway, France, Spain, and Italy alike in Europe; in various parts of India, Abyssinia, and Natal; in Madeira, the Canary Islands, and the Azores; in North America, Mexico, Guatemala, Caracas, Java, New Granada, and Singapore. Even in England it has a wide range. With regard to variation, this species differs essentially from *A. aculeatum*, which is

ASPIDIUM—*continued*.

singularly constant in its character, whereas of the Soft Prickly Shield Fern some remarkable varieties have been either found wild or raised artificially from spores in such quantities that the forms affected by the fronds are very extensive, and many of them are remarkably handsome and decorative. Thus we have forms of much larger size than the species from which they spring, and others very dwarf; some with very broad fronds, as we also have particularly narrow-fronded varieties. In a popular work like this no good purpose would be served by recording all the varieties thus obtained. Those interested will find them fully described in Druery's "British Ferns."

A. capense.

A handsome and very useful greenhouse species, native of the Cape of Good Hope, but found in a wild state in various other places. Its fronds, of a very leathery texture and of a shining nature, have both surfaces naked; their leafy portion is nearly deltoid in form, tripinnate, 1ft. to 3ft. long and 1ft. to 1½ft. broad, and is borne on a firm, erect, greyish stalk, densely scaly below. The lowest leaflets frequently measure 6in. to 10in. long by 3in. to 4in. broad; they are oblong-spear-shaped, sharp-pointed, wedge-shaped at the base and have bluntly-lobed segments. The sori are disposed in two rows nearly filling the space between the midrib and the edge. In gardens this species is also known as *A. coriaceum*.

A. coriaceum.

A garden name for *A. capense*.

A. falcatum.

Ferns belonging to the *Cyrtomium* section form a small group of most useful subjects in the genus *Aspidium*, but this species and its several varieties surpass all others in being best adapted for indoor decoration. Although all known forms of *Cyrtomium falcatum* are, in commerce, considered as so many species, they are simply varieties of *A. falcatum*, a species with a very wide range of habitat, being known as a native of Japan, China, the Himalayas, Neilgherries, &c. Its handsome fronds, 1½ft. to 2½ft. long and 6in. to 9in. broad, are borne on stout stalks 6in. to 10in. long, and densely clothed, especially at the base, with large light brown scales. They are produced from a very stout crown of a particularly scaly nature, and are spear-shaped, simply pinnate, and of a shining dark green above but paler underneath. The numerous leaflets are stalked at the base of the frond, but stalkless in its upper

ASPIDIUM—*continued*.

half; they are sickle-shaped, 4in. to 6in. long, lin. to 2in. broad, sometimes eared, the lower side rounded or obliquely truncate at the base. The sori are bold and pretty, being thickly scattered over the whole under-surface of the frond. Although generally considered as a greenhouse Fern, this species has proved perfectly hardy out of doors in various parts of England, Ireland, and Wales. In these cases, however, it became deciduous, though the vigour of the plants remained unimpaired.

A. f. caryotideum.

This variety, of Japanese origin, is totally distinct from the type in its drooping habit and also in the colour and shape of its fronds, which, instead of being dark green, are of a most conspicuous light green tint. It is erroneously known as *Cyrtomium Fortunei*.

A. f. Fortunei.

In commerce this Japanese variety is sometimes called *Cyrtomium Anomophyllum*, and differs from the type in having the leaflets narrower and more opaque. The fronds, too, produced in greater quantities, are also of a more upright habit, 2ft. to 2½ft. long, and their leaflets, slightly eared at the base, are of a rather thin texture, and of a dull dark green colour when matured, but prettily mottled with lighter green in their young state. It is quite as hardy, and reproduces itself true from spores.

A. f. pendulum.

A very elegant garden variety, whose chief distinction lies in its pendulous habit. Fig. 67.

A. falcinellum.

A pretty, greenhouse species, of medium growth, native of Madeira, having oblong-spear-shaped, very leathery fronds, 1ft. to 1½ft. long and 4in. to 6in. broad, borne on somewhat slender stalks 4in. to 8in. long, densely clothed, especially below, with spear-shaped blackish-brown scales. The central leaflets are about 3in. long and ¼in. broad, but gradually become smaller towards the base and summit of the frond; they are all short-stalked, their upper side is bluntly eared and their lower one obliquely truncate at the base, and their edge is finely saw-toothed. The bright green of the fronds, and the bold nature of the large sori, disposed in two long rows, with their conspicuous indusia, render this Fern one of the most attractive of the whole genus.

A. frondosum.

A beautiful, evergreen species, native of Madeira. Its fronds, 1ft. to 2ft. long and 9in. to 12in. broad, are of a rich,

ASPIDIUM—*continued.*

shining green; they are borne on strong, straw-coloured or pale brown, usually polished stalks 1ft. to 2ft. long, but densely scaly below. The lowest leaflets measure from 6in. to 12in. in length and 3in. to 4in. in breadth, and are borne on comparatively long footstalks. Their leaflets, of a somewhat leathery texture, are spear-shaped, very unequal-sided, pinnatifid, with rounded lobes terminating in sharp-pointed teeth, and obliquely truncate at the base below. The sori are plentifully produced, and are disposed principally in two rows close to the midrib.

A. laserpitiifolium.

Much better known under the popular name of *Lastrea Standishii*, this very handsome, greenhouse Japanese Fern has proved hardy in several parts of England and Ireland. It is of robust growth and very elegant habit, producing from a slowly-creeping rootstock of a woody nature, roughly scaly, and remaining on the surface of the ground, fronds which frequently measure 2½ft. in length by 1½ft. in breadth at their widest part, and which are borne on stout, fleshy, light green stalks quite 1ft. long. The leafy part, of a somewhat broad spear-shaped form, is tripinnate, being abundantly furnished with spear-shaped leaflets, which are in their turn subdivided into leaflets of the same shape and of leathery texture, so closely set as to overlap, and these, being very numerous and bluntly lobed, give the whole plant a very massive, though feathery and beautiful, appearance.

A. lepidocaulon.

A very interesting, greenhouse species, native of Japan and Tsus-Sima, with fronds of a dark green and shiny nature and of a leathery texture, like those of the popular *A. (Cyrtomium) falcatum*, but usually much longer, drooping, and rooting at their extremity. The chief peculiarity of this Fern is that the upper part of its fronds is totally unprovided with leaflets, and terminates in a long, tailed process, producing at the extreme end a solitary bulbil, which later on develops into a perfect plant. A splendid basket or bracket Fern.

A. Lonchitis.

This very handsome species, which is generally known under the popular name of "Holly Fern," but which sometimes is also called the "Alpine Shield Fern," is of very cosmopolitan character. Though usually accepted as a plant of true British origin, it is so extensively distributed as to be considered native of almost all parts of the globe. *A. Lonchitis* has a thick and almost woody rootstock

ASPIDIUM—*continued.*

densely covered with the overlapping bases of former stalks. The newer portion is of a very chaffy nature, being thickly clothed with large, egg-shaped scales of a peculiar rusty-brown colour. The stiff leathery fronds are smooth and shining, very dark green in colour, and are disposed in shuttlecock fashion at the top of the rootstock. They are borne on scaly stalks lin. to 4in. long, vary in length from a few inches to 1½ft., and are from lin. to 2in. broad. According to Mr. Reeve it is best grown in "a shady part of the rockery, where it can be kept constantly damp without ever being wet." It must be planted firmly in a compost of equal parts sandy loam and peat with a liberal admixture of sand, as early in the spring as possible, and if a hand-glass or bell-glass is placed over it for a short time it is all the better, as this will keep the soil moist about it for some time without the application of much water, after which it should be gradually inured to more air. It is usually increased by means of its spores, which should be sown as soon as ripe. Division of its crowns is at all times a very risky operation.

A. macrophyllum.

The plant usually listed under this name is *Nephrodium macrophyllum*.

A. mucronatum.

This lovely, dwarf, close-growing, evergreen, easily-cultivated, stove species is a native of Jamaica, and through the leathery texture of its fronds, their dark colour, and their stiff habit, somewhat resembles our Holly Fern (*A. Lonchitis*), though more graceful in habit (Fig. 68).

A. munitum.

When well grown and fully developed, this is one of the finest of North American Ferns. The spear-shaped evergreen, leathery fronds are bright shining green above and paler beneath. They seldom exceed 2ft. in length and 8in. in breadth under cultivation, and are borne on tufted, straw-coloured stalks 4in. to 9in. long, densely clothed with large, glossy, light brown scales. The leaflets, which are very numerous, are from 3in. to 4in. long, ½in. broad, and closely set; they are nearly straight, and their margin is finely but sharply saw-toothed. The large and conspicuous sori are disposed in two rows near the edge.

A. pungens.

Very pretty greenhouse species, native of the Cape Colony and Natal, chiefly distinguished by the wide-creeping

ASPIDIUM—*continued.*

nature of the underground rhizome, from which its somewhat leathery spear-shaped fronds, 2ft. to 3ft. long by 9in. to 10in. broad, and borne on slightly scaly stalks 1ft. long, are abundantly produced. This species is prolific, being usually provided at the end of its fronds with a solitary bulbil that develops into a perfect plant.



Fig. 68. *Aspidium mucronatum*, a close-growing evergreen species, resembling in habit the popular Holly Fern, but of more graceful habit.

A. setosum.

One of the most popular kinds grown for decorative purposes on account of its enduring nature. Its appearance is somewhat similar to that of our *A. angulare*, but its evergreen fronds, $1\frac{1}{4}$ ft. to $1\frac{1}{2}$ ft. long and 4in. to 6in. broad, are borne on stiff stalks 8in. to 10in. long and of a very scaly

ASPIDIUM—*continued*.

nature (Fig. 69). These fronds are densely furnished with dark shining green leathery leaflets, subdivided into leaflets that are somewhat heart-shaped but terminate in a sharp bristle, and so closely set as to be in some cases quite overlapping. Hardy in sheltered positions in the West and South of England. Synonymous with *Polystichum setosum*.



Fig. 69. *Aspidium setosum*, a species remarkable for its lasting qualities, and one that is hardy in favoured parts of England.

A. triangulare laxum.

A garden name for a Fern with elegant, long, and very narrow drooping fronds. On account of its leathery texture it is useful for decoration. It is synonymous with *Polystichum xiphoides*.

A. triangulum ilicifolium.

A greenhouse variety, native of Northern India. Its fronds, 6in. to 9in. long and 1in. to 2in. broad, are borne on slender stalks 1in. to 2in. long, clothed throughout with large scales of a light brown colour. The leaflets are about 1in. long, abruptly pointed at their extremity (Fig. 33), and cut

ASPIDIUM—*continued*.

down below to the stalk into spear-shaped or sharp-pointed, narrow lobes of a leathery texture. The sori are disposed principally in two rows near the midrib.

A. trifoliatum.

When well grown, this stove species, native of the West Indies and Tropical America, is one of the most conspicuous of all cultivated Ferns. Its bold-looking fronds, 1ft. to 1½ft. long and 6in. to 12in. broad, with a large terminal leaflet narrowed or forked at the base, are borne on tufted, brownish, stout stalks 1ft. or more long and scaly only at the base. They also usually have on each side one or two lateral leaflets of a nearly triangular shape, the lowest of which are mostly forked; these leaflets are of a soft, papery texture and bright green colour; they are also fertile throughout. The abundant sori, disposed in rows near the main veins, are gigantic and conspicuously black.

A. tsus-simense.

Probably only a slender form of *A. aculeatum*, of a particularly compact habit and dark green colour.

A. vestitum.

This very handsome, evergreen, greenhouse species, native of New Zealand, Tasmania, and Chili, is of smaller and more compact habit than most of the species belonging to the section *Polystichum*, and it makes a very pretty specimen plant. The fronds, which are produced from a tufted rhizome, are of a particularly dark green colour; they are from 9in. to 12in. long and are borne on stalks of similar length, and densely clothed with bright-coloured scales. These fronds are almost spear-head-shaped and bipinnate; their oblong, pointed leaflets are furnished with leaflets some of which are eared at the base, while the majority of them are wedge-shaped, with a sharp tooth at their point. The distinct and conspicuous sori are disposed in one row on each side of the midvein of the fertile pinnules.

A. viviparum.

Better known under the names of *Polystichum viviparum* and *P. trapezioides*, this stove species is a native of the West Indies, and is distinct from nearly all other species on account of its producing at the extremity of the fronds a solitary bud or bulbil from which the plant may be easily propagated. Its very handsome fronds, 1ft. to 1½ft. long and 4in. to 6in. broad, are borne on stalks, 4in. to 6in. long, covered with large, spear-shaped scales at their base, the lower ones nearly black in the centre. The numerous

ASPIDIUM—*continued*.

leaflets are very leathery and dark shining green, nearly spear-shaped, the central ones 2in. long and $\frac{1}{2}$ in. broad; their edge is more or less deeply lobed. The sori are disposed in two or four rows.

ASPLENIUM.

Spleenwort is the popular name given to this genus, on account of the supposed property of curing affections of the spleen with which these plants were formerly credited. Aspleniums differ from most other Ferns by the disposition of their sori, which are attached to the veins, and which, instead of being parallel with either the midrib or the margin of the frond, are oblique to the midrib, and are of a peculiar linear-oblong shape. The family is very rich in plants suitable for decoration, and those with long, drooping fronds are, on account of their leathery texture, particularly well adapted for hanging-baskets. Worthy of remark, too, is the number of native Aspleniums that may fairly lay claim to be classed as choice.

The genus, as now understood, includes *Anisogonium*, *Athyrium*, *Ceterach*, *Cænopteris*, *Darea*, *Diplazium*, *Euasplenium*, *Hemidictyum*, *Neottopteris*, and *Thamnopteris*.

Aspleniums succeed best in a mixture of fibrous loam, peat, and sand, in equal proportions. In potting, great care should be taken that the drainage is as perfect as possible, as, if it is at all defective, the plants will soon become flabby and generally out of condition. With the exception of a few dwarf species, which grow naturally in walls or in fissures of rocks, Aspleniums, above all, dislike being potted hard. Though many will stand the full rays of the sun under glass, it is not beneficial in any way to the plants, which, instead of being of a healthy, bright, shining green colour, as nearly all of them are when in good condition, have a yellowish tint, although they may perhaps be hardier than those grown in partial shade. Being native of countries very distant from one another, and being found wild under totally different conditions, it will be

easily understood that *Aspleniums* require varied treatment. On that account, while some species and varieties need stove temperature to develop their foliage to perfection, others do well in a greenhouse temperature; while a few may even be used in the hardy Fernery. Although the majority of the hardier kinds—even our own *A. marinum*—grow very well for a time under the influence of strong artificial heat, it must be borne in mind that it is only a fictitious growth, as those species native of New Zealand, as well as our British kinds, are much more robust, although of slower growth, when kept in a lower temperature. A considerable number of exotic *Aspleniums* are either viviparous or at least proliferous at their apex. In either case, if there is any desire to increase the stock of any particular viviparous or proliferous species, the portion of the fronds bearing the rudiments of young plants should be fastened down to the soil by means of wooden pegs, in the way suggested when dealing with Propagation generally. None of the British *Aspleniums* are known to possess these viviparous or proliferous characters, and their propagation is usually effected through the division of their crowns, although they may with advantage be increased from their spores, which mostly ripen in the autumn and germinate freely during the following spring.

As is only to be expected in so vast a genus, there are a few individuals that need special soil or special treatment; but these are easily catered for, and are comparatively few in number. The staple soil has already been given; but for ferns like *A. bulbiferum Fabianum*, so highly prized for table decoration; *A. caudatum*, one of the most beautiful of all for baskets; and *A. formosum*, another lovely species, peat and sand alone should be employed. For *A. Adiantum-nigrum* leaf-soil, sandy loam, lime rubbish, and fibrous peat, in about equal parts, should be provided. The elegant Lady Fern should be planted in a moist, shady situation—at the foot of a rockery, and in turfy soil; it is not as a rule a

good pot subject. Strange as it may appear, our native Sea Spleenwort (*A. marinum*, Fig. 70) is best grown under glass—a method of treatment that also suffices to bring out the best characteristics of other hardy species and varieties. *A. fontanum*, *A. Goringianum pictum*, and *A. lanceolatum* are all best grown as greenhouse subjects. The compost for the first should consist of sandy peat, broken bricks, and old mortar rubbish; that



Fig. 70. *Asplenium marinum*, a lovely little fern that succeeds best under glass.

for the second, two parts leaf-mould to one each of fibrous loam and silver sand; and for the last of peat, lime-rubbish, small pieces of broken bricks, and leaf-mould in about equal parts. Our native *A. Trichomanes* must have a light, airy position, and be planted in a mixture of porous, loamy soil, lumps of sandstone, and old lime-rubbish. For forming an edging, planted between stones, to the outdoor Fernery, it is a most effective species. The Bird's

Nest Fern, *A. Nidus*, gives a splendid "tropical" effect in the outdoor summer bedding arrangements, but it must not be placed in full sunshine.

It is worthy of special note that all *Aspleniums* are particularly free from the attacks of such pests as thrips, green fly, and mealy bug, and are naturally clean plants, their worst enemies being woodlice and slugs, which are fond of their succulent stalks. The former may be fought by means of phosphorus paste, and the latter with Slugicide.

A. *Adiantum-nigrum*.

This hardy, evergreen species, popularly known as the Black Maidenhair Spleenwort, is a native Fern, and is also found in quantities almost all over the world. The fronds, 6in. to 12in. long and 4in. to 6in. broad, are borne on chestnut-brown, nearly black, polished stalks usually 6in. to 9in. long, but sometimes longer than the leafy portion of the fronds; they usually taper to a long, narrow point, and are of a deep shining green colour above and paler beneath. These fronds are furnished on each side with numerous leaflets, 2in. to 3in. long and 1½in. to 2in. broad, cut down to a compressed, winged stalk into numerous leaflets, which frequently are in their turn cut down into oblong segments sharply toothed round the outer edge, so that according to their state of development or to their size the fronds may be said to be twice, thrice, or almost four times divided to the midrib. The fronds are very lasting and highly valued on that account. They are extensively sold in the market as "French Fern."

This useful species has, in its wild state, produced several variations, the most distinct of which are—*A. A.-n. acutum*, *A. A.-n. decompositum*, *A. A.-n. grandiceps* (Fig. 7), *A. A.-n. incisum*, *A. A.-n. microdon*, *A. A.-n. obtusatum*, *A. A.-n. oxyphyllum*, *A. A.-n. ramosum*, and *A. A.-n. variegatum*.

A. *attenuatum*.

This singular, dwarf, rigid Fern, native of New South Wales and Queensland, requires stove temperature. Its dark green fronds, their fleshy texture, and their narrow, ragged outline, strikingly contrast with other species. They are scarcely divided, becoming pinnatifid only at the base; they rise from a short, erect crown, and are borne on short stalks covered with narrow, blackish scales; their length varies between 6in. and 12in., and they are usually

ASPLENIUM—*continued.*

proliferous at their extremity (Fig. 15). The lowest lobes which are oblong or roundish, reach down nearly or quite to the crown. The large and comparatively few sori occupy much of the lower surface, where they reach nearly to the edge.

A. Baptistii.

This very handsome stove species, of medium growth, is a native of the South Sea Islands, the habitat of many good Ferns known in cultivation. It is a perfectly distinct plant, producing from a stout, decumbent stem broadly ovate fronds about 1ft. long, borne on stalks 6in. to 8in.



Fig. 71. *Asplenium Belangeri*, a species noteworthy for the disposition of its fronds in a graceful plume.

long; they are bipinnate. The leaflets, about 5in. long, are borne on short stalks; each of them is provided with four narrow leaflets 2in. long, equally disposed on short, slender stalks, and a terminal lobe, $3\frac{1}{2}$ in. long and $\frac{1}{4}$ in. broad, furnished with distinct marginal teeth pointing forwards, and terminating in a long-attenuated point, which is toothed nearly to the end. The slender stalks of both leaflets and leaflets give a very open appearance to the centre of the fronds, which are of a thick and leathery texture, and dark green in colour. The long, narrow, and straight sori are parallel with, and close to, the midrib.

A. Belangeri.

An evergreen stove species, native of Java, Sumatra, and Borneo, and one of the most elegant of the genus,

ASPLENIUM—*continued.*

forming a graceful plume of finely-divided fronds, spreading on all sides. It is better known as *A. Veitchianum*. The fronds, 1ft. to 1½ft. long, 2in. to 3in. broad, and bipinnate, are borne on firm, erect, smooth stalks of a greenish colour and from 4in. to 8in. long. The numerous and closely-set leaflets are almost horizontal, 1in. to 1½in. long, ½in. broad, and proliferous on their entire length; they are rounded at the point, truncate at the base on the lower side, and regularly cut down throughout to a broadly-winged stalk into blunt, linear lobes or leaflets; the latter are all simple except the basal one on the upper side of the pinnæ, which is always once and frequently twice forked. The spore masses, produced over the whole under-surface of the frond, are long and narrow; one is disposed on each segment or lobe, where it is situated on the exterior side, and as is characteristic of plants belonging to the sub-genus *Darea*. These spore masses open on the outward side—the side turned away from the rachis. Fig. 71.

A. biforme.

Synonymous with *A. dimorphum*.

A. bulbiferum.

Perhaps the best-known and most universally grown of all the *Aspleniums* is this greenhouse species, from New Zealand, Australia, &c., owing to its rapid growth, its robustness, and its easy cultivation; while the fact of its being viviparous in the highest degree accounts for its being met with in almost every collection. It is also one of the best of all Ferns for dwelling-rooms. Its fronds, 1½ft. to 2ft. long and 8in. to 12in. broad, are borne on stalks 6in. to 10in. long, green on the upper side and brown below; they are spear-shaped, bearing numerous oblong leaflets, 4in. to 8in. long and 1½in. to 2in. broad, cut down to a compressed, winged stalk into numerous somewhat egg-shaped leaflets, the largest of which are usually situated near the midrib, and wedge-shaped at the base. Though of a naturally erect and somewhat stiff habit, the fronds are usually quite pendulous by the great quantities of young plants with which their entire surface is covered at some time of the year, and these young plants may frequently be seen with half-a-dozen fronds of their own. The principal varieties of this species are *A. b. Fabianum* and *A. b. laxum* (commonly known in commerce under the name of *A. laxum pumilum*). The latter is particularly handsome.

ASPLENIUM—*continued.***A. caudatum.**

A very interesting and highly-decorative stove species, native of India, Polynesia, Java, Brazil, Ecuador, &c. Its fronds, 1½ft. to 2ft. long, 4in. to 8in. broad, and borne on firm stalks 4in. to 6in. long, densely clothed with fine, small, brown scales, are composed of from twenty to thirty pairs of leaflets 3in. to 4in. long and comparatively narrow, seldom 1in. broad, elongated, spear-shaped, usually opposite, and pinnatifid; these leaflets are broadest at the base and attenuated at their extremity, with their edge deeply toothed and their two sides unequal, the upper one being eared and narrowed suddenly, and the lower one very obliquely truncate at the base. The fronds are of nearly the same breadth throughout, except near the apex, where they suddenly become narrower and terminate in a tail-like appendage, usually bearing one solitary bulbil, or sometimes two, from which the plant may be readily propagated. Its sori are of a bright reddish-brown colour when mature, disposed on either side of and parallel to the midvein, along the whole length of which they form a close double row; besides these, one or more, usually not so bold, run longitudinally along the segments and at a slight angle to those near the midvein.

A. Ceterach.

This species, of dwarf habit, generally known as *Ceterach officinarum*, and popularly called Scaly Ceterach, Scaly Spleenwort, or Scale Fern, is of a very cosmopolitan character, for, besides being essentially a British Fern, it is also known to be indigenous throughout Europe, Northern Asia, British India, &c. The "scales" giving rise to the popular names are situate on the under-surface of the leathery fronds. The fronds, 4in. to 6in. long and 1in. or less broad, are cut down nearly or quite to the rachis into alternate, blunt, nearly entire, roundish lobes, with a rounded depression between them. These fronds are produced in great abundance from a close, central crown, and, although they frequently shrivel up completely during the dry weather, as also during the winter, they spread out afresh as soon as the plant is exposed to a certain degree of moisture. Fig. 4, p. 7.

A. C. aureum.

This charming Fern, also known as *Ceterach canariensis* of Willdenow, although usually termed a species, is undoubtedly only a large variety of *A. Ceterach*; it differs in its much more vigorous habit and also in the disposition

ASPLENIUM—*continued.*

of its beautiful fronds, which are usually produced from a single crown. Although requiring warmer treatment than the type, it is more amenable to cultivation, and will be found to do well in a mixture of three parts sandy peat and one of loam and sand, with small pieces of limestone. When potted in such light material it requires a pretty liberal supply of water at the roots, but the drainage must be perfect. There are numerous forms of this.

A. Colensoi.

A useful and very elegant greenhouse species, native of New Zealand, frequently found in the trade under the erroneous name of *A. Hookerianum*, which is properly applied to a plant of entirely different appearance. The species dedicated to Bishop Colenso is much in the way of the well-known *A. bulbiferum*, but of more compact habit and of much smaller dimensions in all its parts. When fully developed, the fronds are literally studded all over with young plants, by which means this species is usually propagated.

A. dimorphum.

This very handsome greenhouse Fern, native of Norfolk Island, is undoubtedly one of the most elegant of the whole genus. It is also known in commerce under the names of *A. biforme* and *A. diversifolium*. These significant synonyms are very applicable to a species whose barren and fertile fronds or portions of fronds are so entirely different that, unless seen growing upon the plant, it is difficult to reconcile the two as belonging to the same subject, the one having the leaflets narrow and thread-like, while in the other they are broad and not unlike the leaf of a celery-plant on a small scale. *A. dimorphum* is a remarkably variable species, having its fronds sometimes all fertile, sometimes all barren, while it is not at all unusual to find that the lower portion of a frond is barren while the upper part of it is fertile. It is a plant of exceptionally good constitution and very prolific, producing on the upper surface of its fronds numerous small bulbils, by which means it is usually propagated. The sori, single on each pinnule, are situated on the inner edge and very long, occupying generally three-fourths of the length of the pinnule.

A. diversifolium.

Synonymous with *A. dimorphum*.

A. ebeneum.

This charming greenhouse species, although given as from Ecuador and Cape Colony, is a small-growing Fern

ASPLENIUM—*continued.*

essentially indigenous in North America. The general appearance of the plant is that of an erect-growing, elongated form of our own *A. Trichomanes*. The pretty fronds are 1ft. to 1½ft. long and 2in. to 3in. broad. Fig. 72.

A. elegantulum.

Synonymous with *A. incisum*.

A. erectum.

Synonymous with *A. lunulatum*.

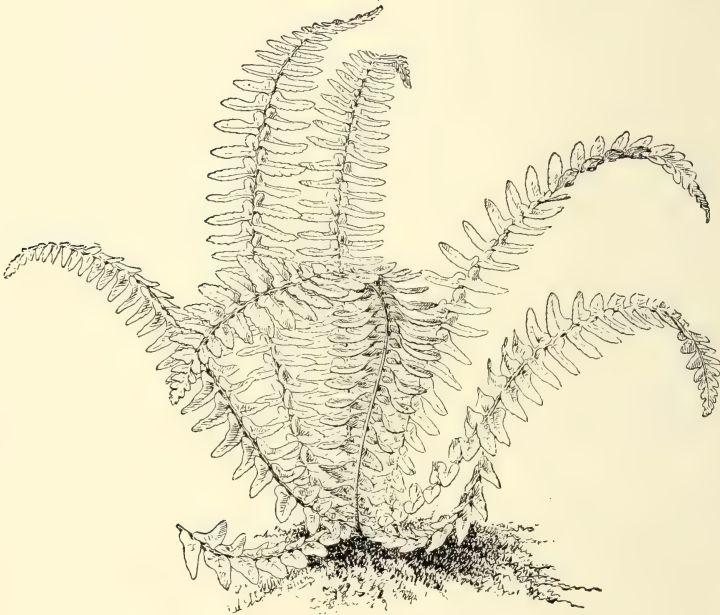


Fig. 72. *Asplenium ebeneum*, a North American species having considerable resemblance to our native *A. Trichomanes*.

A. Filix-fœmina.

This, the popular Lady Fern, is one of the easiest to grow as well as one of the most decorative of our native species. The fronds, 1ft. to 3ft. long, and 6in. to 12in. broad, are borne on firm, erect, straw-coloured or brownish stalks, scaly below and 6in. to 12in. long; they are remarkably light in form, plume-like and graceful, and are disposed in a crown situated at the summit of a rootstock which in old plants is often very large and stem-like, but which, even then, remains lying upon the surface of the ground. The leafy

ASPLENIUM—*continued.*

portion of the fronds is oblong-spear-shaped, with numerous leaflets, the lower ones of which are spreading, spear-shaped, 3in. to 6in. long and 1in. to 1½in. broad, cut down to a compressed, winged stalk, into leaflets which in their turn are again deeply incised. The texture is soft and papery. The sori are usually linear-oblong, though the lower ones are often curved.

No British Fern is so variable in its forms and in its dimensions as this one, for its varieties, though they all pass into one another by various gradations, are innumerable. No good purpose would be served by describing these here. Anyone interested in such variations from the type would do well to purchase Drury's "British Ferns."



Fig. 73. *Asplenium fontanum*, one of the gems among the small growing species of the genus, pretty as to frond, and compact as to habit.

A. flaccidum.

Very variable, greenhouse, evergreen species, native of Australia, Tasmania, and New Zealand, and one of the most appreciated of all the basket Ferns adapted to cool treatment. The fronds are from 2ft. to 3ft. in length, 4in. to 8in. broad, and are borne on stout, though flexible, greenish, naked stalks 4in. to 8in. long; these are furnished with numerous close or distant spear-shaped leaflets of a thick, leathery texture and deep green colour, 4in. to 8in. long, ½in. to ¾in. broad, sometimes rather rigid and recurved, sometimes quite flaccid and drooping like the main stalk, occasionally deeply pinnatifid, but oftener cut down to the thick midrib into oblique or nearly sickle-shaped, narrow-linear lobes, upon which the sori are quite marginal.

ASPLENIUM—*continued.***A. fontanum.**

One of the prettiest of the dwarf, compact-growing species contained in the genus (Fig. 73). It is known to grow wild in various parts of France, Switzerland, Italy, Spain, Germany, Siberia, and also in Britain. The fronds, 3in. to 6in. long, including the slender, wiry, naked, greenish stalks on which they are borne, and about $1\frac{1}{2}$ in. broad, are oblong-spear-shaped, broadest above their middle, and tapering towards the base and the extremity; they are furnished with numerous dark-green leaflets, about $\frac{1}{2}$ in. long, and cut down to the midrib into several leaflets, which are again pinnatifid. The margin of each lobe is deeply notched with from three to seven angular teeth. The plentiful sori are disposed from two to four on each pinnule, but when mature they become confluent and then cover nearly the whole of the under-surface of the frond.

A. formosum.

This elegant, delicate-looking, small-growing, evergreen, stove species, which, by the wiry, polished nature of its dark-coloured stalks, approaches the *Trichomanes* group, is a native of Tropical America; it is also found in Ceylon and on the Neilgherries. Its lovely fronds, which are produced abundantly from a very short, upright stem, are of a papery texture and of a particularly light green colour; they are borne on very short, tufted, polished stalks, of a chestnut-brown colour, and measure from 1ft. to $1\frac{1}{2}$ ft. in length and about 1in. in breadth. They are furnished with from twenty to thirty pairs of horizontal stalkless leaflets, $\frac{1}{2}$ in. long, deeply divided almost to the midrib on their upper edge, while their lower edge is wedge-shaped, and forms a straight line. The short, narrow-oblong sori are disposed from one to four on each side of the midrib.

A. Goringianum pictum.

This remarkably pretty greenhouse species, popularly known as *Athyrium Goringianum tricolor*, is a native of Japan, and is said to be quite hardy in sheltered positions; but to have it in perfection, so that none of its beautifully-coloured foliage shall be damaged by late frosts, cold winds, &c., it is necessary to give it at least the protection of a cold frame. It is distinguished from all other members of the genus by the bright colour of its fronds, which are entirely deciduous; they are from 10in. to 15in. long, spear-shaped, and pendulous. The numerous leaflets are divided into sharply-toothed leaflets, on which the oblong or sometimes kidney-shaped sori are abundantly disposed in two

ASPLENIUM—*continued.*

rows parallel to the midvein. The stalks on which they are borne, claret-coloured in their entire length, form a pleasing and striking contrast to the bright grey colour of the leaflets next on each side, which disposition forms a central grey band running through the whole length of the frond, and is as effective as in the better-known *Pteris quadriaurita tricolor*.



Fig. 74. *Asplenium Hemionitis multifidum*, a beautiful variety having fronds as broad as they are long, and their main divisions deeply cut, giving them a fringed outline.

A. G. tricolor.

Synonymous with *A. Goringianum pictum*.

A. Hemionitis.

This very distinct greenhouse species, perhaps the most striking of all the known species with lobed fronds, is a native of Madeira, the Canaries, the Azores, and Teneriffe; it is much more commonly known by the name of *A. palmatum* on account of the peculiar shape of its fronds, which are borne on firm, naked, dark-coloured stalks 4in. to 8in. long. These fronds, 4in. to 6in. each way, usually 10in.

ASPLENIUM—*continued.*

high, and of a papery texture, are composed of a triangular, sharp terminal lobe and of two large heart-shaped, pointed lateral ones, which are again sometimes bluntly, sometimes acutely, lobed at the base, and these basal lobes on each side overlap one another and the stalk. The very abundant sori affect the form of a narrow line about $1\frac{1}{2}$ in. long, disposed on each vein, giving the fronds the appearance of being striped in long lines all over their under-surface. This plant must not be confused with the West Indian *Hemionitis palmata*. It has produced two quite distinct varieties: *A. H. cristtum* and *A. H. multifidum*. Fig. 74.

A. incisum.

This greenhouse species, somewhat resembling the British *A. lanceolatum*, is a native of Japan, where it is common; also of Tsus-Sima, Chusan, and Western China. Its fronds, 8 in. to 12 in. long and $1\frac{1}{2}$ in. to 2 in. broad, are borne on tufted, polished stalks of a chestnut-brown colour and 2 in. to 3 in. long. The numerous leaflets, of a particularly thin, papery texture, are blunt in the lower part of the frond, whereas the central ones, 1 in. long and spear-shaped, are cut down to the midrib into numerous egg-shaped leaflets conspicuously truncated at their base on the lower side and deeply pinnatifid. The linear-oblong sori are disposed one to each vein. This species is also known as *A. elegantulum*.

A. longissimum.

This beautiful, pendulous, stove species, native of Java, Borneo, Malacca, and the Mauritius, is the best of all the family for growing in a large basket. Its very elegant fronds, 2 ft. to 3 ft. long and 4 in. to 6 in. broad, are borne on strong, blackish stalks 3 in. to 12 in. long and very flexible; they are furnished on each side of the midrib with numerous leaflets of a somewhat leathery texture and dark green in colour. The leaflets are stalkless and have their two sides nearly equal, with a distinct midrib, their edge slightly toothed, and their base often eared on both sides. The fronds are abundantly produced from a thick and slightly-creeping rhizome, so that, being an evergreen species, the plant is well furnished at all seasons with fronds which last a very long time. The numerous sori are disposed in two regular rows on each side of the midrib and reach nearly to the edge.

A. lucidum.

The plant which is extensively grown under this name for decoration is really a form of *A. obtusatum*.

ASPLENIUM—*continued.***A. lunulatum.**

This pretty, stove species, also known as *A. erectum*, is very widely distributed throughout the Tropics. It is of medium dimensions, and its narrow-spear-shaped fronds, 6in. to 18in. long and only about $1\frac{1}{2}$ in. broad, borne on nearly naked, grey stalks 2in. to 4in. long, are furnished with from twenty to twenty-five pairs of leaflets about 1in. long, $\frac{1}{4}$ in. broad, bluntish at the point, and more or less deeply notched throughout. These fronds are of a thin, papery texture, dark green in colour, and the lower pinnæ are often deflexed, whereas the others are all horizontal. The sori, disposed on each side of the midrib, form oblique lines falling short of both edge and midrib. Several pretty and distinct forms of *A. lunulatum* are cultivated as decorative Ferns, the principal ones being *A. l. Fernandesianum* of Kunze and *A. l. reclinatum* of Houlston (*A. tenellum* of commerce, Roxburgh). The former is distinguished from the typical plant by its more rigid habit and also by the more leathery texture of its leaflets, while the latter is a form with wide-spreading fronds of equally dark green colour but copiously proliferous at their extremity.

A. marinum.

Though found in many countries, it is chiefly as a British plant that this species is most interesting. The Sea Spleenwort generally grows in chinks of rocks, to the sides of which it clings so firmly that it is very difficult to remove the plants without injuring them. Fortunately it is a free-growing Fern which, even when detached with only a few roots, readily starts into growth under good treatment. Its firm, leathery foliage, of a pleasing dark green colour and most peculiarly glossy nature, renders it one of the most distinct of our native Ferns. The fronds, under generous cultivation, sometimes attain 20in. in length. They are produced from a single succulent crown almost entirely covered with black, chaffy scales, which, however, do not extend along the stalk; they usually are oblong-spear-shaped, from 6in. to 12in. long and 2in. to 3in. broad, and are borne on tufted, polished stalks 3in. to 6in. long and of a chestnut-brown or nearly black colour. The abundant leaflets are of a leathery texture and bright shining green in colour; those of the lower half of the frond are quite distinct (Fig. 70), spreading horizontally, 1in. or more long, $\frac{1}{2}$ in. broad, with their point sometimes sharp but more usually blunt and their margin notched and toothed, slightly truncate below and often eared above. The broad sori fall short

ASPLENium—*continued.*

of the edge. Some very distinct varieties, mostly, if not all, of natural production, are in cultivation.

A. monanthemum.

This exceedingly pretty, greenhouse species is a native of the temperate regions of both hemispheres. Its simply-pinnate fronds, 1ft. to 1½ft. long and barely lin. broad, borne on polished chestnut-brown stalks seldom more than 2in.

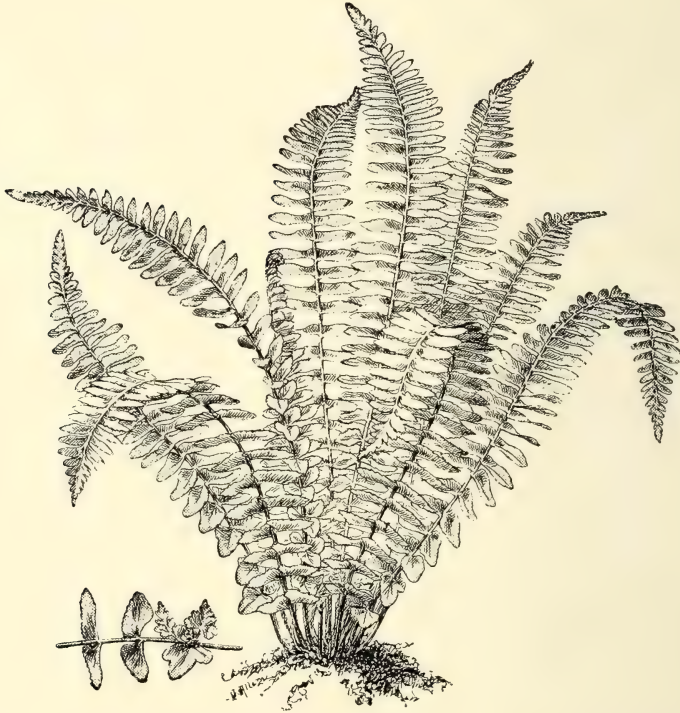


Fig. 75. *Asplenium monanthemum* showing the habit of the plant and the mode of proliferation usually found on the basal pair of leaflets in fully developed specimens.

long, are of erect habit and furnished with twenty to thirty pairs of stalkless brilliant green leaflets of a leathery texture, and disposed horizontally; these, about ½in. long and ¼in. deep, are fully developed on one side of the midvein and scarcely at all on the other, are rounded at their extremity (which, like their upper side, is notched), suddenly narrowed at the base, and often eared; their lower side is more or less cut away in a straight or, in the lower ones, decurved line, and they are so closely placed as to be in some cases almost overlapping. Instead of being proliferous at their

ASPLENium—*continued.*

extremity or on their upper surface, the fronds of this species possess the peculiarity of producing little bulbils at the axils of the basal pair of leaflets only, being in that respect different from most other *Aspleniums* in cultivation. The very conspicuous sori are mostly solitary, being disposed parallel with the lower edge of the leaflet; occasionally, however, there are two or even more to a leaflet. Fig. 75.

A. Nidus.

This singular and very interesting stove species, popularly known as the Bird's-nest Fern, has a very extensive range of habitat, being a native of Mauritius, the Seychelles, Japan, Bonin, and Chusan, westward to the Society Islands, southward to Queensland, Norfolk Island, and Lord Howe's Island; it is also found in the Peninsula of India. The undivided fronds, 2ft. to 4ft. long, 4in. to 8in. broad, of a leathery texture and shining nature, rise symmetrically from a single succulent crown, leaving quite a hollow centre at the base; they are of nearly the same breadth throughout, sharp-pointed at their extremity, and gradually taper below into a very short stalk. The sori, which occupy the upper half of the frond, are disposed in oblique lines about half-way between the midrib and the margin. It is a Fern which thrives best in a mixture of about equal parts of rough, fibrous peat and chopped sphagnum, for it requires very little soil, most of its nourishment being derived from aerial roots, which are produced freely on the surface of the pot and at the base of the fronds, if the atmosphere is kept in proper condition. Fig. 2.

A. N. australasicum.

This variety differs from the typical plant in its fronds being less pointed and having their midrib strongly keeled on the back, also in its habit, as the fronds grow horizontally before taking their upright course, thus forming a circular, deep, vase-shaped hollow.

A. N. musæfolium.

This most distinct form is also so handsome that Sir W. J. Hooker says "it is unquestionably the most noble of all the genus *Asplenium*." It differs essentially from the species by its larger fronds, which do not grow horizontally, but are disposed symmetrically all round the succulent crown, and take an upright direction from the start, so as to leave the crown less elevated and less exposed, thus making the hollow centre more funnel-shaped. The sori extend nearly to the edge. This variety is remarkably well adapted for decoration in vases, in which it makes a very pretty object.

ASPLENIUM—*continued.***A. nobile.**

A garden name for a variety of *A. viviparum*.

A. obtusatum lucidum.

This, the common *A. lucidum* of commerce, is a very decorative, free-growing form, whose fronds, of a graceful habit and beautiful shining-green colour, often measure 2ft. in length and 1ft. in breadth. The leaflets, which vary from fifteen to twenty on each side of the stalk, are oblong, leathery, 6in. long, 1½in. broad, and narrowed gradually to a long, tapering point; their edge is also more deeply toothed. The long lines of sori are placed so near together that when mature they become confluent, and when in that state the dark brown fructification forms a very pleasing contrast to the vivid colour of the frond. This New Zealand variety is an easily-cultivated plant.

A. obtusilobum.

This is a very pretty, dwarf, stove species, native of the New Hebrides. It is readily distinguished from all other known Aspleniums by the proliferation, which, instead of being, as is usual in many Aspleniums, located at the extremity of the fronds, only shows itself on the slender, whip-shaped growths that start from amongst the fronds at the base of the plant. These runners, which have all the appearance of undeveloped fronds and which extend to fully 1ft. long, bear at a distance of about every 3in., where they appear as if articulated, a proliferous bud: this, even without its being brought into immediate contact with the soil, produces a young plant, from the base of which several runners like the one above described will eventually start and produce young plants in their turn. The fronds, about 6in. long and 2in. broad, are borne on greenish, naked, tufted stalks about 2in. long. They are furnished with from nine to twelve pairs of leaflets of a papery texture and bright shining-green colour; the largest leaflets are about 1in. long and ¾in. broad, divided into leaflets. The sori are regularly disposed on the margin of the leaflets.

A. palmatum.

A popular name for *A. Hemionitis*.

A. præmorsum.

A very variable, greenhouse species, found wild in the West Indies, Australia, Teneriffe, and the Canary Islands. From its good constitution and its general appearance it is a popular favourite, for its beautifully-arching fronds, sometimes 3ft. long, are among the most decorative of the genus; they are produced from a slightly-creeping

ASPLENIUM—*continued.*

rhizome, bipinnate, and furnished with elongated leaflets of a leathery texture and dark green in colour, narrowing to a point and divided into leaflets with a sharply-toothed margin. The sori are disposed in narrow, oblique lines extending from the midvein to very near the edge of the pinnules.

A. rutæfolium prolongatum.

This is a variety which, on account of the drooping habit of its fronds and of their highly proliferous nature, is very distinct from the original species (Fig. 76). It is indigenous



Fig. 76. *Asplenium rutæfolium*, a beautiful species for the greenhouse.

in Southern India, and, according to Beddome, is abundant on the Shevagherry Hills, although rare in other localities. Its fronds, 4in. to 6in. long, of the same leathery texture as those of the species, suddenly terminate in a tail-like naked extension of the rachis, 1in. to 2in. long, having at its extremity a proliferous bulbil. The leaflets are divided and subdivided much in the same way as those of *A. rutæfolium*, but they are less closely placed, and the spore masses are disposed on the margin of the pinnules as is the case in the species.

A. Sandersoni.

This pretty and very distinct greenhouse species (Fig. 77) is a native of Natal, Zambesi Land, and Johanna

ASPLENIUM—*continued.*

Island. Its slender, graceful fronds, 6in. to 9in. long, $\frac{1}{2}$ in. broad, and usually proliferous at their extremity, are borne on green stalks 1in. to 2in. long and slightly scaly. They are furnished with from twelve to twenty pairs of horizontal leaflets about $\frac{1}{2}$ in. long, shortly stalked, of a peculiar dimidiate form, and deeply toothed on the upper edge, the lower one being straight, quite entire, and curved backwards. The texture is thin and papyry, and the oblong



Fig. 77. *Asplenium Sandersoni*, an elegant fronded species for small baskets.

sori are disposed from one to three to each leaflet. The small size of the fronds and the well-defined characters of its pinnæ give this Fern a very elegant aspect and render it most interesting and useful for small baskets.

A. tenellum.

Synonymous with *A. lunulatum reclinatum*.

A. Trichomanes.

This pretty, dwarf species, known as the Maidenhair Spleenwort, is found throughout Europe, in most parts of

ASPLENium—*continued.*

India, throughout the United States, and in nearly every part of England. According to the situation which it occupies, its long and narrow fronds, only once divided to the midrib, vary from 6in. to 12in. in length; they are borne on slender, glossy stalks 2in. to 4in. long and of a peculiar chestnut-brown colour, and are furnished with from fifteen to thirty pairs of dark green leaflets, scarcely stalked and of a somewhat leathery texture. These are usually roundish-oblong, obliquely wedge-shaped at the base, and toothed all round, yet variable in form. The fructification is distributed over the frond, and the sori are disposed in linear, oblique lines of three to six on each side of the midrib, become confluent when fully developed and entirely cover the under-side of the leaflets.

The Maidenhair Spleenwort has produced several very interesting and pretty varieties, some of which are more or less crested, forked, or branched, while others differ from the typical species by having their leaflets variously cut or disposed in different ways. These will be found listed in the catalogues of Fern specialists.

A. trilobum.

A very rare little, stove species, native of Chili and South Brazil, with curious fronds 1½in. long and 1in. broad, borne on firm, erect stalks 2in. to 3in. long and scaly below. These fronds are very singular in shape, being wedge-shaped at the base, entire, with their margin undulated and notched, on the lower part deeply lobed with broadly-notched divisions. They are of a leathery texture, and the sori are broad and short.

A. Veitchianum.

A synonym of *A. Belangeri*.

A. viviparum.

This exceedingly elegant stove species, native of the Mauritius and Bourbon Islands, has dark green fronds, 1ft. to 2ft. long, 6in. to 8in. broad, borne on firm, erect, greenish stalks 6in. to 9in. long. The many closely-placed leaflets, 4in. to 6in. long, 1½in. to 2in. broad, are cut down to numerous pinnatifid leaflets, the lower segments of which are again forked and hardly thicker than a thread: these being of a somewhat erect nature give the plant a very feathery, light appearance, which is enhanced by the presence of young plants, with which the upper surface of its fronds is entirely covered, and which, when pegged down to the soil, root very freely. The abundant sori are solitary and disposed on the margins of the segments. *A. v. nobile* is a beautiful and more vigorous form, and it also requires stove treatment.

ATHYRIUM. *See Asplenium.*

BALANTIUM. *See Dicksonia.*

BLECHNUM.

The genus is a comparatively small one, and derives its appellation from *Blechnon*, a Greek name for a Fern. It includes *Blechnidium* and *Blechnopsis*. The plant popularly described as *Blechnum Spicant* belongs to another genus—*Lomaria*.

The distinctive characters of the family are found in the disposition of the sori, which are linear, continuous, or nearly so, and occupy a position parallel with, and usually contiguous to, the midrib. Their covering is membranous and distinct from the edge of the frond.

Blechnums are mostly handsome-growing plants, of strong habit, very useful for decorative purposes, although they also include several dwarf kinds that are particularly adapted for Fern-cases or shallow crevices in the rockery. Like the *Lomarias*, to which they are closely allied, but from which they differ in not producing separate fertile fronds, the *Blechnums* are mostly hardy, of robust constitution, and of rapid growth. They also have a particular dislike to water over the fronds, which causes them to turn first brown and then black in a very short time, unless the plants are in a very light, warm, and well-ventilated place. This, to a certain extent, counterbalances the effects of the superfluous moisture by not allowing it to remain on the foliage long enough to injure it. *Blechnums* will thrive in almost any compost; but their fronds become stouter and have more consistency when grown in a mixture of two parts peat, one part loam, and one part sand, with good drainage, taking care that the roots never suffer from want of water. Propagation is usually effected by means of the spores. These are produced in abundance, and germinate very freely when sown in heat.

B. boreale.

Synonymous with *Lomaria Spicant*.

BLECHNUM—*continued*.**B. brasiliense.**

This very handsome and popular greenhouse or stove species, native of Brazil and Peru, is undoubtedly the strongest-growing and most useful from a decorative point of view of the family (Fig. 78). Its comparatively slender stem, which attains an average height of 3ft., is densely



Fig. 78. *Blechnum brasiliense*, a very decorative species, and the strongest growing of the family.

clothed at the crown with dark brown scales. The fronds, which are produced in great abundance, are oblong-spear-shaped, 2ft. to 3ft. long, 1ft. or more broad, narrowing downwards very gradually; they are pinnatifid, their leaflets, of leathery texture, not being cut quite down to the midrib, with which they remain connected along the whole length of the frond; when mature they are somewhat inclined to be pendulous, getting with age into a nearly horizontal position. The numerous leaflets are 4in. to 6in.

BLECHNUM—*continued.*

long, $\frac{1}{2}$ in. broad, gradually narrowed towards the point, very finely toothed, the lower ones only being short and blunt; they are of a light green colour, with both surfaces naked, and the sori are disposed in a continuous line close to the midrib.

B. b. corcovadense.

This variety, extensively grown for decoration, differs from the typical species in its fronds being of a beautiful crimson colour when young, gradually turning to a metallic hue before becoming permanently green; they are also more erect. The plant forms an upright stem of the same dimensions as that of *A. brasiliense*.

B. b. c. crispum.

A very pretty variety is met with in gardens under this name. It is not so strong-growing as the type, its fronds being shorter and furnished with wavy leaflets of a harsh texture and with crispy edges.

B. cartilagineum.

A very handsome greenhouse species, native of temperate Australia. Its stem, which generally grows in an oblique position, is densely clothed at the crown with blackish scales. The fronds, 2ft. or more long, and 6in. to 9in. broad, are borne on strong, upright stalks 4in. to 6in. long, scaly and covered with sharp points in the lower part; they are simply pinnate, and broadly spear-shaped. The leathery leaflets are gradually narrowed towards the point; they have their margin finely toothed, and are enlarged and connected at the base, the lower ones being very little smaller than the others. The sori are disposed in a broad line close to the midrib.

B. hastatum.

A very distinct and pretty greenhouse species, native of the temperate parts of South America, producing from a short, stout, scaly stem its spear-shaped fronds, 1ft. to 1½ft. long and 2in. to 4in. broad; these are borne on erect and nearly smooth stalks 4in. to 6in. long, and are furnished on each side with from twenty to forty leaflets of a leathery texture. The barren leaflets, 1in. to 1½in. long and $\frac{1}{2}$ in. broad, are somewhat sickle-shaped and gradually narrowed to a point; they are slightly eared on their lower side, whereas their upper side is heart-shaped and provided with distinct halb-ber-shaped auricles. The fertile leaflets, of similar shape, are narrower, and the sori are disposed half-way between the midrib and the edge in a continuous or more or less interrupted line.

BLECHNUM—*continued***B. Lanceola.**

An interesting, evergreen, greenhouse species, of dwarf habit, native of Tropical America. Its little undivided fronds, 4in. to 6in. long and $\frac{1}{2}$ in. broad, spear-shaped, and of a somewhat leathery texture, are borne on slender, erect stalks 2in. to 4in. long, and produced from a slender, creeping rhizome of stoloniferous nature—that is to say, at the point of junction between the crown and the roots the plant is provided with loose, trailing branches or shoots which take root at intervals, whence fresh buds are developed. The



Fig. 79. *Blechnum longifolium*, a somewhat variable species from Tropical America and the West Indies.

sori are disposed in a continuous line on each side of and close to the midrib. This pretty little species is particularly adapted for planting in Fern-cases, where it thrives admirably, and where the contrast between the bright dark green of the upper surface of its fronds and the continuous central band of deep brown formed by the sori is very conspicuous and attractive.

BLECHNUM—*continued*.**B. longifolium.**

A variable stove species, native of Tropical America and the West Indies. Its fronds are only once divided to the midrib, usually from 9in. to 12in. long including their stalks, and are produced from a slender, creeping rhizome; they consist of a terminal leaflet and three to six pairs of lateral ones (Fig. 79), of a leathery texture, 3in. to 5in. long and $\frac{1}{2}$ in. broad, gradually narrowed towards the point and somewhat heart-shaped at the base, the lower ones about 1in. apart. The sori are disposed in broad lines close to the midrib.

B. l. gracile.

A distinct and pretty variety, differing from the species through the slender habit of its fronds, which are of a beautiful red colour when young. It is a good companion to *B. Lanceola* when planted in the Fern-case, and thrives under similar treatment.

B. occidentale.

To the West Indies belongs this justly appreciated stove species, of dwarf habit. It is very popular on account of its easy cultivation, and the lasting qualities of its fronds when cut. For years it has been used in many private establishments for growing amongst orchids, to which it forms a very effective background or undergrowth, the more so that it is a plant never infested by insects of any sort, and that it grows as well in coarse sand, gravel, or moss as in the best compost. The fronds, 9in. to 15in. long and 4in. to 8in. broad, are borne on upright but flexible stalks 6in. to 12in. long and scaly below; they are furnished on each side of their midrib with twelve to twenty-four linear leathery leaflets, 3in. to 6in. long and $\frac{3}{4}$ in. broad, gradually narrowed to a point, heart-shaped or even eared at the base, the lower ones often 1in. apart, and the lowest pair usually deflexed (Fig. 80) and very little shorter than the others. The sori form a broad, continuous line close to the midrib.

B. polypodioides.

Synonymous with *B. unilaterale*.

B. serrulatum.

This very handsome stove or greenhouse species is the only one in which the leaflets are plainly and distinctly articulated to the stalks; it is a native of the West Indies, Guiana, Brazil, Australia, New Caledonia, Borneo, Malacca, and North America. The fronds, produced from a stout, ascending rhizome and borne on strong, erect, smooth stalks 6in. to 12in. long, are 1ft. to 2ft. long, 6in.

BLECHNUM—*continued*.

to 9in. broad, and furnished on each side of their rachis with from twelve to twenty-four distinctly-articulated leathery leaflets. The leaflets are elliptical or narrow-oblong, 4in. to 5in. long and $\frac{1}{2}$ in. broad, gradually narrowed towards the point and downwards to a rounded or obtusely wedge-shaped, often unequal, base; their margin is very finely toothed. The fertile leaflets, usually confined to the upper part of the frond, are narrower and often longer



Fig. 80. *Blechnum occidentale*, a much appreciated species whose fronds are very enduring when cut.

than the barren ones. The sori are disposed in a continuous line close to the midrib. *B. striatum* is another name for this species.

B. Spicant.

A very common but erroneous name for *Lomaria Spicant*.

B. striatum.

Synonymous with *B. serrulatum*.

BLECHNUM—*continued*.**B. unilaterale.**

Of small dimensions, this very elegant stove or greenhouse species, native of tropical America, is usually met with in gardens under the name of *B. polypodioides*. Its fronds, while young, are of a conspicuous pink colour, and are borne on slender stalks lin. to 4in. long, scaly below, and produced from an elongated rhizome densely clothed at the crown with narrow, pale brown scales; they are spear-shaped, 6in. to 12in. long, about 2in. broad, and furnished with numerous leaflets of a thin, papery texture, usually toothed at the point, but with the edges smooth or nearly so, the lower ones being dilated to a broad base, shorter, and blunt. The sori are disposed in a line close to the midrib.

BRAINEA.

So far, this commemorative genus is represented by a solitary species, *B. insignis*, a tree-like Indian and Chinese Fern resembling *Blechnum* in general appearance, but with naked sori, and with veins forming little cells along the costa or midvein. Its distinctive characters consist in the sori being continuous along transverse veins near the midrib, and being also produced along the small veins in the direction of the edge of the leaflets, which they at length entirely cover. The roots of *B. insignis* are of a remarkably brittle nature, and great care must be taken in repotting; if that operation is carelessly performed, a certain quantity of roots are mutilated, and the chances are that the plant will never recover. The compost it prefers is a mixture of fibrous peat and loam in equal parts, with the addition of some sharp sand; it also requires good drainage, as it should receive plenty of water at the roots and on the stem. It is usually propagated from spores, which germinate freely.

B. insignis.

An interesting greenhouse Tree Fern, of small dimensions, native of Hong-Kong, Burmah, and Khasya. It forms a somewhat stout stem, which is seldom perfectly straight, and which, when fully developed, attains a height of 4ft., measures about 2ft. in circumference, and is covered with narrow, rusty scales $\frac{1}{2}$ in. to 1in. long. The fronds, which are not unlike those of a *Lomaria* in general appearance,

BRAINEA—*continued.*

are abundantly produced, and borne on firm stalks 3in. to 4in. long, naked, and scaly only at the base; they are 2ft. to 3ft. long, 8in. to 12in. broad, and simply pinnate. The barren leaflets, of a leathery texture and of a bright green colour on the upper surface, but of a greyish hue and showing peculiar markings on their under-side, are narrow-spear-shaped, 4in. to 6in. long, nearly stalkless, and finely toothed on their margins. The beauty of the plant is enhanced by its fronds being of a distinct metallic colour when partly developed. In the fertile fronds the pinnæ are much contracted.

CAMPYLONEURON. See *Polypodium.*

CHEILANTHES.

This somewhat extensive genus, of which there is no British representative, is composed of mostly delicate-looking Ferns, the majority of which are of small dimensions, and of a brittle nature. All the plants included in the genus have their veins free, and the sori are terminal, or nearly so, on the veins—small, and semi-spherical at first, but becoming more or less confluent afterwards; their covering, which is formed from the reflexed margins of the segments, forms roundish and distinct little pouches, partly connected, but not quite continuous. This peculiarity is responsible for the popular name of Lip-Fern.

As now understood, the genus includes *Adiantopsis*, *Aleuritopteris* (*Allosorus*), *Eucheilanthes*, and *Physapteris*.

This most interesting genus is strikingly distinct, and includes some of the most elegant and beautiful Ferns in cultivation. They are all ever-green, and, although coming principally from tropical countries, the majority of them thrive best in a house where the temperature seldom exceeds 60deg. with artificial heat; a good many of them are even suited with a greenhouse temperature of 45deg. minimum in winter. This is no doubt owing to their being found in their native habitats at great elevations and in dry, rocky, exposed situations. Anyhow, wherever Cheilanthes are seen

at a disadvantage and in bad condition, it is invariably due to their being kept in an over-heated, close stove, and frequently syringed—treatment which produces shapeless, emaciated plants deprived of all beauty. They should be grown as near to the light as possible, either on shelves against the glass, or in hanging-baskets suspended from the roof, for which purpose some of them are very well adapted. No overhead watering or syringing should at any time be allowed, as this is quite as injurious to all of them as any extra heat; but they should be supplied with an abundance of water at the roots, and for this purpose they must be either potted or basketed in good fibrous peat and sand, with their crowns well above the rim. The compost should be very porous, and to that end a small portion of sandstone and charcoal broken up into little pieces should be added to it. The two great evils to be avoided are strong, close heat, and overhead moisture, while essentials to their well-being are an abundance of water at the roots, an open, porous compost for them to grow in, a somewhat airy atmosphere, and plenty of light overhead. Most, if not all, of the *Cheilanthes*, reproduce themselves freely and true from spores, which germinate very readily and form young plants in a comparatively short time.

C. alabamensis.

See *Pellæa alabamensis*.

C. californica.

Californian Lip Fern is the name in North America by which this pretty Fern is known. Its elegant fronds are borne on densely-tufted, erect stalks about 6in. long and of a glossy nature, and proceed from a short-creeping rootstock that is very chaffy with rigid, narrow, dark brown scales; they are deltoid about 3in. each way, and quadripinnatifid. The leaflets of the lower side, which are much larger than the others, are cut down to the midrib into numerous segments, and these again are very sharply cut nearly to the centre. The sori, which are roundish, and disposed from two to six to a segment, are usually placed at the base of the depressions at the ends of single veinlets.

CHEILANTHES—*continued.***C. chlorophylla.**

This stove species, native of South America, from New Granada southward to Monte Video, is a very handsome plant, and perhaps the most robust-growing of the section to which it belongs. Its somewhat spear-shaped and tripinnatifid fronds, 1ft. to 1½ft. long and 4in. to 6in. broad, produced from a stout, scaly rhizome, are borne on strong, erect, naked, chestnut-brown polished stalks 1ft. to 1½ft. long. The leaflets, 3in. to 5in. long and $\frac{3}{4}$ in. to 1½in.



Fig. 81. Cheilanthes Clevelandi or Cleveland's Lip Fern, a delicately beautiful species from North America.

broad, are spear-shaped and somewhat distantly placed; their leaflets, equally spear-shaped, are cut down to the midrib into entire, narrow-oblong segments, on both edges of which the numerous small and roundish sori are uniformly disposed.

C. Clevelandi.

A very handsome greenhouse species, native of North America, where it is popularly known as Cleveland's Lip

CHEILANTHES—*continued*.

Fern. Its pretty and delicate-looking fronds, 4in. to 12in. long and borne on tufted, erect, scaly stalks, are produced from a creeping rootstock nearly as thick as a goose-quill, several inches long, covered with closely-pressed, rigid-pointed, nearly black scales; they are tri- or quadripinnate, with the ultimate divisions of the leaflets nearly round (Fig 81), small, deep green above, and covered with fine white scales beneath. The numerous sori are disposed in interrupted series on the edges of the segments.

C. dealbata.

Synonymous with *C. farinosa*.

C. Eatoni.

A very distinct and pretty greenhouse, North America species, that in general appearance is somewhat similar to the well-known *C. tomentosa*, but smaller in all its parts; it also differs from that species in being coated with rather rigid-pointed scales instead of mere woolly hairs on the stalks and midrib of the leaflets beneath, and in being matted with tomentum on the upper surface of its fronds.

C. elegans.

Synonymous with *C. myriophylla*.

C. farinosa.

This magnificent stove species, frequently found in gardens under the name of *Aleuritopteris mexicana*, has a very extensive habitat. It is found in Africa, on the Cameroon Mountains, in Zambesi Land, Abyssinia, &c.; in the Malayan Peninsula, Java, and the Philippine Islands; in Brazil and Mexico up to 8,000ft. elevation; in Guatemala and New Granada; on the Neilgherries, and in other mountainous districts of the Madras Presidency, it is called the Silver Fern. In size it is very variable, its fronds ranging from 3in. to 12in. in length and 3in. to 6in. in breadth, and being borne on densely-tufted stalks 3in. to 6in. long, of a dark chestnut-brown colour, and clothed with narrow scales when young; they are usually spear-shaped, sometimes deltoid, and twice or thrice divided half-way to the midrib; the somewhat leathery leaflets are disposed in opposite pairs, the lowest ones often much the largest, with the lowest leaflets longer than the others and deeply pinnatifid, most of the others having a broad, entire central space. In mature fronds the under-surface is densely covered with pure white powder; their upper surface is of a dull green, slightly speckled with white. The small, brown sori are placed in a continuous line along the edges, their coverings extending throughout every fertile segment of the frond. *C. dealbata* is another name for this species.

CHEILANTHES—*continued.***C. ferruginea.**

The plant grown in gardens under this name is identical with *Nothochlæna ferruginea* of Hooker.

C. fragrans.

This pretty evergreen, greenhouse species, of small dimensions, also known under the names of *C. odora* and *C. suaveolens*, is of a very cosmopolitan character. It is found wild in the South of France, Spain, Italy, Greece,



Fig. 82. Cheilanthes fragrans, a very fragrant-froned species that retains its perfume for a long time when dried.

Turkey, Madeira, and the whole of the Mediterranean Islands; also in Afghanistan, Syria, Algeria, and the Himalayas. Its delicately-cut little fronds are deliciously scented, and retain their agreeable perfume for a very long time when in a dried state; they are only 2in. to 3in. long, about lin. broad, bi- or tripinnatifid, and borne on thin, wiry stalks lin. to 3in. long and densely clothed with

CHEILANTHES—*continued.*

narrow, reddish-brown scales. The leaflets, of a somewhat leathery texture and deltoid, are about $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, opposite, and cut down to the rachis below into several pinnatifid, linear-oblong lobes. The small and numerous sori are covered by light brown involucres of a parchment-like tecture, and toothed all round. Fig. 82 is reduced from Col. Beddome's "Ferns of British India" by the kind permission of the author.

C. hirta.

This very handsome, delicate-looking, greenhouse species, native of the Cape of Good Hope, Port Natal, Grahamstown, Mexico, and the Java Mountains, is one of the most decorative of the genus. Its pale green, brittle fronds are produced from a somewhat erect crown, and borne on strong, erect stalks 2 in. to 4 in. long, densely coated with spreading, woolly hairs of a bright reddish-brown colour; they are 4 in. to 12 in. long, 2 in. to 5 in. broad, spear-shaped, and three times divided half-way to the midrib. The leaflets, also spear-shaped, are opposite, and spread from the main stalk at right angles; they are 1 in. to 3 in. long, and are cut down to the midrib into numerous leaflets which are scarcely more than $\frac{1}{4}$ in. long and again pinnatifid and notched; their margin is much incurved. The abundant bright reddish sori are distinct, and are disposed all round the edge of each segment of the fertile frond, and eventually become confluent. This species varies greatly in size and hairiness, the most distinct form being the one generally found in gardens under the name of *C. Ellisiana* of Moore, which has fronds much broader, more finely divided, and of a more upright habit, than those of the typical plant.

C. Lindheimeri.

A very pretty greenhouse species, native of Western Texas, New Mexico, and Arizona. Its fronds, 3 in. to 6 in. long, $1\frac{1}{2}$ in. to 2 in. broad, are produced from a thin, slender rootstock, several inches long, very nearly black, and bearing a few rusty-coloured scales at the base, and are borne on wiry, dark chestnut-brown coloured stalks 3 in. to 6 in. long and thinly clothed with narrow-spear-shaped scales. The spear-shaped leaflets are numerous, and cut into many linear-oblong leaflets, which are again cut into numerous minute, roundish segments. The upper surface is webby with slender branching hairs, which are much entangled and constitute a heavy tomentum of exceedingly delicate hairs having no evident articulations. When the frond is very old this webbiness partly wears off, while the

CHEILANTHES—*continued.*

colour of the scales of the lower surface gradually becomes deeper. The whole under-surface is densely clothed with imbricated, ferruginous scales. The outer margin of the segments is so revolute as to make them appear almost pouch-like. The sori, disposed a few to the margin of each pinnule, are entirely hidden beneath the scaly and woolly covering.

C. microphylla.

This very elegant, delicate-looking, greenhouse species is popularly known in North America as Plumier's Lip Fern—after its discoverer, the Rev. C. Plumier. It has a very extensive range. Its fronds, produced from a slightly - creeping rhizome, and borne on slender, wiry, flexuous stalks 2in. to 6in. long, of a dark chestnut-brown colour and woolly below when young, are 3in. to 9in. long, 2in. to 3in. broad, spear-shaped and bi- or tripinnatifid. The numerous leaflets are disposed in opposite pairs; the lowest, 1in. to 2in. long, are divided into linear-oblong, somewhat leathery, pinnules, and cut down to the stalk below. Both surfaces are green and smooth. The roundish or elongated sori are covered with narrow involucre of a pale colour.

This species is extremely variable in the form and composition of the frond, abundance or scantiness of the pubescence, and continuity of the involucre; consequently, several varieties are recorded, *C. m. micromera* being the best known.

C. myriophylla.

Undoubtedly this is one of the prettiest species of the genus, and popularly known as the Lace Fern. It is usually cultivated under the name of *C. elegans*, a name preferred by Mettenius, who says that the specimens of *C. elegans* and of *C. myriophylla*, both of Desvaux, are exactly alike. It certainly is the most extensively-grown species, and succeeds well either in the greenhouse or in the stove, being a native of Tropical America. Its delicate-looking, brittle fronds, 4in. to 6in. long, 1½in. to 2in. broad, and borne on densely-tufted, wiry, erect stalks, 3in. to 6in. long, thickly clothed with pale, woolly down, are somewhat spear-shaped and three or four times divided half-way to the midrib. The lower leaflets, about 1in. long, ½in. broad, and broadly spear-shaped, are cut down to the rachis on both sides into numerous narrow-oblong leaflets, which are again slightly branched at the base, and further divided into very small roundish, bead-like segments, the margin of which is so much incurved as to make these organs appear pouch- or

CHEILANTHES—*continued*.

pocket-shaped. The upper surface of the frond is of a bright pale green, and slightly hairy, while the lower one is distinctly matted and scaly. The abundant sori are disposed all round the margin of the bead-like segments, and are slightly confluent.

C. odora.

Synonymous with *C. fragrans*.

C. pulchella.

A distinct and pretty greenhouse species, native of Madeira and the Canaries, with fronds 3in. to 12in. long and 2in. to 4in. broad, borne on densely-tufted, strong, erect, dark chestnut-brown stalks 3in. to 9in. long. These fronds are tripinnate, and their lower leaflets, 2in. to 3in. long and opposite, are divided into spear-shaped leaflets of a somewhat leathery texture, and cut down to the rachis into numerous narrow-oblong segments, around the edges of which the copious roundish sori are regularly disposed.

C. radiata.

For a long time this pretty little stove Fern was considered a species of *Adiantum*, to which, by its general appearance, it seems related much more than it does to any of the plants belonging to this genus. It is a native of tropical America, and has a very extensive range. Usually there are six to nine leaflets to each frond, all starting from a common central point like the spokes of a wheel, with a whorl of bract-like segments at the axis; they are borne at the extremity of strong, erect, wiry stalks 1ft. to 1½ft. long, and of a blackish, glossy, polished nature. The longest of the leaflets are from 6in. to 9in. long, about 1in. broad, and furnished with numerous leaflets about ½in. long, unequal-sided, truncate at the base below, and eared at the base above. The small and very numerous sori are very conspicuously placed along both margins of the entire pinnules, often crowded, and always covered with a kidney-shaped indusium of a bright brown colour.

C. tenuis.

A pretty little stove species, native of Mexico, with fronds averaging about 1ft. in length, including the stalk, which is produced from a creeping rhizome; they are somewhat spear-shaped and tripinnate. The leaflets, oblong in shape, are divided again into minute and somewhat circular segments with a wedge-shaped base, dented, reflexed, and concave; they are covered on both sides with a woolly

CHEILANTHES—*continued*.

substance of a rusty-brown colour. The sori are disposed in a single row and are in some degree hidden in the axis of the reflexed margin of each segment, where they are covered by a narrow and continuous indusium.

C. viscida.

A very elegant little North American greenhouse species, known as the Sticky Lip Fern—a characteristic that has given rise to the specific name. Its fronds, 3in. to 5in. long, narrow-oblong in outline, and bipinnate, are borne on wiry, dark brown, tufted stalks 3in. to 5in. long, chaffy at the base, but shining in their upper part; they are of a soft, papery texture, minutely glandular, everywhere sticky, and furnished with from four to six pairs of nearly stalkless leaflets $\frac{1}{4}$ in. long, divided into conspicuously toothed segments. The sori are disposed from one to three to each segment, where they are covered by curiously-recurved, minute, herbaceous teeth.

CHRYSODIUM. See **Acrostichum**.

CIBOTIUM. See **Dicksonia**.

CRYPTOGRAMME.

It is worthy of notice that the genus *Cryptogramme* (Mountain Parsley Fern, or Rock Brake) is composed of a solitary, but distinct and very pretty, species, of British or European origin, and of only two varieties—one from Northern India, and another, a North American form.

The Mountain Parsley Fern, so named on account of its great resemblance to the typical Parsley, is one of the prettiest of all our native Ferns. It is also one of the very few which, under cultivation, have retained their characters perfectly constant; for, notwithstanding the enormous quantities grown under various conditions, no deviation from the species worthy of record has as yet been noticed in this country. It is essentially a deciduous plant, losing its fronds about the end of October and starting into growth again about the beginning of May. Its fertile fronds, considerably longer than the others and produced as a second crop of foliage later in the season, are greatly appreciated for bouquets and button-holes. Their spores ripen and

scatter themselves, in their native state, about September, after which the fronds soon die down, the barren ones remaining on the plants rather longer than the others.

The Mountain Parsley Fern delights in a cool, moist, and shady spot, and is especially adapted for a quiet nook in a rockery, where it should be planted in a well-drained place and in a mixture of loam



Fig. 83. *Cryptogramme crisa acrostichoides*, a pretty North American variety of our Mountain Parsley Fern often called *Allosorus Crispus*.

and peat in about equal parts, with the addition of bricks broken into small pieces; but care should be taken that the compost is free from lime, which is highly injurious to its very minute, fibrous rootlets. It may be propagated by spores, but this is a slow and tedious process; the more so that it is readily increased by the division of the crowns in the spring months, just before growth commences. This little

CRYPTOGRAMME—*continued.*

gem also grows luxuriantly in a cold frame, or for two or three years in the greenhouse, or under the shade of vines, where, however, it seldom lasts any longer. The plants should always be well established in pots before being turned out into the border or on the rockery.

C. crispa.

The fronds are of a pale, delicate green colour, abundantly produced from a densely-tufted rootstock, which lies horizontally just beneath the surface of the soil and produces a great quantity of very minute, hair-like, fibrous rootlets. These fronds, of a soft, papery texture and 2in. to 6in. long, are borne on straw-coloured, polished stalks of the same length and slightly scaly towards the base; they are oblong in shape, three or four times divided half-way to the midrib, and naked on both surfaces. In the barren fronds, the ultimate segments are somewhat wedge-shaped and deeply pinnatifid, while those of the fertile fronds are pod-shaped. The sori are hidden beneath the reflexed margins of the segments, which nearly join at the midrib, eventually becoming confluent. This is *Allosorus crispus* of the older botanists.

C. c. acrostichoides.

This variety is a native of North America, where it is commonly known under the popular name of American Rock-Brake. It is of larger and stronger habit than our species, the barren fronds having their rachis narrowly winged, and their segments of thicker texture and not so deeply cut. The fertile fronds are twice as long as the others, and are provided with fewer and more distant, longer, narrow and distinctly-stalked segments; these are pod-like, and their edges are so far recurved as to meet at the midvein or even to overlap, forming a papery involucre which spreads when mature.

CYATHEA.

About eighty species are embraced in this genus (which includes *Disphenia*), but few are in cultivation even in large establishments. Still, like the closely-allied *Alsophilas* and *Dicksonias*, the majority of these species are highly decorative, and several are deservedly popular and extensively used for the embellishment of our conservatories and winter gardens. Indeed, it may be truth-

fully said that some of the most beautiful of all Tree Ferns are to be found in *Cyathea*; but whether of gigantic habit, or otherwise, all the species are tree-like.

The distinguishing characters of the family reside in the disposition of the spore masses, which are invariably situated either on a vein or in the axil of the forking of a vein; in the character of their receptacles, which are elevated, globose, or elongated; and especially in the singular nature of their globose, inferior involucre, which cover the whole sorus, and which, when mature, break at the summit and form a more or less persistent cup (hence the generic name from *kyatheion*, meaning a little cup) quite even or irregular at the margin.

All the species are evergreen. To make good growth they require not only an abundance of water at the roots, but also that their trunks be kept constantly moist. By these means only can *Cyatheas* be induced to produce fine heads of fronds, which last all the longer on the plants if they have gradually been inured to the sun during the summer. Like all other Tree Ferns, *Cyatheas* are satisfied with very little pot-room, and the soil in which they should be potted, tubbed, or, better still, planted out in the Fernery, is a mixture of three parts fibrous peat, one of loam, and one of coarse silver sand. Of the numerous species grown, none are known to produce adventitious growths along the trunk or at the base, and none are known to be proliferous. Propagation is usually, therefore, from spores; these are abundantly produced and germinate freely, making very showy young plants in the course of a couple of seasons.

C. Burkei.

A synonym of *C. Dregei*.

C. dealbata.

Deservedly the most popular species of the whole genus, this beautiful Fern (Fig. 1) is a native of the Northern and Middle Islands of New Zealand. The handsome fronds, which are borne on smooth, or at the most slightly rough, stalks, are from 5ft. to 7ft. in length, of a bluish-green

CYATHEA—*continued*.

colour above and very glaucous or silvery beneath; they are twice or thrice divided to the midrib, and somewhat spear-shaped, and are divided into narrow, pointed leaflets which have their sickle-shaped segments conspicuously toothed. The reddish-brown sori, which form a most interesting feature, are abundant, and produce a most pleasing contrast with the white under-side of the leaflets (a peculiarity responsible for the specific name), to the lower half of which they are sometimes confined, though usually disposed midway between the midvein and the margin; they are covered by roundish involucre of a thin and more or less transparent nature, which break down in an irregular manner. Planted in a conservatory and in a somewhat elevated position, *C. dealbata* makes a very noble object, and the peculiar colour of the under-side of its fronds shows itself to perfection when seen by artificial light.

C. Dregei.

A stove species, also known as *C. Burkei*, native of Natal, Macalisberg, and Zambesi Land, with a trunk seldom more than 4ft. high and very thick. Its fronds are twice divided to the midrib, borne on smooth stalks, and furnished with stalkless leaflets 2in. to 3in. long, which are also cut into blunt, somewhat sickle-shaped, and more or less deeply-toothed lobes. The sori, disposed half-way between the midvein and the margin, are covered by thin, fragile involucre, which, opening at the summit, form cups with a small, slightly irregular margin.

C. insignis.

This truly magnificent stove species, usually found in collections under the names of *C. princeps* and *Cibotium princeps*, is a native of Cuba, Mexico, and St. Catherine's Peak. It forms a stout trunk of large dimensions, producing numerous beautifully arching fronds from 10ft. to 12ft. long, borne on robust stalks thickly covered at their base and up to the leafy portion with long, glossy, light brown scales, but eventually becoming whitish, and quite brittle. They are tripinnate, having stalkless leaflets, pinnatifid nearly to the midrib, and divided into oblong-sickle-shaped, sinuate or toothed lobes, with slightly reflexed margins. The bright green colour of the upper surface of the fronds forms a pleasing contrast to the beautifully bluish-green hue of their under-side. The abundant sori are provided with very peculiar cinnabar-brown involucre, often breaking down into four nearly equal valves.

CYATHEA—*continued.***C. medullaris.**

This is a magnificent and deservedly popular greenhouse species, quite distinct from any other known Tree Fern. It is a native of New Zealand, Norfolk Island, and



Fig. 84. *Cyathea medullaris*, a popular species, and the largest of the whole genus. The centre of the trunk yields a pulpy sago-like substance that furnishes a useful article of food in New Zealand and the Pacific Islands.

the Pacific Islands. In its native habitats it has a trunk upwards of 40ft. in height, bearing magnificent spreading fronds 12ft. to 15ft. long and proportionally broad, twice or thrice divided to the midrib, and of a leathery texture.

CYATHEA—*continued.*

These are borne on robust stalks, at first of a peculiar prune-colour, but ultimately becoming jet-black and highly polished. Before they are fully unfolded, the young fronds are densely clothed with long, black, chaffy scales, which later on change to a bright, light brown colour. In the fully-developed fronds, the stalks and also the midribs are rough with hard, glandular tubercles of a glossy nature and resembling a resinous exudation. The leaflets, fully 3ft. long, are divided into secondary ones 5in. to 6in. long, about lin. broad, cleft nearly to the midrib, or again pinnate; these are again cut into leaflets or segments of an oblong or a narrow-oblong shape, blunt, coarsely toothed in the barren fronds, lobed and pinnatifid in the fertile ones, with the margins turned back. The sori, abundantly produced and orange-yellow in colour, are disposed one to each lobule of the pinnule or lobe, and are situated about midway between the midvein and the margin; they are covered by circular involucre of parchment-like texture, which soon break open at the summit with an irregular, often two-lobed margin. The whole surface of the frond is of a pleasing, bright green colour.

C. medullaris is of very rapid growth; when planted in a conservatory where plenty of room can be allowed for its perfect development, it makes a good-sized stem or trunk in a comparatively short time. It is by far the most imposing of all known Tree Ferns that will succeed under cool treatment. Fig. 84.

C. princeps.

This is synonymous with *C. insignis*, a Fern more extensively known in gardens as *Cibotium princeps*.

CYRTOMIUM. *See Aspidium.***CYSTOPTERIS.**

Bladder Fern is the popular name of this small genus, all the species of which have their fronds twice or thrice divided, of thin texture, and with veins free. The distinguishing characters of the genus, however, reside in each sorus, of a roundish form, being placed on the back of the veins and provided with a nearly globular involucre of a membranous nature, which is inserted by its broad base under the sorus, and at first covers it like a hood. Notwithstanding its being small, this genus, which is composed of

only four species and a few varieties, is nevertheless very interesting, inasmuch as, with the exception of the essentially North American *C. bulbifera*, all others are indigenous to this country, and well adapted for planting in the outdoor Fernery, where shady and well-drained spots should be selected for them, all being found growing naturally at high elevations. With the exception of *C. montana*, which is provided with underground creeping rhizomes, all the Cystopterises produce their slender fronds in great abundance either from a closely-tufted crown or from shortly-decumbent rhizomes. On account of their delicate appearance, all are well adapted for pot-culture, either under glass, in a cold frame, or without glass protection, in a sheltered position. All the known species and varieties lose their fronds early in the autumn, and remain dormant until about April, during which period their crowns must not be allowed to get completely dry. When planted out, a compost of about equal parts of fibrous peat, loam, and leaf mould is best. For pot-culture it is advisable to add to this mixture a small proportion of old, crumbled mortar or broken limestone, and also to pay special attention to the drainage. Bladder Ferns are usually propagated during March and April by division of the crowns, wherever more than one has formed; they are also easily raised from spores sown in autumn in a cold frame. *C. bulbifera*, however, is more readily increased by means of the bulbils produced along the stalks of the leafy portion of the frond, which, having fallen to the ground, soon emit a few slender roots and send up some rudimentary fronds, producing perfectly-developed foliage during the second year.

C. bulbifera.

This singular and elegant species, which takes its name from the large, fleshy bulbils borne on its upper leaflets, is a very distinct plant, of North American origin, and quite as hardy as any of the British species and varieties. The fronds are of a thin, papery texture, and yet not without a kind of brittle rigidity; they are produced from a root-stock that is usually quite short, seldom over lin. long,

CYSTOPTERIS—*continued.*

and covered with the persistent and somewhat fleshy bases of the old stalks. In mature plants they are usually 6in. to 12in. long and 3in. to 4in. broad at their widest part. They are usually spear-shaped, frequently much elongated upwards, and twice or thrice divided half-way to the midrib; their broadest part is the base, where the leaflets are often 2in. to 3in. long, 1in. broad, and divided into narrow-oblong segments cut down nearly to the midrib and slightly toothed; thence they gradually narrow to their extremity, having, according to Eaton, a narrower and more tapering outline than any other known North American Fern with compound and feathery fronds. The stalks are usually 4in. to 6in. long, very slender, smooth, and of a brittle nature, usually green, except at the base, where they are dark brown; but sometimes the whole stalk and rachis are brownish. The sori are produced so abundantly as to be found on all portions of the frond, even to the base; they are disposed two to twelve to a leaflet and usually in two rows, one in each segment.

C. fragilis.

This is probably the commonest of the known species of *Cystopteris*, and it possesses a peculiarly cosmopolitan character, being found nearly the world over. It is the Brittle Fern of North America, and the Brittle Bladder Fern of Britain, having been known here for over two centuries. It is readily distinguished by its fronds, 4in. to 8in. long, 1½in. to 3in. broad, somewhat spear-shaped, and twice or thrice divided half-way to the midrib, being abundantly produced from a close, tufted crown, and borne on smooth, reddish-brown stalks 2in. to 4in. long, of a very slender and brittle nature. The largest leaflets, 1in. to 1½in. long and ¾in. broad, are divided into oblong leaflets, which are cut down into bluntly- or sharply-toothed lobes. The texture is soft and papery, and the abundant sori are disposed two to twelve to a pinnule. This species requires a suitable situation to develop and preserve its true character, as it is very liable to alter its growth according to its position. Of its numerous varieties the best, from a gardening point of view is:

C. f. Dickieana.

Undoubtedly this remarkably pretty, dwarf Fern is the most distinct variety, and it possesses the property of reproducing itself so truly from spores, that some authorities are inclined to accord it specific rank. It differs from the type in its much denser habit and more ovate fronds, the height of which is seldom above 5in.,

CYSTOPTERIS—*continued.*

including their short stalks; these latter are thicker than those of any of its congeners, and have their base densely coated with brown scales.

C. montana.

The Mountain Bladder Fern is a very handsome plant, quite distinct in habit from all other species and varieties belonging to the same genus; for its lovely and very elegant

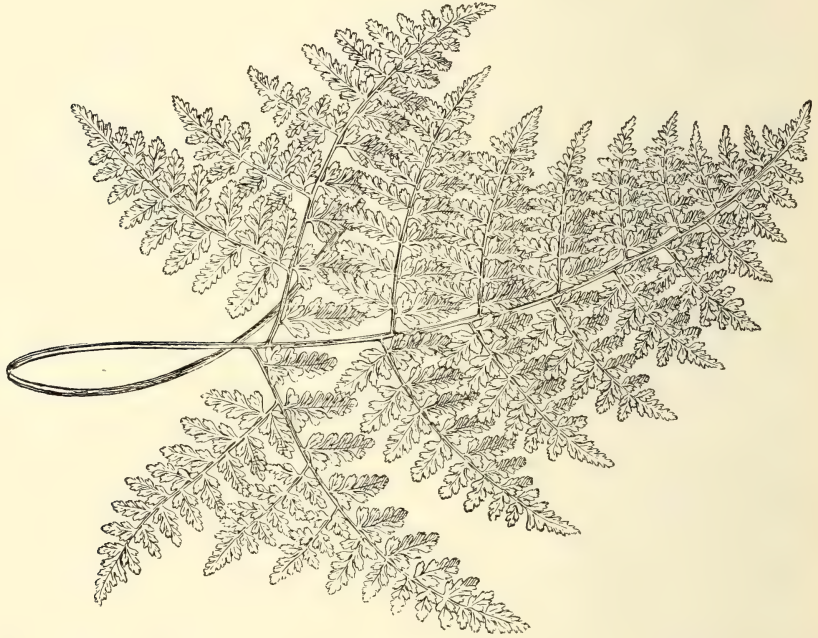


Fig. 85. Frond of the Mountain Bladder Fern, *Cystopteris montana*, a lovely Fern for a moist sunless part of the Hardy Fernery.

fronds, which are delicately divided (Fig. 85), strikingly triangular in outline, about 6in. each way, instead of emanating from either a compact crown or a short rhizome as in other species, are produced on very slender, underground rhizomes. They are borne on slender, erect stalks, from 6in. to 9in. long, perfectly smooth, except near their base, where there are a few light-coloured scales, and are quadripinnatifid and of a light green colour. To grow this Fern successfully a sheltered, moist, and sunless part of the hardy Fernery must be chosen. Devote to it a level spot 1ft. square, remove the soil about 10in. deep, half-fill the hole thus formed with broken bricks, or other porous material, and

CYSTOPTERIS—*continued.*

in the remaining space put some very fibrous peat, mixed with a little loam and silver sand. Plant in this, and cover with a bell-glass, having its rim raised an inch or so above the surface for ventilation; but beware of snails. Keep the soil always moist while the plant is growing, and remove the glass as soon as the Fern appears sufficiently well established. When it has made vigorous growth it will not require any further protection. The above advice is that of the late Mr. R. Sims, who was most successful in the cultivation of all British Ferns.

DAVALLIA.

Hare's Foot Ferns, or Davallias, are almost evergreen in character. Their mode of fructification is so distinct that there is very little difficulty in identifying the species when once their most distinctive characters are understood. In all Davallias the sori are either marginal or sub-marginal; they are generally globose or roundish, but sometimes elongated, either laterally or vertically. They are disposed in shortly- but distinctly-stalked capsules, and are covered by involucre that are variable in form, being sometimes kidney-shaped, sometimes nearly round, always open at the summit, broadly fastened at the base, and generally united, though occasionally open at the sides. The veins are always free, and although there are a few exceptions, the majority of the species produce their fronds from rhizomes that are usually wide-creeping, scaly, and peculiarly predisposed to remain on the surface of the soil. Botanists subdivide the family thus:—*Acrophorus*, *Eudavallia*, *Humata*, *Leucostegia*, *Loxoscaphe*, *Microlepia*, *Odontoloma*, and *Stenoloma*.

Davallias are some of the finest of all Ferns for basket culture, such species as *D. bullata*, *D. canariensis*, *D. dissecta*, *D. Mariesii*, and *D. Tyermanni* being excellent. To the genus also belong the Fern balls, so popular for suspending in rooms or glass-houses; and also the grotesque-looking animals that have a certain vogue. A form of the well-known *D. bullata* (*Nagaha*) is usually employed for the purpose.

Grown in either pots or pans, Davallias that are provided with rhizomes require to be a little elevated above the rim, as nothing is more injurious to them than to have their rhizomes buried in the soil, especially the species whose rhizomes are clothed with large, chaffy scales. Besides being highly decorative, their fronds last a very long time when severed from the plant. Most of them delight in a compost made of three parts fibrous peat, one part of chopped sphagnum or good leaf mould, and one part of silver sand, with thorough drainage and an abundant supply of water at the roots during the growing season. During the winter they must be watered only sparingly, never allowing them, however, even those that are deciduous, to become quite dry. This is a very important point, as, if the rhizomes are allowed to shrivel, the ensuing growth will be much weaker. The plants require no syringing overhead, but derive much benefit from being kept near the glass, where good light is obtainable.

Those species without rhizomes are propagated by spores, which are abundantly produced, and which, if sown in heat, germinate freely and soon form little plants; while species provided with rhizomes may be increased by the division of these organs in the early spring. Where Davallias like *dissecta*, *bullata*, and *Mariesii* are required in quantities, it is much more satisfactory to raise seedlings; and if, as soon as they have produced a small rhizome 2in. long, this is repeatedly pruned, they produce, in a remarkably short time, pretty, bushy little plants.

D. aculeata.

This very handsome West Indian stove species is remarkable on account of its climbing habit, which resembles that of a bramble. Its elegantly-divided fronds possess the singular property of lengthening at the points very much in the way of *Lygodiums* and *Gleichenias*. Their stalks and rachis measure sometimes 6ft. in length, and are covered with sharp thorns curved downwards; they are tripinnatifid, and their lower leaflets, 1ft. to 1½ft. long, 4in. to 6in. broad, and somewhat spear-shaped, are divided into leaflets, which in their turn are cut into wedge-shaped

DAVALLIA—*continued.*

segments, twice to four times lobed and bright green. The small and cup-shaped sori are terminal. The plant is rendered very attractive by the slender stalks and the fresh growths being of a pale claret hue: these issue from a short, underground, creeping rhizome, and make a beautiful pot specimen. This species may also be used with



Fig. 86. *Davallia affinis*, a beautiful species, well adapted for growing on projecting parts of the rockery.

great advantage for covering a rustic pillar, or for climbing over rockwork. It should be either planted or potted in a more sandy or gritty compost than is used for most *Davallias*.

D. affinis.

A handsome, finely-cut stove species, native of Ceylon, Java, and Polynesia, and usually found in gardens under

DAVALLIA—*continued.*

the name of *Acrophorus*. It is well adapted for growing on rockwork, where it should be planted on projecting places. The elegantly-divided fronds, 1ft. to 2ft. long, 6in. to 12in. broad, and somewhat spear-shaped, are borne on strong, erect stalks 4in. to 9in. long, and three or four times divided to the midrib; they are produced from thick prostrate stems (Fig. 86) that are densely clothed with sharp-pointed scales of a peculiar rusty colour. The ultimate segments of the fronds are cleft nearly to the midrib, and are provided with sharp teeth. The small sori are disposed at the base of the teeth, two to six to a segment.

D. alpina.

A charming little stove species, of trailing, dwarf habit, native of Java, Borneo, and the Polynesian Islands, and totally distinct from all others. Its fronds, which are abundantly produced from very slender and peculiarly flattened rhizomes, densely covered with scales of a light brown colour, are of two kinds. The barren ones, 2in. to 3in. long, and about 1½in. broad at their base, are triangular in outline; their upper segments, of a leathery texture, and of a dark shining-green colour, are broad and slightly toothed. The fertile fronds have their segments more finely divided, more distantly placed, and deeply and sharply toothed, which characters give the plant a very elegant appearance. Both kinds of fronds are borne on slender stalks, 2in. to 4in. long, and have their rachis narrowly winged. The sori are placed in the teeth on both sides. This little gem requires a warm temperature and moist atmosphere, although it is not partial to watering overhead. It succeeds remarkably well, and forms a very handsome little specimen, when grown on a pyramid of fibrous peat.

D. bullata.

This handsome, deciduous, stove or greenhouse species, native of Japan, Java, and Hindostan, is popularly known as the Squirrel's-foot Fern, from the general appearance of its creeping rhizomes, which are invariably clothed with minute reddish-brown scales. The fronds, which are abundantly produced on these rhizomes, are 8in. to 12in. long, 4in. to 8in. broad, somewhat triangular, quadripinnatifid, of a rich, dark shining green colour, of a leathery texture, and are borne on rather slender, yet firm, stalks 3in. to 4in. long. The deeply half-cup-shaped sori occupy the greater part of the tooth in which they are placed on the margin of the segments, and are usually provided with a horny projection on the

DAVALLIA—*continued*.

outside. One of the most useful Davallias in cultivation, succeeding equally well in stove or greenhouse, and making a very fine specimen, whether grown in a shallow pan of good dimensions, in a hanging-basket, on a pyramid of peat, or on a vertical piece of cork or a Tree-Fern stem, where the rhizomes have plenty of room for extension.

D. canariensis.

Probably the best known of all Davallias, and commonly called the Hare's-foot Fern, from the peculiar



Fig. 87. The Hare's-foot Fern, *Davallia canariensis*, one of the most useful species of this very large genus.

nature of its prostrate stems (Fig. 87), which are stout, naturally creeping downwards, curving over the sides of the pot in which it grows, and being covered with pale brown, narrow scales, much resemble a hare's foot. Its fronds, 1ft. to 1½ft. long, 9in. to 12in. broad, and borne on strong, erect stalks 4in. to 6in. long, are triangular and quadripinnatifid; they are of a leathery texture and bright green in colour. The sori, abundantly produced and covered by half-cup-shaped involucre, occupy the whole of the margin of the ultimate division on which they are disposed, and are usually provided with a horn extending beyond them. A very ornamental and interesting Fern, useful for either pot or basket culture, or for planting on the rockwork. It is also an excellent Fern for the dwelling-room.

DAVALLIA—*continued.***D. dissecta.**

This very beautiful and easily-cultivated stove species, frequently found in gardens under the name of *D. elegans dissecta*, is a native of Java and the Malayan Archipelago, and one of the most extensively-grown species for decorative purposes. Its fronds, produced in great abundance from a stout, wide-creeping rhizome, clothed throughout with scales of a rusty colour, are 1ft. to 1½ft. long and deltoid, being about as broad at the base as they are long, and four times pinnatifid. They are of a light green tint, which contrasts agreeably with the colour of the rhizomes. The sori, situated one on each of the ultimate segments of the fertile fronds, are small, oblong, and provided with one or two horns protruding beyond them.

D. divaricata.

This exceedingly handsome, strong-growing stove species, native of Khasya, Northern India, the Malayan Peninsula, Java, &c., is generally found in commerce under the name of *D. polyantha*. Its beautiful fronds, 2ft. to 3ft. long, are produced from thick, knotty rhizomes, of a woody nature, and clothed with scales of a rusty colour; they are tripinnatifid, of a deep claret-red when young, gradually changing to a bronzy or metallic colour, and then to a deep shining green; the various hues, all of which are generally observable on the plant, have a beautiful and very pleasing appearance. The barren and fertile fronds, although of similar size and shape, are very different, the latter being very finely divided through the contraction caused by the fructification. In each case the lower leaflets are often 1ft. long by 6in. broad; they are of a leathery texture, and the half-cup-shaped sori are placed obliquely as regards the central veins in the teeth, at some distance from the edge. The place that suits this species best is a projecting rock in the warm Fernery, where it can show itself in all its beauty. It is also a shallow-rooting plant, requiring but a few inches of soil to develop itself to perfection, and on that account can easily be grown on the trunk of a dead Tree Fern.

D. elegans

A magnificent, vigorous-growing, stove species, native of Ceylon, the Malayan Peninsula, Java, Borneo, Madras, &c., and remarkable for the elegant divisions of its fronds, which are 1ft. to 2ft. long, 9in. to 15in. broad, deltoid, three times cut nearly to the midrib, and of a bright shining green. These fronds are abundantly produced from

DAVALLIA—*continued.*

a stout, wide-creeping rhizome densely clothed with woolly fibres; the leaflets of their lower leaflets are fully 3in. long, lin. broad, and cut down into oblong segments which are slightly toothed, and of a leathery texture. The sori, covered by half-cup-shaped involucre, are disposed several on the extremity of each segment, and have sharp teeth projecting beyond them at the edges. This handsome species has produced several varieties, the principal of which are *D. e. dissecta*, *D. e. elata* and *D. e. polydactyla*, the last-named a strikingly handsome variety, with dark glossy green long-enduring fronds.

D. fijiensis.

This charming Fern—the most finely-divided species of the series to which it belongs—is, as its name implies, a native of the Fiji Islands, and requires stove temperature. It is remarkable through its thick rhizomes, which somewhat resemble those of the common *D. canariensis*, but are usually straight. Its handsome fronds, although finely cut (Fig. 88), are firm and durable in texture; they are borne on upright, strong stalks, 6in. to 9in. long, measure from 1ft. to 1½ft. in length and 6in. to 12in. in breadth, have a deltoid outline, and are of a bright green colour. Being of free growth, graceful habit, and evergreen, it must rank amongst the most ornamental and useful of the whole genus. There are several more or less distinct varieties, the most striking being *D. f. major* and *D. f. plumosa*, perhaps one of the most elegant of all known Ferns, distinct from the species by the gracefully-drooping habit and the feathery nature of its pendulous fronds, as also by their much more finely-divided character. *D. fijiensis* and its various forms are all very useful as pot and basket plants, and very valuable for decorative purposes generally, making noble specimens, particularly adapted for exhibition. They are all averse to loam, a peaty compost of a sandy nature being that which suits them best.

D. heterophylla.

This very singular and pretty stove species is a native of the Malayan Peninsula and the Polynesian Islands. It and *D. angustata* are the only known Davallias with entire fronds. The fronds of *D. heterophylla* are produced from a small, creeping, scaly rhizome; they are 3in. to 6in. long, lin. broad, of a leathery texture, smooth on both surfaces, and shortly stalked; the barren ones are spear-head-shaped, entire, or sometimes slightly lobed at the base, while the fertile ones are narrower and deeply

DAVALLIA—*continued*.

notched (Fig. 3, p. 6). The sori are disposed two to ten to a lobe. This plant is particularly well adapted for growing on a Tree Fern trunk, in which position it is shown to great advantage. When grown in a pan or a pot it requires very little soil, as it is only surface-rooting.



Fig. 88. *Davallia fijiensis*, one of the most elegantly graceful species in the genus; its fronds, though finely cut, are very durable.

D. hirta cristata.

A fine, crested form, usually found in gardens under the name of *Microlepia hirta cristata*. It was introduced into this country from the South Sea Islands, and is greatly superior in decorative qualities to the type, being equally vigorous, but of a much more elegant, spreading

DAVALLIA—*continued.*

habit. Its beautiful fronds, of a peculiarly soft light green colour, are produced in profusion from very short, creeping rhizomes having all the appearance of numerous crowns crowded together; they are borne on stout yet flexible stalks, and attain fully 6ft. in length. These fronds not only differ from those of all other known species in having their extremity heavily tasselled, but even their leaflets are freely branched and sub-divided near the summit, and the natural weight of these crests and tassels, and the much-divided pinnæ and pinnules, give the whole plant a very attractive appearance by producing a gradual and graceful curve of the stalks. *D. h. cristata* is one of the strong-growing Davallias which should preferably be grown in fibrous peat and sand only; it is also one of those which suffer most from insufficiency of water at the roots at any time of the year. The whole plant is slightly hairy, and on that account should never be watered overhead. It very seldom produces fertile fronds, so that it is generally increased by the division of the crowns.

D. Mariesii.

An elegant, deciduous, greenhouse species, of dwarf habit and very free growth; it is a native of Japan, where it is very extensively used for decoration. In general aspect it is not unlike the well-known *D. bullata*, but it is more slender in all its parts. As a basket Fern, *D. Mariesii* is one of the best of the genus; its rhizomes, of a very slender and flexible nature, readily take possession of the whole exterior surface of the basket, and peep out in all directions. It is extensively used in Japan for forming boats, wreaths, crosses, and other designs, to which purpose its flexible rhizomes readily lend themselves. *D. M. cristata* is a prettily-crested garden variety.

D. Mooreana.

Synonymous with *D. pallida*.

D. novæ-zelandiæ.

This exceedingly beautiful greenhouse Fern, native of New Zealand, is more generally known under the name of *Acrophorus hispidus*. It almost equals some of the Filmy Ferns in beauty, and should be extensively grown, as it makes a very pretty object on the rockwork, in the fissures of which it becomes quite at home. The fronds, 1ft. to 1½ft. long, 4in. to 8in. broad, triangular, and tripinnate, are produced from a slender, creeping rhizome clothed with rust-coloured hairs, which are soft and jointed; they are of a brownish-green colour, glossy, of a somewhat leathery texture, and borne on firm, erect stalks of a

DAVALLIA—*continued.*

mahogany-brown colour, and from 4in. to 8in. long. The lower leaflets are cut down to the rachis, except towards their extremity, into narrow, deeply-pinnatifid segments, on the teeth of which the minute and numerous spore masses are disposed. The rhizomes, which are of a peculiarly wiry nature, do not bury themselves in the ground.

D. pallida.

This beautiful stove species, native of Aneiteum and Borneo, and usually known as *D. Moorcana*, is undoubtedly one of the handsomest decorative Ferns known. Its robust fronds, of an elongated-triangular form, 2ft. to 3ft. long, and four times pinnatifid, are produced on rhizomes as thick as one's finger, wide-creeping, and covered with spear-shaped scales of a dark brown colour; they are borne on smooth, naked stalks 1ft. to 1½ft. long, and furnished with triangular leaflets, the lowest, which usually are also the largest, frequently measuring 6in. to 8in. broad at their base. The leaflets and their segments are stalked and wedge-shaped at their base; they are of a firm and somewhat leathery texture, the lobes into which they are finally divided, and upon which the spore masses are disposed on the upper side at the base, being blunt and wedge-shaped. That the merits of *D. pallida* are fully appreciated by Fern-growers in general, is amply demonstrated by the fact that huge specimens of it are to be seen at all flower shows, for which purpose it is admirably adapted. It is a Fern of rapid growth, possessing the great advantage, from the decorator's point of view, of making a large specimen in a comparatively small pot.

D. polyantha.

Synonymous with *D. divaricata*.

D. tenuifolia Veitchiana.

The rhizomes of this variety are of such a very short-creeping nature that the plant appears quite destitute of the hare's-foot-like growths so peculiar to Davallias in general, its fronds being produced in great abundance from what appears to be a densely-tufted crown formed by underground rhizomes. It is a most beautiful and distinct variety, easily distinguished from the type by its elegant and pendulous, plume-like fronds, 2½ft. to 3ft. in length, including the stalks, very finely cut and gracefully arching on all sides. Their leafy portion, of a broadly spear-shaped outline, is furnished with numerous leaflets, which are divided into lace-like leaflets and segments, much longer

DAVALLIA—*continued*.

and slenderer than those of any other kind, and the pale green colour of which forms a striking and most pleasing contrast with the red tinge of their slender, round, flexible stalks. This variety is a native of the Straits Settlements. Its light, drooping habit makes it one of the best of stove basket Ferns in cultivation; its roots are averse to loam, and are also very sensitive to the effects of drought.

D. Tyermanni.

This very handsome greenhouse species, native of the West Coast of Africa, is popularly known as the Bear's-foot Fern, on account of the narrow, silvery-white scales with which its wide-creeping rhizomes are densely clothed. Its fronds, of a bright green colour and somewhat leathery texture, are somewhat scantily produced; they are triangular in shape, 4in. to 6in. long, four times pinnatifid, and borne on naked stalks 2in. to 3in. long and of a reddish colour. The sori, disposed at the base of the ultimate lobes, are covered by hemispherical involucre that are free at the sides.

DENNSTÆDTIA. *See Dicksonia.***DIACALPE**

This genus is composed of a solitary species. Its chief peculiarity is the hard, globose, entirely closed covering, which at last bursts open irregularly, and is affixed to the sorus by a small point of contact.

D. aspidioides.

This stove species is a native of the Malayan Islands, Sylhet, Assam, and Ceylon. It is an easily grown plant, its requirements being similar to those of the strong-growing *Aspleniums*, and it is very striking on account of the rich dark green colour of its massive fronds of a graceful habit. These are 1½ft. to 2ft. long, including the smooth and comparatively slender stalks on which they are borne, and about 1ft. broad; they are broadly ovate, and of a thin and more or less transparent texture. The leaflets, of the same shape as the leafy portion of the frond itself, have their leaflets of a peculiar oblong-wedge-shape, lobed, and as the plant becomes older more or less decurrent. This handsome Fern is readily propagated by its spores, which are abundantly produced and disposed one mass to a pinnule, on the midvein of which they are attached by a very short stalk.

DICKSONIA.

The genus *Dicksonia*, as it stands at present, includes *Balantium*, *Cibotium*, *Dennstædia*, *Eudicksonia*, *Patania*, and *Sitolobium*.

The majority of the *Dicksonias* only require cool treatment; most of the arborescent kinds being found growing in valleys and in deep, shaded ravines, and in countries where some of them occasionally have their fronds heavily loaded with snow. *D. antarctica* thrives when planted outside in sheltered spots in different parts of England, Wales, and Ireland. At Bosahan, near Falmouth, Sir Arthur Pendarves Vivian grows it to perfection. Wherever a suitable spot exists, Tree Ferns should be introduced, as they present a tropical appearance. When *Dicksonias* are grown in pots, it is indispensable that water should be applied freely to their roots all the year round, or they will show the effects of a day's neglect in an unmistakable way, and a very long time will elapse before they recover from the injury done during that short time. The plants are all the more likely to suffer from want of water when grown in pots, as these should be of the smallest size possible consistent with the dimensions of the trunks. As a rule, when not planted out, all Tree Ferns thrive best in pots or tubs in which only three or four inches of soil all round the trunks is allowed. The most suitable compost is a mixture of two parts fibrous peat, one part fibrous loam, and one part coarse silver sand. However good their growth may be when cultivated in pots, it cannot equal their vigour when grown in the open ground, in which case the bottom must be particularly well drained; for, although these plants require a constant supply of water, their roots soon decay when stagnancy is allowed. To produce luxuriant and lasting foliage, *Dicksonias* should, during the summer, have their trunks thoroughly watered twice a day; but these copious waterings should gradually decrease as the season advances, and during the winter the trunks should only be kept constantly moist, the heads being slightly shaded during the hottest summer days only.

Dicksonias of arborescent habit are invariably propagated from their spores, which they produce in great abundance, and which germinate very freely. Those species which are provided with rhizomes may be increased by the division of those organs, an operation which is best done in March or April; but when required in large quantities, it is found more advantageous to propagate them from spores in the usual way.

D. antarctica.

This magnificent greenhouse species, native of Eastern Australia and Tasmania, is a universal favourite. Though it is the commonest of all the arborescent Ferns in cultivation, it always attracts special attention, and is much admired on account of its trunk, which, although varying considerably in thickness, is generally proportionate to its height. Although it is said to attain the height of 35ft., the handsomest specimens that one usually meets with measure from 18ft. to 20ft. high. Its massive fronds, 3ft. to 6ft. long, 2ft. to 3ft. broad in the centre, and borne on stalks barely 1ft. long, which in their young state are densely covered with narrow, fibrous scales of a dark purple-brown colour, are tripinnate, spear-shaped, and, when fully developed, furnished with thirty to forty pairs of fully pinnate leaflets. The central leaflets are 1ft. to 1½ft. long and 4in. to 5in. broad; their leaflets, about ½in. broad and of a leathery texture, are stalkless, of a rich shining-green colour above, paler beneath, and sub-divided into oblong, deeply-cleft segments, the sori being disposed six to ten on the lowest only. These sori, globose in form and produced on the extremities of the smaller veins, are small but numerous, and their covering is of a leathery texture. *D. antarctica* is a large and rapid grower, easily cultivated, and requiring very little cultural attention. It is admirably adapted for the decoration of the conservatory, whether planted out or grown in a pot or tub.

D. Barometz.

A handsome greenhouse species, which, on account of the singular appearance of its decumbent, massive, hairy rhizome, is known under the popular name of Vegetable Lamb; it is a native of Assam, China, and the Malayan Peninsula and Islands. The handsome fronds, of a leathery texture and 6ft. to 8ft. long, are tripinnate and triangular in shape. The lower leaflets, 1ft. to 2ft. long and 6in. to 12in. broad, have their leaflets narrow, sharp-pointed, and cut down within a short distance from the

DICKSONIA—*continued.*

rachis in their upper portion and sometimes quite down to it at their base. Their upper surface is a dark, shining green, whereas their underside is of a beautiful glaucous colour. The stalks and rachis are more or less densely clothed throughout with long, light-brown hairs, and the sori, disposed two to twelve to a pinnule, are covered by a distinctly two-valved involucre.

D. Culcita.

This very striking, large-growing, greenhouse species, native of Madeira and the Azores, is popularly known as



Fig. 89. Dicksonia Culcita, popularly called the Cushion Fern; it is a handsome species for the greenhouse.

Cushion Fern. This is due to the fact that its crown and the base of its fronds are covered with a dense, woolly substance of a soft, silky nature, so abundant that it has now become an article of commerce. *D. Culcita* cannot be strictly called a Tree Fern, inasmuch as its trunk seldom, if ever, rises more than a few inches above the ground (Fig. 89). Its fronds, fully 1½ ft. long, 1 ft. broad, and tripinnate, are borne on stout, upright stalks as

DICKSONIA—*continued.*

long again as their leafy portion. The lower leaflets are deltoid, and have egg-shaped divisions, cut down to the stalk in the lower part, with oblong, unequal-sided, deeply-toothed segments of a leathery texture and wedge-shaped at the base. The fertile fronds are so much contracted that there is very little membrane left between the sori, which are one line across and have a singular covering somewhat resembling a purse. *D. Culcita* (usually called *Balantium culcita*), although a very strong grower, produces comparatively few roots; these are of a tough, wiry nature, and seem to delight in an open compost made of two parts peat and one part chopped sphagnum, without any sand. The soil should at all times be kept very moist. Although spores are produced in great abundance, we have no knowledge of any young plants having ever been artificially raised in this country.

D. Lathamii.

This noble greenhouse Fern is the only instance known at present of an artificially-produced hybrid of arborescent habit. It was raised at the Birmingham Botanic Gardens by Mr. Latham, who states that it is the result of a cross effected between *D. antarctica* and *D. arborescens*. It certainly possesses all the characters of a plant intermediate between these two species, and appears to have retained the exceptionally robust nature of the latter, combined with the elegant character of the former.

D. Schiedei.

One of the most beautiful of all known Tree Ferns, and very distinct. Though it thrives fairly well in a conservatory, it prefers stove temperature, being a native of Guatemala and of Mexico. The very elegantly-drooping fronds, oblong-triangular in shape, are frequently seen measuring from 6ft. to 10ft. in length. They are tri-pinnate, are borne on stout, brownish stalks of a very hairy nature, and rise from a crown that is densely covered with long, silky, shining brown hairs. The oblong-spear-shaped leaflets, 1ft. to 2ft. long and ending in a very narrow point, are furnished with short-stalked, narrow leaflets cut down quite to the stalk below; these are again sub-divided into closely-set, somewhat sickle-shaped, toothed segments, upon each of which four to six spore masses are disposed parallel with the edge. The sori are peculiar, inasmuch as the inner valve of the involucre overtops the outer one. This species is highly decorative, and all the more attractive as its fronds, of a somewhat leathery texture, are of a pale yellowish-green above and beneath

DICKSONIA—*continued*,

very glaucous, with which the colour of the conspicuous spore masses forms a pleasing contrast.

D. squarrosa.

A very handsome, arborescent, greenhouse species, native of New Zealand and Chatham Island. It is particularly attractive on account of its slender, black or very dark-coloured trunk, which frequently produces young plants on its surface. The habit of its head is also peculiar and very effective: it is quite flat, and is formed of a quantity of rigid, leathery fronds, dark shining green on their upper surface, paler beneath, and borne on short and comparatively slender, dark purplish or blackish stalks that are covered with raised points and blackish hairs. These fronds are oblong-triangular and tripinnate; their numerous oblong-spear-shaped leaflets, 9in. to 15in. long and 4in. to 6in. broad, are furnished with nearly stalkless leaflets, which in their turn are divided into spear-shaped segments, the barren ones toothed, the fertile ones much smaller, deeply pinnatifid, and contracted. The sori are disposed six to eight on the lower segments, the whole of which they occupy, with the exception of the midrib and the tip. The trunk of this species, being naturally of a very dry nature, must be carefully kept moist.

DICTYOGRAMME. See **Gymnogramme.**

DICTYOPTERIS. See **Polypodium.**

DIDYMOCHLÆNA.

Only a couple of species are embraced in this genus, both being of tree-like habit. They are very ornamental, stove Ferns, and especially is this the case with *D. lunulata*, which is most commonly met with in collections. They are of easy cultivation, although it is nothing unusual to see their leaflets fall off, leaving the stalks naked; that generally happens when the plants have suffered from want of water at the roots; but although unsightly for a time when in such condition, they soon recover under liberal treatment. The plants should be potted in a mixture of two parts of good fibrous peat and one of loam, with a good dash of silver sand, and be thoroughly well drained; although they naturally grow in places that are constantly moist, stagnancy at the roots must be

carefully avoided. The spores, which are produced in abundance, germinate freely, and produce young plants in a remarkably short space of time.

D. lunulata.

This very handsome stove Fern, extensively known in gardens also under the name of *D. truncatula*, is a native of Tropical America. It is entirely distinct from any other Fern in cultivation, its general aspect being that of a tree-like Adiantum, for its pinnules are shaped like those of several Maidenhair Ferns, and the bright metallic colour which adorns its fronds in their young stage helps to make the illusion more complete. The fronds are, however, provided with thick, fleshy stalks, and their leafy portion, at first of a crimson-bronze tint, which gradually turns to a vivid, glossy green, are of a fleshy texture unknown among Adiantums, to which the resemblance is thus much more apparent than real. This Fern might be extensively used for outdoor sub-tropical decorations from mid-June to mid-September, the experiments which have been tried in that respect in France and in Belgium having proved very satisfactory. It has a very disagreeable way of losing its pinnules; but these drop off only when the plant has been allowed to get dry at the roots.

D. truncatula.

A synonym of *D. lunulata*.

DIPLAZIUM. See **Asplenium.**

DISPHENIA. See **Cyathea.**

DOODIA.

Although not an extensive genus, *Doodia* is very rich in decorative Ferns of small habit, and, with the exception of one species, all are of dwarf growth; they are, nevertheless, found very useful, especially for Fern-cases and for edgings of window-boxes filled with taller-growing kinds. Some Doodias grow more luxuriantly in a stove temperature, and produce more massive foliage under such treatment, but none of them actually require great heat; the cool and intermediate houses are the places suitable to all of them. They are also very useful for forming an undergrowth in cool houses devoted to either Palms, Orchids, or other flowering subjects; the more so as they are naturally clean plants, and they bear fumigation without injury. *D. caudata* is perhaps the most generally useful of all the species for this

purpose. Doodias, when planted under or grown amongst other plants, bear with impunity the syringings that may be found necessary to the welfare of the latter, or do equally well without, as the case may be. They should be potted in a compost of three parts of peat and one of silver sand: while a little chopped sphagnum forms a valuable addition. The drainage, especially when they are grown in



Fig. 90. *Doodia aspera multifida*, a variety with gracefully drooping fronds, several times forked at their extremity.

pots, must not be overlooked, as they are very sensitive to the effects of stagnant water. None of them like exposure to the full rays of the sun.

Doodias are invariably propagated by means of their spores, which are produced in abundance, and germinate very freely, but they may also be increased by the division of the crowns in early spring.

DOODIA—*continued*.**D. aspera.**

This pretty, evergreen, greenhouse species, of erect habit, is a native of Temperate Australia. It is easily distinguished from all other known species by the harsh and rigid nature of the dark-coloured stalks of its fronds. The fronds, which are abundantly produced from a short-creeping rhizome, are oblong-spear-shaped, 6in. to 18in. long, 2in. to 4in. broad, and pinnatifid; the numerous long and narrow leaflets have their margins strongly toothed and their base dilated, the lower ones dwindling to mere auricles. They are of a particularly tough texture, and while in a young state, and until quite developed, are of a very beautiful purplish-metallic hue, which gradually turns to the darkest green. The oblong sori are disposed in one or two rows, the inner situated at a short distance from the midrib. Two remarkably pretty and distinct varieties have been produced in *D. a. corymbifera*, a plant of stiff, erect habit, with fronds seldom attaining more than half the dimensions of those of the type, and densely crested at their extremity; and *D. a. multifida*, in which the fronds, instead of being erect, like those of the type, are elegantly drooping, and instead of being densely crested, like those of the foregoing variety, are several times forked at their extremity (Fig. 90); their leaflets show the same character. Both these varieties, the latter of which reproduces itself freely and true from spores, the foliage, of a beautiful claret colour when young, gradually assumes a copper tint and changes to a dark green with age.

D. caudata.

An easily-cultivated, greenhouse species, which comes up readily in crevices and on pots in all Ferneries where one plant of it has been once introduced; it is a native of Australia, Tasmania, and New Zealand. Speaking of this plant, Dr. Hooker, in his "Flora of New Zealand," says: "It is very closely allied to *D. media*, and probably a variety of it, but more flaccid, the fronds often prostrate, pinnate nearly to the top, fertile more distinct from the barren, and longer." *D. c. confluens* (identical with *D. linearis* of J. Smith) differs from the type in having narrow-linear fronds, the upper part of which is undivided, while only the lower third is sinuate and pinnatifid; their lobes are rounded, and the lowest ones are very distinct. It is a native of New Caledonia and Australia.

D. linearis.

Synonymous with *D. caudata confluens*.

DOODIA—*continued*.**D. lunulata.**

A synonym of *D. media*.

D. media.

A very pretty greenhouse species, native of Australia and New Zealand, and also known as *D. lunulata*. It has spear-shaped fronds 1ft. to 1½ft. long, 1½in. to 3in. broad, and borne on slender, smooth stalks of a delicate pink colour, 4in. to 6in. long, and scaly at the base. These fronds, which when young are of a delicate red colour, are of a slenderer and more pendulous habit than those of any other Doodia. They are furnished with numerous narrow leaflets, which in the barren ones are usually bluntish at the point and finely toothed at the margins; the upper ones are dilated and connected at the base, while those below the middle are heart-shaped and even eared on the upper side. The fertile fronds, which are usually longer, have their leaflets much narrower, almost linear, except at their base, where they are pinnatifid or eared above and below. The texture of both kinds of fronds is somewhat leathery, and the short, oblong sori are disposed in one or two rows, with a considerable space between the inner one and the midrib. The whole plant is of a bushy habit, the fronds being produced from a close, compact crown. There are several varieties in commerce, one of the most distinct being *D. m. Kunthiana* from the Sandwich Islands.

DORYOPTERIS. See *Pteris*.

DRYNARIA. See *Polypodium*.

ELAPHOGLOSSUM. See *Acrostichum*.

GLEICHENIA.

The plants comprised in this genus, popularly known as Umbrella and Bead Ferns, may be differentiated from all other Ferns by their mode of growth. From the centre of each frond develops a bud that gives birth to a pair of fronds, in all respects identical with the one from which they were evolved. The genus is divided into two sections—*Eugleichenia* and *Mertensia*.

In the majority of cases cool treatment is the most suitable for these plants, and that with very few exceptions they fare best in a house where during the winter the temperature falls as low as 45deg.

In fact, most, if not all, of the failures experienced in the early attempts at cultivating these charming plants may be traced to growing them in too much heat—treatment which caused them to make stunted growths, generally full of thrips and scale. Besides the house being at most what is usually called intermediate, it should also be light and well ventilated. Bright light is indispensable; they will even withstand a little sunshine during the morning and the afternoon, and be benefited by it. Light, in fact, is of such importance that if a plant in perfect health be placed under, say, Tree Ferns, or under any other plant that will permanently shade it, it will soon start on a retrograde march, and show by its spindly growth that it does not at all appreciate the presence of neighbours taller than itself. It is also worthy of note that success cannot reasonably be expected unless these plants are in a perfect state of cleanliness.

The section that includes such plants as the elegant *G. circinata* and its varieties are very shallow rooters, and when not planted out should be grown in rough, sandy peat, in pans. Their rhizomes must be carefully kept on the surface by being pegged on the potting material, which must be made firm, if not altogether hard. Abundance of pot-room is therefore indispensable. The pans should be well drained, as, although *Gleichenias* require liberal waterings, nothing is more injurious to them than stagnant moisture at the roots.

In the *Mertensia* section that includes *G. dichotoma* and *G. flabellata*, &c., a compost of two parts fibrous peat, one part fibrous loam, and one of sand is preferable to the sandy peat recommended for the others. They also require a quantity of water at the roots, though stagnant moisture must carefully be avoided. Plants of both sections are always the better for being kept dry overhead. *Gleichenias* in general propagate slowly. With the exception of seedlings of *G. circinata speluncae* and *G. c. semi-vestita* of commerce, and of *G. rupestris*, the mode of increase has always been limited to the

division of clumps, an operation which is very tedious, extremely hazardous, and seldom attended with complete success.

G. circinata.

This elegant, greenhouse species, native of Australia, Tasmania, New Zealand, New Caledonia, and Malacca, is of particularly slender habit, with short and narrow fronds borne on stems clothed with chaffy hairs of



Fig. 91. Gleichenia circinata Mendelli, a compact-habited very elegant Fern.

a reddish-brown colour. The lobes of their leaflets are ovate or nearly round, especially when fertile, more or less glaucous underneath, and have their margins slightly rolled inwards. The sori are disposed in capsules three or four together, and very abundantly produced. It is also known as *G. microphylla*. Several very handsome forms, considered in commerce as distinct species, are only varieties of *G. circinata*. Of these the most distinct are:

G. c. Mendelli.

This differs from the type in being much more robust in growth and of a thicker texture; in fact, it is a very compact-habited plant (Fig. 91). The under-part of its

GLEICHENIA—*continued.*

lobes, which, instead of being circinate, are perfectly flat, is of a beautiful silvery colour. This variety is also known in gardens under the name of *G. c. glauca*.

G. c. semi-vestita.

A handsome, stove variety, native of New Caledonia and Malacca, differing from the species, and also from its other forms, by its close habit and very erect mode of growth.

G. c. spelunçæ.

Perhaps this rare, large-growing and essentially distinct variety is the most handsome and decorative of the whole group of plants with beaded fronds. It is a native of New South Wales and Tasmania, and is easily recognised by its pendent but not curving fronds, which are produced in abundance and divided into elegantly-arching or pendulous leaflets, loosely and gracefully set.

G. dicarpa.

An elegant and equally variable greenhouse species, native of Australia and Tasmania, where it is very abundant, and also of the Isle of Pines and of New Caledonia. It is distinguishable from all the other species belonging to the same section by its graceful fronds, of variable length, being repeatedly divided in two only, the leaflets being again pinnatifid, and by their lobes or segments being small, round, deeply pouched, pale green below, and of a dark shining green above. The sori consist of two capsules, concealed in the almost slipper-shaped lobes, and are mixed with rusty-coloured hairs which often extend to the stalks. In commerce there are several very handsome forms of this variable species, the most noteworthy of which is *G. d. longipinnata*, a remarkably handsome, greenhouse form, which must not be confounded with *G. longipinnata* of Hooker (a variety of *G. pubescens*); it is a native of Tasmania, whence it is occasionally imported among plants of the typical species. The fronds, which are longer than those of the type, and of an exceedingly graceful habit, have their pendulous leaflets formed of numerous small and very deeply-pouched segments, the pouching being caused by the recurving of their edges.

G. dichotoma.

This handsome, distinct, stove species is one of the most widely distributed of the whole group, being found in tropical and sub-tropical regions in the New and in the Old World, in the Pacific Islands, and as far north as Japan. On account of this extensive distribution, it

GLEICHENIA—*continued.*

is very variable in size as well as in the shape of its leaflets, which are sometimes 1½ft. long and 6in. broad, but frequently only 5in. long and 2in. broad. In some cases they are more or less woolly beneath, but they are generally smooth, bright green above, and very glaucous underneath. Occasionally also the lowest pair of the lobes of which they are composed are much elongated, reflected, and pinnatifid, and the species is distinguished at first sight by the pairs of accessory leaflets which are invariably present at the base of the forks. *G. dichotoma* is a solitary species in its section, not only on account of the peculiar formation of its fronds, but also because it is perhaps the only species provided with wiry, creeping rhizomes of the smooth, shining nature of those of the plants with beaded leaflets. The sori, according to Lowe, consist of from ten to twelve capsules, punctiform and naked. *G. Hermannii* and *G. rufinervis* are synonymous with this species.

G. flabellata.

No doubt this is the most popular and best-appreciated of all those belonging to its section. It is a native of Australia and Tasmania, New Zealand, and New Caledonia, and it is a greenhouse Fern of robust, erect habit, making a magnificent specimen. The handsome, fan-shaped fronds, produced from thick, underground rhizomes of a woody nature, are very proliferous and two or three times forked, thus producing a whorl of spear-shaped, ascending leaflets furnished with comb-like leaflets and terminating in a tail-like process. These leaflets or segments are very narrow and of a bright green colour on both surfaces. The sori consist of from one to four naked spore cases disposed on each side of the midvein. The stalks are stout, of a dark colour, and it is not unusual to see specimens 6ft. in height and 6ft. through.

G. Hermannii.

A synonym of *G. dichotoma*.

G. microphylla.

A synonym of *G. circinata*.

G. rufinervis.

Synonymous with *G. dichotoma*.

G. rupestris.

A rare and very handsome greenhouse species, native of New South Wales and Port Jackson, somewhat allied to *G. circinata*, but of denser and more symmetrical

GLEICHENIA—*continued.*

habit; it is distinct from most other plants of the same section through the leathery texture of its foliage and the reddish-purple tint or prune-colour of the stalks of its fronds. There is a pretty variety in *G. r. glaucescens*, in which the fronds are of the same dimensions as in the type, but their leafy portion is of thicker texture, and their glaucous colour, besides being more conspicuous, is not confined to the under-part only, but spreads all over the surface, and forms a striking contrast with the reddish-purple tint of the stalks.

GONIOPHLEBIUM. See *Polypodium*.

GONIOPTERIS. See *Polypodium*.

GYMNOGRAMME.

This somewhat extensive genus contains the majority of what are popularly known as the Gold and Silver Ferns, the under-side of the foliage of many of them being covered with farina of a colour varying from the purest white to shades of yellow. Sometimes plants are found that bear fronds suffused with white and yellow powder at the same time: this may frequently be observed in forms derived from the *calomelanos* type, which also sometimes produce fronds provided with the usual covering on one half, whereas the other portion is quite destitute of such powder. In some species the powder is practically confined to the stalks—in *G. decomposita* (Fig. 92) for instance.

The distinctive characters of the genus reside in the naked nature and in the disposition of the sori, which arise from the veins of the under-surface of the fronds; in their form, which is linear or linear-oblong, and either simple or forked; and in their being irregularly scattered over the entire under-surface of the fronds. They are situated along the veins between the base and the apex, and usually occupy almost the whole length of the minor veins. After a time they become confluent, and when this occurs the proper distribution and arrangement of the spore masses are no longer apparent. The genus as it is now accepted embraces many plants which formerly were classed under different generic names,

as follows:—*Ceropteris*, *Dictyogramme*, *Eugymnogramme*, *Leptogramme*, *Selliguea*, and *Syngramme*.

All the species of *Gymnogrammes* are very ornamental, and the majority of them may be



Fig. 92. *Gymnogramme decomposita*, a species in which the powdering is practically confined to the stalks.

successfully grown in hanging baskets. Where practicable, this method of culture is really the most suitable, as *Gymnogrammes* are fond of light and also of a drier atmosphere than that found in the ordinary Fernery or the warm plant-house. How-

ever, owing to their great size and robust growth, some kinds may only be grown in pots.

Gymnogrammes should be firmly potted in light material, made up of two parts fibrous peat, one of leaf mould, or the same quantity of finely-chopped sphagnum, and one of silver sand. Those grown in pots should not be mixed among other Ferns, but be kept by themselves and out of reach of the water from the syringe, as they not only suffer from the effects of watering overhead, but also present a wretched appearance, the white or yellow meal being easily displaced by the slightest sprinkling. Then, too, accumulations of water in the crests of the fronds will cause damping off in winter. This is particularly so with the beautiful form *G. calomelanos chrysophylla Parsonsii*. This needs to be kept in a very dry place, and as close to the light as possible. They grow very well and get much better coloured if kept without, or with only very light, shading, the light, however strong, never being too much for them, provided they have been accustomed to it from the first, and that plenty of ventilation is afforded. Although particularly fond of a dry atmosphere, Gymnogrammes are plants that suffer very much if water at the roots is not freely administered. They are readily propagated from spores.

G. calomelanos.

This very handsome, robust-growing, and extremely variable, stove species, is a native of the West Indies; also of the Tropical West African Islands. The oblong-triangular fronds, 1ft. to 3ft. long and 6in. to 12in. broad, are borne on firm, very nearly black, shining, tufted stalks 6in. to 12in. long. These fronds spring from all round the crown of the rhizome, bending outwards, and leaving the plant very hollow in the centre. The spear-shaped leaflets, often cut down quite to the midrib, are closely set, 6in. long and 1½in. to 2in. broad; they are divided into distinct, toothed leaflets, of a somewhat leathery texture, dull green on the upper side, but entirely covered underneath with creamy-white farinose powder. The sori are branched, oblique, and confluent, nearly covering each segment.

Under this species are now included as forms many plants that in catalogues are usually regarded as species.

GYMNOGRAMME—*continued*.

The more noteworthy are: *G. c. chrysophylla* (aptly called by Lowe the "King of the Gold Ferns"); *G. c. c. Alstonia* (nearly all of whose leaflets are turned upwards and gracefully incurved, the upper side of the fronds appearing as if dotted with golden globules); *G. c. c. grandiceps* (a beautiful crested form); *G. c. c. Laucheana* and the gigantic



Fig. 93. *Gymnogramme calomelanos peruviana*, a rather striking and graceful form.

form (*gigantea*); *G. c. c. L. grandiceps* (the most striking of all known Gold Ferns); *G. c. c. Parsonsii* (a beautifully-crested dwarf form, of upright habit); *G. c. peruviana* (Fig. 93), *G. c. p. argyrophylla* (the finest of all Silver Ferns, being thickly coated with white meal); and *G. c. p. Mayii* (fronds surfaced with pale yellow powder).

G. dealbata.

Synonymous with *G. tartarea*.

GYMNOGRAMME—*continued.***G. decomposita.**

This finely-divided, strong-growing, stove species, native of South America, regarded by some as a natural hybrid between *G. Pearcei* and *G. calomelanos chrysophylla*, and by others as a species, is a remarkably handsome and totally distinct Fern, with somewhat the habit of *G. pulchella*, but when in a young state much more finely divided and scantily furnished with powder: this powder is white, or nearly so, but as the plant gets older it becomes of a bright yellow and covers the stalks, but seldom extends to the leafy portion of the fronds, in this respect resembling the finely-cut *G. Pearcei*. Its fronds are quadripinnatifid, and their closely-set and triangular leaflets are longest at the base of the frond; these leaflets have a peculiarly elegant aspect (Fig. 92), being divided into small leaflets, that in turn are sub-divided into several minute, finger-like lobes. The slender and conspicuous sori are confluent where the lobes join, running up into them. The plant reproduces itself freely from spores.

G. japonica.

This interesting and highly-decorative, greenhouse species, usually known under the name of *Dictyogramme japonica*, is, as its name implies, a native of Japan, though hardly distinct in general appearance from *G. javanica* (Fig. 94). When first introduced, it was expected to become a good evergreen Fern for outdoor culture. As a matter of fact, it will only bear a few degrees of frost, and can hardly be called an evergreen, as the old fronds, although dying down gradually, have all disappeared by the time the new ones make their appearance. The general aspect of the plant is that of a broad-leaved *Pteris cretica* of a very dark colour and stiff habit. It is a great lover of moisture, and to do well requires a quantity of water at the roots all the year round. The soil which suits it best is a mixture of about equal quantities of peat and fibrous loam. The plant has a great antipathy to being potted hard, and particularly dislikes water on the fronds, which turn black in a very short time if subjected to frequent syringings.

G. Muelleri.

An interesting species, from Northern Australia, suited for either a cool or a warm house. When young it resembles *Asplenium Ceterach*, but very different therefrom when old. Its fronds, 4in. to 10in. long, and 1in. to 3½in. broad, borne on wiry stalks 3in. to 4in. long, are thick and leathery, and the under-surface, like the stalks, is thickly clothed with rusty-brown scales.

GYMNOGRAMME—*continued.***G. Pearcei robusta.**

Like the type, from which it is an accidental seedling, this variety has somewhat deltoid fronds of a dark green colour and very finely cut, but narrower at the base and more elongated towards the summit: in other respects it



Fig. 94. *Gymnogramme javanica*, a Fern that with difficulty is differentiated from *G. japonica*.

is larger in all its parts. The lower portion of the stalks and the crown itself are covered with white powder. Unlike most *Gymnogrammes*, which have but a single crown, this variety forms a tuft of crowns at the apex of the short stem, from which many stalks arise, giving the plant a denser habit and the appearance of being better furnished than the original type.

GYMNOGRAMME—*continued.***G. pulchella.**

A very handsome, stove species, native of Venezuela, and one which comes very near *G. calomelanos peruviana*, from which, however, it is readily distinguished by its more upright habit and by the shape of its fronds, which are borne on firm stalks 6in. to 9in. long, of a dark chestnut-brown colour and silvery.

G. p. Wettenhalliana.

This highly decorative variety, of garden origin, differs from the type mainly in the crested form of its fronds, which are of smaller dimensions, but otherwise very similar in division. It does not come true from spores.

G. schizophylla.

This is a very distinct, stove species, native of Jamaica, and one of the most attractive of Ferns. The fronds, which are freely produced from a central crown, are borne on slender, reddish-brown stalks; they average about 2ft. in length and 6in. broad, and are elegantly arched on all sides, which habit makes this one of the very best Ferns for growing in suspended baskets. The ultimate segments are very small, and their slightly-powdered under-surface is covered with the spore masses, which are disposed one row to each segment. A very remarkable peculiarity in this species consists in the forking of the stalk at about two-thirds of its length in the leafy portion, where it produces a young plant. These little plants may be used for propagation, as they root very freely when pegged down on a mixture of peat, chopped sphagnum, and sand, in about equal proportions.

G. s. gloriosa.

A beautiful garden form of the above, with fronds of much larger dimensions and of a peculiarly feathery nature, raised in France by Mr. Ch. Maron in 1881, and distributed in 1883 by Linden as one of his introductions. It is also of much more robust constitution, and reproduces itself true from spores, which are produced abundantly, and also from young plants. The latter are found growing not only at the extremity of the fronds, but even at the end of each leaflet.

G. sulphurea.

This exquisitely beautiful, stove species, native of the West Indies, is about the smallest-growing of all the Golden Gymnogrammes with spear-shaped fronds. The fronds, which are 6in. to 12in. long and 3in. to 4in. broad, are extremely elegant, the leaflets being in pairs and set rather

GYMNOGRAMME—*continued.*

widely apart; those nearest the base of the frond are smallest and of a triangular shape, and they gradually become larger and more elongated as they become farther removed from the crown from which they are produced, attaining



Fig. 95. *Gymnogramme tartarea*, one of the most popular species known to cultivation; the fronds beneath are covered with snow-white powder.

their greatest length in the centre of the fronds. The stalks are lin. to 6in. long, but generally short, slender, of a chestnut-brown colour, and often powdery. The leaflets are fan-shaped, with undivided or cleft, wedge-shaped segments of a soft, papery texture, pale green above, and

GYMNOGRAMME—*continued.*

profusely covered beneath with a brilliant sulphur-yellow, farinose powder, of which there is also an occasional sprinkling on the upper surface. The narrow, obliquely-forked sori become, when fully mature, confluent, and nearly cover the whole under-surface of the frond. It is more difficult than other Gymnogrammes to grow from one year to another. During the winter it must be kept as close to the light as possible.

G. tartarea.

A very distinct and deservedly-popular, stove species, also known in gardens as *G. dealbata*, native of Tropical America. Its fronds are oblong-triangular, 1ft. to 2ft. long, 6in. to 12in. broad, and borne on firm stalks 6in. to 12in. long, of a dark chestnut-brown colour, and scaly towards the base. They are twice divided nearly (not quite, as appears to be the case in Fig. 95) to the midrib; of the numerous spear-shaped leaflets, the lowest are the largest, and all are divided into oblong, blunt leaflets, entire or nearly so, of a heavy, dull green colour on their upper surface, but entirely covered beneath with snowy-white powder. The abundant narrow spore masses are disposed along the midvein, eventually becoming confluent; and being of a very dark colour, as well as the stalks, form a striking contrast with the pure white under-side of the fronds. *G. t. ochracea* differs essentially from the type in the bright yellow colour of the under-side of its fronds, which have leaflets very regular, and only the lowest distinctly toothed.

GYMNOPTERIS. See **Acrostichum.**

HEMIDICTYUM. See **Asplenium.**

HEMIONITIS.

This genus is composed exclusively of small-growing Ferns with peculiar-shaped fronds—hence the popular name of Ivy-leaved Ferns. It forms a small group of stove plants which are practically confined to the Tropics, and which are readily distinguished through their spore masses being disposed in continuous rows along, and sometimes also developed between, the veins, in which division they are netted. Although some eight or nine species are known and described, only three or four of them are usually found in cultivation: these are easily-grown plants of dwarf habit, very useful for decoration and also for growing in Fern-cases, where they

thrive luxuriantly even if planted in moss only. When grown in pots, all these singular Ferns require is a mixture of two parts of fibrous soft peat, and one part of sand, or where the peat obtainable is of a somewhat close nature, the mixture is benefited by

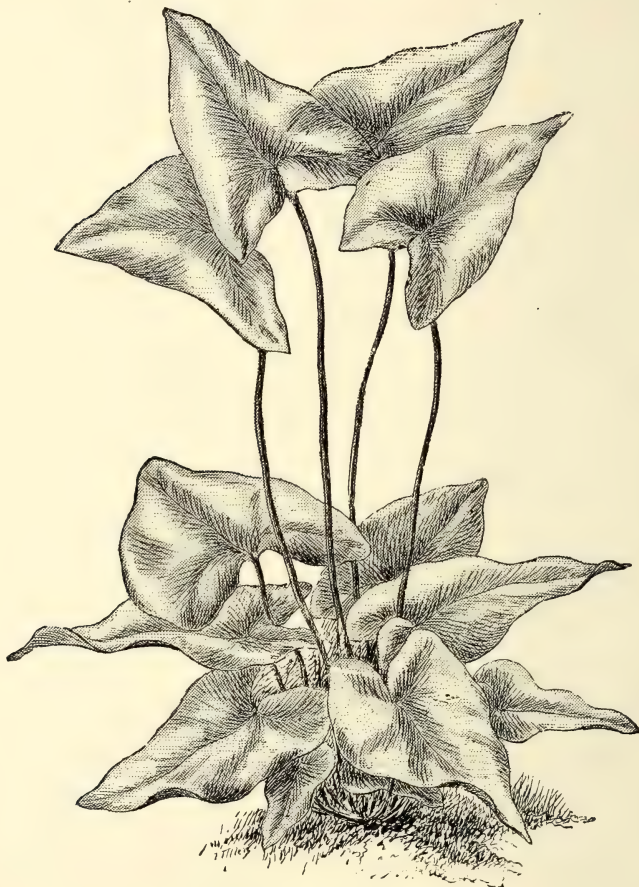


Fig. 96. *Hemionitis cordata*, a stove species with distinctly heart-shaped barren fronds and triangular fertile ones.

the addition of one part of chopped sphagnum. It is essential, on account of the few roots which they produce, that these plants should be kept in pots of comparatively small dimensions and that the drainage should be perfect. All are liable to be attacked by green-fly, which is easily destroyed by slight fumigations; thrips also may make their appearance on the

foliage, in which case the most efficacious treatment consists in a dip in a slight solution of lemon oil. The plants are readily propagated from spores, which germinate freely, and also by means of the young plants which most species produce at the base and at the notches of the segments of the fronds. These should be firmly laid on a surface of the soil recommended above.

H. cordata.

This very distinct, stove species (Fig. 96), native of Ceylon, Moulmein, the Philippines, and also of various parts of Peninsular India, is so very unlike any other known Fern in general outline, that it forms a striking contrast with its associates wherever it is introduced. Its fronds, which are produced from an underground, creeping rhizome, are of two kinds. The barren ones, 2in. to 3in. each way, heart-shaped, bluntish at the point, and with rounded basal lobes and a deep notch between them, are borne on dark chestnut-brown, glossy stalks 2in. to 4in. long. The fertile fronds have their lobes much sharper, the whole leafy portion being nearly triangular; these are borne on stalks similar to those of the barren fronds, but often 1ft. long. Both kinds are of a somewhat leathery texture, smooth and dark green on the upper surface, whereas their under-side, which is slightly hairy and of a paler colour, is completely covered with sori, that are narrow at first, but eventually become confluent. The barren fronds are prolific at their base, where one or several little bulbils are produced, and by means of these the species may easily be propagated.

H. palmata.

This dwarf-growing and thoroughly distinct, stove species, native of the West Indies and Mexico, is generally known by the appropriate name of "Ivy-leaved Fern," its palmate fronds, 2in. to 6in. each way, being composed of five nearly equal divisions; but there the comparison ends, for they are covered on both sides with rusty-coloured hairs, which extend all along the stalks. The fertile fronds, which have their divisions more sharply defined, are borne on glossy, dark chestnut-brown stalks 6in. to 12in. long and upright; whereas the barren ones, with lobes shorter, blunter, and less divided, are borne on similar stalks, but only 2in. to 4in. long, and their habit is horizontal: both kinds are of a soft, papery texture and pale green in colour. The narrow sori are disposed all along the veins, and are so copious as eventually to become confluent. Fig. 29, p. 40.

HYMENODIUM. See **Acrostichum.**

HYMENOPHYLLUM.

The chief characteristic of Filmy Ferns in general has already been alluded to in the first part of this book. So far as this genus is concerned, with the exception of *H. fuciforme* and *H. pulcherrimum*, nearly all the species at present known are of creeping habit, and, being provided with shallow-rooting rhizomes, they succeed best when growing on the surface of a rock and allowed to run under the moss which covers it. They are particularly well adapted for growing in Fern-cases in towns; they are all the more valuable by reason of their foliage, though apparently of a delicate nature, not being, like that of most other Ferns, affected by the London fogs.

Hymenophyllums require but little light and only a small depth of soil, as their slender, mostly wiry, rhizomes, have the greatest objection to being buried. When the plants are cultivated in pots or in pans the compost should be made of sandy peat, chopped sphagnum, and small pieces of sandstone, in about equal parts, with an additional sprinkling of coarse crock dust, the whole being made so light and permeable as to be prevented under any circumstances from becoming sour through the accumulated moisture resulting from the repeated sprinklings and waterings necessary to produce condensation. Some species, especially among the most dwarf-growing kinds, succeed best when established on a piece of sandstone without any other material.

Hymenophyllums are propagated but slowly by spores—a fact which no doubt accounts for their prices remaining higher than those of ordinary Ferns. They are, however, commonly increased by the division of their rhizomes, an operation which is safe enough, although it is one requiring a little patience. Draughts must be carefully avoided at all times of the year, and air should only be very sparingly admitted into the case.

H. caudiculatum.

This large, erect-growing species is a native of Peru, Chili, and Brazil, where it is found growing on mossy trees

HYMENOPHYLLUM—*continued*.

and among decaying vegetable matter. It is undoubtedly one of the handsomest and most striking of cultivated Hymenophyllums. The very translucent, erect, smooth, and shining fronds, 6in. to 15in. long, 2in. to 3in. broad, broadly spear-shaped, and three times divided nearly to the midrib, are borne on upright stalks 4in. to 6in. long, of a wiry nature, and broadly winged almost to the base. The leaflets are spear-shaped, and, as is also the case with the fronds, tailed at the extremity (hence the specific name); the lower ones, often 2in. long, are divided down to a broad, central rachis, their lower leaflets being again cleft nearly to the midrib, while the upper ones are simple or only forked. The sori, two to twelve to a leaflet, are placed at the extremity of the segments on both sides; they are provided with a very large covering, divided nearly to the base, with valves twice as broad as deep and bluntly toothed.

H. chiloense.

This real gem among Filmy Ferns is a small, pendent, tufted species which, in Southern Chili and in Chiloe, is said to form a dense carpet over trees and rocks alike. Its pretty little fronds, triangular or broadly spear-shaped, seldom more than 2in. long and 1in. broad, are of a dull green colour, with very conspicuous, dark veins covering their entire surface; they are bipinnatifid, their leaflets being regularly ciliated on the margin with short, strong hairs, and their under-surface slightly hairy. The sori are placed singly at the base of the leaflets on the upper side, divided about half-way down, with a wedge-shaped base free or sunk in the frond, and half-rounded, strongly-ciliated valves.

H. demissum.

This species, native of New Zealand, Fiji, Java, and the Philippine and adjacent Polynesian Islands, is perhaps the most decorative and the easiest-grown of the entire genus, and is so well appreciated as to be found in every collection where an attempt at the cultivation of Filmy Ferns is made. Its fine fronds (Fig. 97), 4in. to 12in. long, 3in. to 4in. broad, and broadly triangular, are borne on upright, firm, wingless stalks 4in. to 6in. long, and of a wiry nature; they are three or four times divided nearly to the midrib, and their lower leaflets, 2in. to 3in. long, are cut down very nearly to the rachis on both sides into numerous leaflets, which are again divided into pinnatifid segments. The sori are very numerous, terminal and axillary on the segments on both sides, and provided with a covering that is divided nearly to the base and has egg-shaped, entire or

HYMENOPHYLLUM—*continued.*

toothed valves. No *Hymenophyllum* is more effective than this species; it is a suitable companion for the Killarney Fern, with which, under cultivation, it is often found.

H. dichotomum.

This pretty, dwarf-growing species, native of Juan Fernandez and Chili, where it grows on mossy trees, is particularly striking on account of the beautifully-cripsed and transparent characters of its finely-divided foliage, which distinguish it at first sight from any other species. It delights in sending its tiny rhizomes through a coating of moss covering either a piece of rock or a block of wood or Tree Fern.



Fig. 97. Frond and Portion of Rhizome of *Hymenophyllum demissum*, one of the most decorative of the whole genus.

H. flabellatum.

This lovely species, also known under the names of *H. nitens* and *H. nitidum*, is a native of Australia, Tasmania, and New Zealand, where it grows pendent from trunks of Tree Ferns and other trees, also from holes in rocks and roots of trees. It is very variable in size, compactness, and degree of elongation of its fronds, which are of a peculiar, glistening, bright green hue, the same tint being found in both young and old fronds. According to the variety, the fronds are from 4in. to 12in. long, 2in. to 4in. broad, and

borne on firm, erect, smooth stalks 2in. to 4in. long; they are three times divided to the midrib, and somewhat resemble those of *H. demissum* in outline, but are more spear-shaped, and their leaflets, instead of being smooth, have a crisped appearance, produced by a contraction which is natural to them.

HYMENOPHYLLUM—*continued*.**H. Forsterianum.**

This beautiful species was accidentally introduced into this country growing among some clumps of *Cattleyas* imported from Brazil. At first sight it seems intermediate between *H. caudiculatum* and *H. dilatatum*, its large, handsome fronds, 1½ft. long and fully 6in. broad, being borne on stalks which are 6in. to 8in. long, conspicuously winged to the very base, and measure in the leafy portion quite ¼in. in breadth. Their fronds are tripinnatifid, the leaflets, 3in. long, and not tailed like those of *H. caudiculatum*, as well as their segments, being of a light green colour, closely set, and prettily undulated. The sori, two to six only on a leaflet, are terminal at the summit of the segments on the upper side only, and are provided with a very large covering, that is divided nearly to the base, and has broad, entire valves smooth on the edges. This is a very free-growing plant, whose wiry rhizomes are particularly fond of moss and decaying vegetable matter.

H. nitens.

A synonym of *H. flabellatum*.

H. nitidum.

A synonym of *H. flabellatum*.

H. tunbridgensis.

Though one of the smallest-growing species, the Tunbridge Wells Filmy Fern is also one of the most interesting. It is not only in the British Isles that *H. tunbridgensis* is indigenous, for it is of a very cosmopolitan habit, being often imported from Madeira and the Azores, where it frequently covers the short trunks of *Dicksonia* (*Balantium*) *culita*. It is reported from the Mauritius, Jamaica, Venezuela, Guatemala, and the Peruvian Andes; it has also been found in Ceylon, on the Himalayas, &c. It is a compact, elegant little plant, with tiny, thread-like rhizomes of a very wiry nature, producing little fronds oblong-spear-shaped (Fig. 13, p. 18), 1in. to 3in. long, ½in. to 1in. broad, and furnished with somewhat fan-shaped leaflets, divided nearly to the midrib on their upper side. The sori, which are stalkless and usually solitary in the axils of the narrow segments, are provided with a nearly round, two-valved covering, that is copiously toothed on the upper margin. Unfortunately, it is one of the most difficult of all Hymenophyllums to manage. It dislikes water over the fronds, and thrives well either in a mixture of equal parts peat and silver sand or on a block of sandstone, the principal object being to have it pressed hard on to the material upon which it is intended to grow.

HYPOLEPIS.

This genus, closely allied to *Cheilanthes*, as it is accepted now, comprises only about a dozen species of Ferns of medium and large dimensions, all furnished with creeping rhizomes. The distinctive characters of the plants reside in the non-confluent nature of their uniform, roundish, marginal, small sori, and in their invariably being placed in the notches of the ultimate divisions of the frond; also in the involucre, of the same shape as the sorus which it covers, being membranous in texture and formed out of the reflexed margin. All the species require either stove or greenhouse temperature. They are highly ornamental when planted in the rockery, for which purpose they are most useful, as they thrive best when associated with stones, over and amongst which their creeping rhizomes delight to run, although they do not cling thereto. All are of easy culture, and when kept in pots should be grown in rough peat with a good sprinkling of small stones and silver sand, as they require an abundant supply of water at the roots at all times of the year. On that account also it is indispensable that the drainage of either the pots or the part of the rockery in which they are planted should be perfect, any deficiency in this respect producing most disastrous results. Hypolepises should be grown in a fairly shaded position, as the rays of the sun are hurtful to their foliage, which in most instances is of a soft, papery texture. All the species may be propagated from spores; but they are usually increased by the division of their rhizomes, this being a quicker and less troublesome mode of reproduction.

H. Bergiana.

This well-marked, greenhouse species is a native of South Africa, and one of the handsomest. Its beautiful, triangular, quadripinnatifid fronds are of a peculiarly upright habit; they are from 1ft. to 1½ft. long, 6in. to 9in. broad, and borne on strong, tufted, upright stalks, 1½ft. to 2ft. long, dark chestnut-brown in colour, and woolly throughout. The leaflets are also triangular, and their leaflets, of a similar shape, are further divided into egg-shaped segments ½in. to ¾in. long and ¼in. to ½in. broad, with oblong,

HYPOLEPIS—*continued.*

bluntly-toothed ultimate divisions, which give the plant a very elegant appearance. The leafy portion of the fronds is of a peculiarly thin, papery texture, and bright shining green in colour, and the rachis is of a rigid nature, zig-zag, dark brown and woolly. The under surface of the frond is hairy throughout. The very small sori, produced in great abundance, are placed in the sides of the lobes of the segments or ultimate divisions. This species is singularly prolific.

H. repens.

Although somewhat coarse-growing, this stove species, native of Tropical America, is a robust, handsome plant, with fronds 3ft. to 4ft. long, quadripinnatifid, produced from a wide-creeping rhizome, and borne on strong, upright stalks 1ft. to 2ft. long, straw-coloured, and more or less densely prickly. The lower leaflets (Fig. 98), 1ft. to 2ft. long and 6in. to 12in. broad, are divided into spear-shaped leaflets 6in. long, $1\frac{1}{2}$ in. to 2in. broad, with oblong-spear-shaped, blunt segments, that are cut down nearly to the midrib into numerous bluntish lobes; they are of a soft, papery texture, and the sori, two to six to a segment or lobe, are placed in the notches. This species produces spores so freely that, when once obtained, it is almost impossible to lose it; indeed, it becomes a troublesome weed, covering every Fern-pan, to the exclusion of all less robust species.



Fig. 98. Leaflet of *Hypolepis repens*, a robust and handsome, if coarse-growing species.

LASTREA. See *Nephrodium*.

LEPICYSTIS. See *Polypodium*.

LEUCOSTEGIA. See *Davallia*.

LINDSÆA. See *Lindsaya*.

LINDSAYA.

Lindsaya (commonly called *Lindsæa*) or Dryander, is a large genus of stove and greenhouse Ferns, very few of which are grown in this country. Most of the species have one-sided leaflets of a somewhat transparent though leathery texture, approaching in shape a quarter of a circle. Lindsayas are readily distinguished through the sori, marginal or nearly so, being placed at the summit of and uniting two or more veins, and through their being furnished with a double involucre opening outwardly. As now made up the genus contains *Diellia*, *Eulindsaya*, *Isoloma*, *Schizoloma*, and *Synaphlebium*. For a long time the requirements of these Ferns were little understood. Of recent years, however, owing to their being differently created, some of the most interesting species have been established in this country. Although they require an abundance of water at the roots, perfect drainage for Lindsayas cannot be too strongly insisted upon, for they suffer considerably from the effects of stagnant water—as much, in fact, as from the want of atmospheric humidity. When properly established, these plants should be potted in a mixture of two parts turfy loam and one part fibrous peat, with just a dash of sand; and only a little of this mixture should be used in each pot, the greater part of which should be filled with drainage materials. They should then be either set on, or, better still, plunged in, a bed of sphagnum, kept close, and occasionally sprinkled overhead. Nearly all the species thrive fairly well under such treatment, although a few members of the genus, notably those native of New Zealand, such as *L. linearis* and *L. trichomanoides*, &c., naturally need a little less heat. With the few exceptions indicated, all the species require stove temperature. Lindsayas are usually propagated by the division of their crowns or of their rhizomes.

L. linearis.

This pretty, distinct, small, and rare greenhouse species, native of Tasmania, New Zealand, and West Australia, has

LINDSAYA—*continued*.

much the smallest leaflets of the unbranched group. Its fronds, which are produced from a creeping rhizome of a wiry nature, are simply pinnate, 6in. to 12in. long, with small, rigid, stalkless leaflets, often distinctly fan-shaped, the upper edge of which is very slightly toothed; the lower ones are arranged with a considerable space between them. The sori are disposed in a continuous line along the upper edge of the leaflets.

L. trichomanoides.

A distinct and pretty, dwarf-growing, greenhouse species, native of New Zealand, Tasmania, and New South Wales, with oblong fronds 4in. to 9in. long and 2in. to 3in. broad, produced from a creeping rhizome of a scaly nature, and borne on slender, wiry stalks 4in. to 6in. long, of a chestnut-brown colour. The spear-shaped leaflets, 2in. to 3in. long, are cut down quite to the midrib into wedge-shaped leaflets, which are again broadly lobed on the upper edge; they are of a thin, papery texture, and of a very pleasing bright green colour. The sori are disposed in a continuous, marginal line.

LITOBROCHIA. *See Pteris.***LOMARIA.**

An important genus (including *Lomariopsis*) of stove, greenhouse, and hardy Ferns of world-wide distribution, though its headquarters are situated in the South Temperate zone. There is but one British example, *L. Spicant* of Desvaux (or, as it is most commonly called, *Blechnum Spicant*), but this has produced many variations, some of which are quite distinct from the typical plant.

While some few species need stove treatment, the great bulk of them are greenhouse plants; and some few are hardy. Lomarias must never be "forced," for, as soon as the temperature becomes too high, thrips make their appearance; while, if water overhead is used at all, the texture of the foliage of most species is such that the fronds get spotted. These remarks are applicable to nearly all the species, large and small alike.

With regard to soil, this should consist of about equal parts good fibrous loam, leaf-mould, and silver sand. Where leaf-mould is not easily procurable,

an equal proportion of peat may be substituted, but leaf-mould is best. A few of the smallest-growing species—*L. alpina*, *L. Germainii*, and *L. lanceolata*, are adapted for growing in Fern-cases. Several species are also useful for room-decoration, the principal among them being the well-known and much-appreciated *L. gibba*, which for that purpose is very extensively raised by our wholesale growers. The slower-growing, but very compact, *L. ciliata* and *L. discolor nuda* are also highly decorative.

Although they will not bear being kept dry, Lomarias do not require so much water at the roots as do the majority of other Ferns. They should be potted somewhat loosely, for they dislike the soil being pressed hard into the pots. An excellent way of making use of them is to plant them in dead Tree-Fern stems. Remove the decayed or partly-decayed matter from the centre of the stems, and scoop them out sufficiently to accommodate a solitary plant with a little mould round it, in order to give it a start; after that, keep the stem constantly moist, and the result will be that in a short time the roots of the transplanted Lomaria will have taken possession of the dead stem, in which they run apace. Lomarias are almost invariably increased by means of their spores.

L. alpina.

This pretty little evergreen, almost hardy Fern, of smaller dimensions than our common *L. Spicant*, is a native of Temperate South America, New Zealand, Tasmania, and South Australia. As in the case of all other Lomarias, the barren and the fertile fronds are totally distinct; both are produced from a wide-creeping rhizome, clothed at the crown with spear-shaped, rusty-brown scales. The barren ones, 4in. to 8in. long and $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, are narrowly spear-shaped, with closely-set, blunt leaflets (Fig. 99) $\frac{1}{2}$ in. long, of a somewhat leathery texture, and of a bright metallic hue when young, turning with age to a very dark green colour. The fertile ones, borne on stalks 4in. to 8in. long, have their leaflets narrower and more distant; these do not share the changes of colour which affect the sterile ones. Although it may in many sheltered places be treated as a hardy Fern, this species succeeds best and remains evergreen in the greenhouse. It is extremely useful for

LOMARIA—*continued*.

edging in the rockery or for planting in groups, making patches of a metallic or dark green colour on, say, the point of a rock, as it is a plant which requires very little soil in which to grow.

L. attenuata.

This distinct and handsome species, of easy cultivation, has a particularly wide range of habitat, being found in America, the Polynesian, Norfolk, Mauritius, and Bourbon Islands; Fernando Po, and Cape Colony. It is usually met with growing wild, either on the sides of Tree Ferns or on partly-decayed branches of trees. The barren fronds, 1ft. to 3ft. long and very gradually narrowed downwards, are furnished with numerous leaflets connected at the base, 3in.

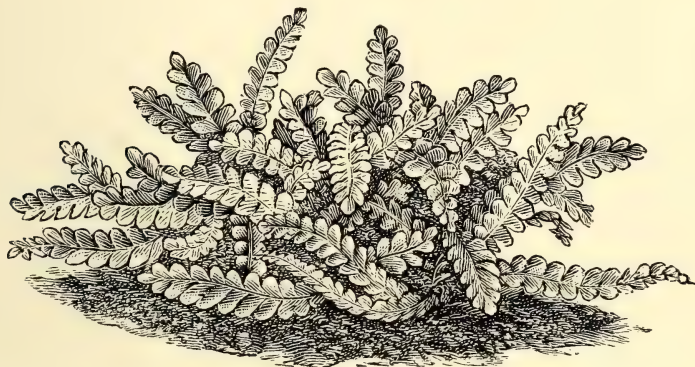


Fig. 99. *Lomaria alpina*, a nearly hardy evergreen species very useful for Fern-cases.

to 4in. long, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, gradually narrowing towards the point, which is sometimes bluntly toothed; they are of a leathery texture, and when young are of a very pretty rosy tint, but later on become dark green. The fertile fronds, of a similar shape, are much smaller, their numerous leaflets being very much contracted and of a uniform dark green colour at all times. Both kinds of fronds are produced from a stout, decumbent stem, densely clothed with narrow bright brown scales, with which the crown also is entirely covered; they are borne on upright stalks 4in. to 6in. long, naked or but slightly scaly below. *L. gigantea* of Kaulfuss is identical with this species.

L. Boryana.

Undoubtedly one of the most distinct species of the whole genus; it is a decorative, greenhouse plant, native of the West Indies, and in gardens is familiar under the synonyms

LOMARIA—*continued.*

L. magellanica and *L. zamioides*. It is easily distinguished from any other Lomaria by its extremely dense habit and the succulent texture of its foliage. Although it hardly grows to sufficient height to be classed among Tree Ferns, it produces a stout, massive trunk or stem, from which rise a quantity of sturdy, egg-shaped barren fronds 1ft. to 2ft. long, 6in. to 8in. broad, and having the general appearance of *Zamia*-leaves. There are several acknowledged varieties, the most distinct of which are *L. B. cycadoides*, *L. B. Dalgairnsiæ*, and *L. B. robusta*.

L. crenulata.

A synonym of *L. Germainii*.

L. discolor.

A thoroughly distinct and beautiful greenhouse species, native of Australia, Tasmania, and New Zealand, forms a short, thick, tough, woody stem or trunk, bearing a massive crown of gracefully-arching fronds. The barren ones are borne on strong, black stalks 3in. to 6in. long, densely clothed at the base with long, dark scales; they are 1ft. to 3ft. long, 4in. to 6in. broad, and gradually narrowed at the base. The numerous leaflets, 2in. to 3in. long and about $\frac{1}{2}$ in. broad, are cut down nearly to the midrib, suddenly narrowed towards the point, and wavy on their margin; they are of a leathery texture, rich green above, and pale whitish-green beneath. As is usual among Lomarias, the fertile fronds are entirely different from the barren ones, but in this case they are furnished with numerous narrower and shorter leaflets, which, instead of being contracted in their whole length, are like the barren ones at the base of the fertile frond, above which part they are very narrow; they are conspicuously dilated or widened at the base, where they are connected with the midrib, a character which gives the whole plant a unique appearance.

L. d. bipinnatifida.

This greenhouse variety, native of South Australia, is certainly one of the most pleasing and attractive of Lomarias in cultivation, not only on account of its light, cheerful colour, equally bright on both sides of the beautifully-cut fronds, which in general appearance resemble those of the Welsh Polypody (*Polypodium vulgare cambricum*), but also owing to its drooping habit and other characteristics perfectly distinct from those of the species to which it is said to be related. It is a somewhat arborescent Fern. As little artificial heat as possible, so as to keep it free from the attacks of thrips and red spider, should be afforded this variety.

LOMARIA—*continued.***L. d. nuda.**

Although accepted as only a variety of *L. discolor*, this handsome, compact-habited, Australian, greenhouse Fern, often met with in cultivation under the name of *L. falcata*, is apparently very distinct from the type. Its general appearance, the texture of its foliage, its mode of growth, and the disposition of its fructification, are all different. With the exception of *L. gibba*, which is of more rapid growth, *L. d. nuda* is undoubtedly the most useful Lomaria in a young state for table and room decoration. This variety, which is readily propagated by means of spores, and is extensively grown for decoration, has produced several sub-varieties, the best of which, and indeed the only one worth cultivating for its own decorative merits, is the one commonly known as *L. d. n. pulcherrima*, an ornamental plant with a constitution equally as good as that of the typical plant from which it no doubt originated. From *L. d. nuda* it differs in having the extremity of each leaflet somewhat crested or forked, and the summit of the frond still more distinctly crested. It should be kept as much as possible from artificial heat, the effects of which are most pernicious to the young growth.

L. falcata.

A synonym of *L. discolor nuda*.

L. Germainii.

This pretty, dwarf-growing, greenhouse or hardy species, native of Chili, is more extensively known in gardens and in the trade as *L. crenulata*. In general aspect it much resembles *L. alpina*, but the lower leaflets of its fronds are distinctly separated.

L. gibba.

This well-known, stove or greenhouse species, native of New Caledonia, Aneiteum, and the Isle of Pines, is one of the most elegant and useful species of the large genus. Its elegant barren fronds, 2ft. to 3ft. long and 6in. broad, are deeply pinnatifid, their leaflets being cut down nearly to the rachis, but dilated and connected at the base; in the centre of the frond they are 2in. to 3in. long, but the lower ones grow shorter very gradually; all are of a bright shining green colour and of a leathery texture. In the fertile fronds, the leaflets are narrow and contracted, and the sori occupy the whole space between the edge and the midrib. Both kinds of fronds are borne on short, strong, upright stalks densely clothed below with long, narrow, black scales, and produced from a fleshy crown, which in course of time

LOMARIA—*continued*.

forms a stem or trunk 4ft., or even 5ft., in height. These fronds, which are of a somewhat erect habit when the plant



Fig. 100. *Lomaria gibba platyptera*, a gigantic handsome *Blechnum*-like variety.

is still in a young state, become more pendulous as the specimen gets older, and are of a very elegant, arching habit when the trunk is formed. There are many varieties, the most striking being

LOMARIA—*continued*.**L. g. platyptera.**

This is a Fern of gigantic dimensions, its handsome fronds frequently attaining 3ft. in length. Although given by Moore as a variety of *L. gibba*, it has all the appearance of a *Blechnum*, as on the mock-fertile fronds, which never produce any spores, the false fructification is disposed on each side of the midvein, and does not form a separate frond. It is permanently barren, and has been produced several times by sowing together spores of *L. gibba* and *Blechnum brasiliense*. Fig. 100.

L. g. rosea.

In this handsome variety, also known in commerce under the name of *L. g. tinctoria*, the principal attraction and most distinctive character reside in the lovely pinkish or rosy colour with which its fronds when in a young state are adorned, and which is equal in intensity to that observed in certain *Adiantums*. It is of much more erect habit than the species. This variety reproduces itself freely from spores.

L. g. gigantea.

A synonym of *L. attenuata*. It must not be confounded with *L. ciliata gigantea*.

L. lanceolata.

An evergreen greenhouse species, native of New Zealand, Tasmania, Australia, and the Polynesian Islands, particularly attractive on account of its dwarf and compact habit and the lively colour of its young barren fronds; these are beautifully ornamented by the bright orange-red coloured rachis which runs through their centre. The barren fronds are 6in. to 12in. long, 2in. to 4in. broad, borne on dark brown stalks 4in. to 6in. long, and abundantly produced from a close, fleshy crown. The closely-set leaflets, of a leathery texture and bright green colour, are somewhat sickle-shaped, gradually narrowed to a point, slightly toothed, and smooth on both sides. The fertile fronds, which are distinctly pinnate, of a more upright habit, and seldom more than 3in. long, are furnished with contracted, sickle-shaped leaflets about $\frac{1}{8}$ in. apart at the base.

L. L'Herminieri.

Under this name is known a most attractive stove species from Tropical America, as its foliage when young is of a beautiful crimson colour, changing with age to a dark glossy green. The barren fronds are broadly spear-shaped, 9in. to 15in. long, and 3in. to 4in. broad, numerous and disposed in

LOMARIA—*continued*.

a somewhat erect position, which, on account of their stiff, leathery texture, they retain as long as they remain on the plant. They are furnished with leaflets about 2in. long, $\frac{1}{2}$ in. broad, and rounded or somewhat blunt at the extremity. The fertile ones are distinctly pinnate. Besides being one of the *Lomarias* most sensitive to moisture on the fronds, it is also one requiring peat and sand only to thrive well, as loam, unless very light and fibrous, is injurious to its roots.

L. magellanica.

Synonymous with *L. Boryana*.

L. pumila.

A very pretty, greenhouse species, native of New Zealand, and one which somewhat resembles the better-known *L. alpina*, but it is much more delicate in texture and has its leaflets distinctly notched.

L. Spicant.

Although a thoroughly British plant, the Hard Fern, also known as *Blechnum boreale* and *B. Spicant*, is found in nearly every part of the world. It is one of the commonest of our evergreen species, and its striking dwarf and sturdy habit, as well as the deep green colour of its barren fronds, renders it one of the most useful plants for the decoration of the outdoor rockery, where, in a moist, shady nook, it forms a beautiful and most conspicuous object. *L. Spicant* is one of the least fastidious of all our British Ferns, for, although it prefers a moist situation with a northern aspect, it also succeeds in a stiff, clayey soil, and when exposed to the more or less direct rays of the sun. It dislikes lime in any form. It is in great request for the hardy Fernery, but, like some others of our British Ferns, it may with great advantage be also used for the decoration of the greenhouse and conservatory: under such conditions its fronds, which are extremely useful in a cut state for mixing with cut flowers, retain their stiffness all through the winter. The most reliable method for increasing the varieties of the Hard Fern is by division of the crowns, as very little dependence can be placed on their exactly reproducing the varieties in any other way. The species is readily propagated by means of spores, which are usually ripe about September. *L. Spicant* has produced many very interesting varieties, the most distinct and the most attractive of which well deserve special attention at the hands of all qualities they are equal to the type. They are too numerous Fern-growers, the more so that in hardiness and decorative

LOMARIA—*continued*.

to be described, and those interested must refer to a specialist catalogue like those issued by Birkenhead, May, and Veitch and Sons. One of the handsomest is

L. S. trinervis.

This remarkably handsome variety, originally found on the Sugar-loaf Mountains, in Wicklow, differs from all other known forms through the division of the barren fronds into three sections near the base, where one lateral branch is produced on either side of the central one, which is usually



Fig. 101. Lomaria Spicant trinervis coronans, a beautifully crested Fern of graceful habit.

much larger than the lateral ones. The fertile fronds, which are but sparingly produced—seldom more than two on a plant—are branched at the base in the same way. Sometimes the summit of the fronds, and the extremity of the branches, are forked or even terminated by a crest of very distinct character; it is then called *L. S. t. coronans*. Fig. 101.

L. zamiaefolia.

A synonym of *L. Boryana cycadoides*.

L. zamioides.

A popular garden name for *L. Boryana* and its variety *cycadoides*.

LOMARIOPSIS. See *Lomaria*.

LYGODICTYON. See *Lygodium*.

LYGODIUM.

In this comparatively small yet widely-diffused genus of Climbing Ferns, most of the species require stove temperature. The fronds of all are totally different from those of any other Ferns; consisting as they do of a stalk or shoot possessing the power of almost indefinite elongation, and sometimes attaining under cultivation 20ft. to 30ft. in length. They are also of a different structure: though of various forms, their leaflets are never directly disposed on the stalk or shoot, but are connected with it through "primary" and "secondary" petioles. Primary petioles are the short (sometimes very short) stalks that bring the climbing or twining stem into contact with the secondary petioles, the latter being a connecting link between the primary petioles and the leafy portions. The genus includes *Hydroglossum* and *Lygodictyon*, the latter of which often finds a place in nurserymen's lists.

All *Lygodiums* luxuriate in rich, spongy soil of an open nature; that which suits them best being a mixture of peat or good leaf mould, loam, and chopped sphagnum, in about equal proportions. They require an abundance of water at the roots, and are greatly benefited by frequent and copious syringings during their most active season, from May to October. It is only when planted out that these singular Ferns show themselves to advantage and attain their full development, and in that condition they are also less liable to the attacks of pests than when restricted to pots.

Propagation is effected by means of spores, when the plants are required in quantities, and such is the method usually adopted for producing strong, healthy plants of *L. japonicum*, which species is the most generally grown. Most of the other species are increased by the division of the crowns, which operation may be safely performed at any time between March and September.

LYGODIUM—*continued*.**L. circinatum.**

Synonymous with *L. dichotomum*.

L. dichotomum.

This very beautiful species (also known as *L. circinatum*, *L. flexuosum*, and *L. pedatum*) is a native of Chusan, Hong-Kong, Ceylon, and the Philippine and Malayan Islands. The very long shoots are well furnished with repeatedly-divided fronds, which are disposed in pairs, opposite and somewhat distant. The primary petiole is so much reduced that the fork seems almost to spring from the main rachis or shoot; the secondary ones, 1in. to 2in. long, are firm and naked. The finger-shaped leaflets are composed of five or six lobes, reaching nearly down to the base, or once or even twice forked. The barren divisions, 8in. to 12in. long and $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, are of a beautiful bright green colour and of a leathery texture, with both surfaces naked. The fertile divisions, very much narrower and contracted, have their spore masses disposed in spikes one to two lines long, in close, marginal rows. It is a species well adapted for covering large pillars, as it is of very robust growth and most effective; its foliage, though somewhat massive, is very elegant, and remains on the plant for a very long time.

L. flexuosum.

This is a synonym of *L. dichotomum*.

L. Forsteri

Synonymous with *L. reticulatum*.

L. japonicum.

This very pretty and elegant greenhouse species is a native of Japan, China, the Himalayas, Java, the Philippines, and North Australia. It is distinguished from all other species by the shape of its leaflets, which are 4in. to 8in. long, nearly as broad, and triangular; the primary petiole is very short, and the secondary one is from $\frac{1}{2}$ in. to 1in. long. It undoubtedly is the most popular member of the whole genus; its decorative merits are so well recognised that for years past thousands of plants of it have found their way to our great flower markets, where it is known only under the misleading name of *L. scandens*. *L. japonicum* is a delightful climber, producing shoots 8ft. to 10ft. long, of an exceedingly tender nature, and furnished with finely-cut foliage of a cheerful green colour, forming light festoons that are very useful for table-decoration. It is well adapted for growing in a Fern-case, but should be placed near the light. The plant may also

LYGODIUM—*continued.*

be grown in a wire basket 12in. to 14in. in diameter. Three plants should be put in it, one between each chain. Some of the strongest shoots should be trained upwards along the chains and in the centre of the basket; while those of medium growth should be allowed to hang all around the sides, which they will soon completely cover.

L. palmatum.

This charming greenhouse species, of comparatively small dimensions, is undoubtedly the most delicate-looking as well as the hardiest kind comprised in the genus. It is a native of North America. From a wide-creeping rhizome, of a very slender nature and of a dark brown, almost black, colour, the extremity of which is scantily furnished with short, semi-transparent, jointed hairs, rise at a distance of 1in. or 2in. apart a quantity of delicate climbing graceful fronds. The lovely fronds, which, when mature, show a fertile portion totally different from the barren ones, creep and climb or twine over other plants to the height of 3ft. or 4ft. The totally barren fronds, as well as the lower portion of the fertile ones, are strictly bipinnate, and of a peculiar shape, inasmuch as, beginning at 6in. or 8in. from the ground, the twining midrib bears very short branchlets disposed 1in. or 2in. apart. A very ornamental character is imparted to this most interesting plant by the handsome appearance of the fertile portion of its fronds, composed of several pairs of somewhat triangular leaflets, three or four times pinnatifid, being pinnately divided, with leaflets generally three-lobed, and formed only of winged stalks and short, spike-like fertile ultimate divisions of a very graceful and elegant appearance. This species requires a very porous soil; the best mixture is good leaf-mould and chopped sphagnum in equal parts, with an abundance of water at the roots all the year round, but principally from March to September. Fig. 10, p. 15.

L. pedatum.

This is synonymous with *L. dichotomum*.

L. reticulatum.

This fine, bold-looking plant, native of the Polynesian Islands and Eastern Tropical Australia, though not so hardy as the Japanese and North American species, is a gem among the large climbing Ferns; it is particularly effective when grown around a pillar where massive foliage is required, for, besides being a robust grower, its beautiful fronds are of a rich, dark, glossy colour, especially when the plant is grown in a rather shady place. These fronds, which are of indefinite length and distinctly bipinnate, are

LYGODIUM—*continued.*

furnished with numerous pairs of leaflets, all disposed exactly opposite, the primary petiole being only $\frac{1}{4}$ in. long and



Fig. 102. *Lygodium scandens*, a slender growing, bushy habited species that produces young shoots all along the stems.

the secondary ones $\frac{1}{2}$ in. long. The leaflets are composed of a terminal segment and from four to six lateral ones on each side; these are of a firm, almost leathery, texture, either

LYGODIUM—*continued*.

rounded or heart-shaped at the base, 2in. to 3in. long, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, all articulated at the base, and the lower ones short-stalked; they are also rendered very attractive by their margins being finely toothed and beautifully wavy. The fertile segments, which are broader, though shorter, than the barren ones, bear the small, oblong fruit-spikes, one to three lines long, in close rows on the margins, where they appear like so many blunt teeth. A soil of a little more substantial nature than that recommended for the other species suits *L. reticulatum* (also called *Lygodictyon Forsteri*) best.

L. scandens.

This is a species of very slender growth and somewhat bushy habit, thoroughly distinct from the *L. scandens* of commerce, which is synonymous with *L. japonicum*. A character peculiar to this species is the natural propensity which it possesses for developing fresh young shoots all along the stems, being in that respect much more prolific than any other species in cultivation. The variety *microphyllum* is a common form, with short, broad segments. Fig. 102.

MARATTIA.

Marattias are distinctly characterised by their sometimes stalkless, sometimes shortly-stalked, capsules, from four to twelve of which are usually joined together in concrete, boat-shaped masses (synangia): these consist of two opposite rows of capsules, and open by slits down their inner faces. The genus includes *Eumarattia*, *Eupodium*, and *Gymnotheca*.

The Marattias are highly ornamental, robust-growing Ferns, and although they do not form trunks, generally attain very large dimensions. Being swamp-loving plants, they should be potted in a substantial compost, and the pots partially placed in water. A mixture of about equal parts of roughly-broken peat, loam, and river sand is one in which they thrive most luxuriantly, especially if given a good amount of heat. *M. fraxinea elegans*, however, has been kept in a cold Fernery for several consecutive years, and indeed made very good progress during the summer months, although resting in the winter; but it is, we believe, the only one

which will succeed under cold treatment. *Marattias* possess an immense advantage over most, if not all, other gigantic-growing Ferns, inasmuch as, if they are accidentally allowed to get dry at the roots, the fronds and their divisions, being jointed and of a fleshy nature, hang down and become quite flabby—a condition in which they have the power of remaining a comparatively long time without sustaining any serious damage. It is, however, advisable, when plants in that condition are detected, to give water at the roots at once, when the fronds will speedily regain their former stiffness without showing a trace of having suffered from the mishap.

Marattias are usually and readily increased by laying the basal scales of the fronds on a bed of constantly moist material, such as sphagnum, where they will be found to emit roots most freely, and to produce on each side of the scales little bulbous growths, which later on develop into plants similar to the parents.

M. alata.

This is a species of highly ornamental habit and strikingly distinct characters, native of the West Indies, Mexico, and Guatemala. Its magnificent fronds, 3ft. to 4ft. long and tripinnatifid, are borne on robust stalks 1ft. to 2ft. long, $\frac{1}{2}$ in. or more thick, of a fleshy nature, and deciduously scaly. The lower leaflets are the largest, and the ultimate divisions or segments, which are $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. broad, of a soft, papery texture, oblong in shape, blunt or pointed, with a wedge-shaped base, sometimes smooth, but usually finely toothed on their margins, are unique in the genus. The same remark applies to the rachises, which through their entire length are furnished with a very distinct and conspicuous wing. The synangia, which are copious and nearly marginal, have their sides erect and their attachment oblong or roundish. Spores of this species are produced freely; but they will not develop beyond the prothallus stage.

M. Cooperii.

This native of New Caledonia is unsurpassed for decoration in a warm conservatory. Its magnificent, massive, much-divided fronds, $2\frac{1}{2}$ ft. to 3ft. long and 2ft. broad, rise from between two horny-looking appendages of a peculiarly rough nature, and are borne on succulent, blackish, round stalks 2ft. to 3ft. long, of a somewhat dull colour and

MARATTIA—*continued*.

wrinkled appearance, singularly contrasting with the smooth or shiny appearance of the leafy portion of the fronds. These fronds are bipinnate in young specimens, but in plants that have attained their full development they are distinctly tripinnate and furnished with oblong leaflets, that are pointed at the extremity, deeply but irregularly toothed on the margins, of a leathery texture and dark green colour. The synangia, disposed in close rows near the margin of the leaflets, have their sides vertical, and show from six to twelve capsules on each side. Of all the Marattias in cultivation, it is perhaps the one most subject to the ravages of thrips and scale; but it may easily be kept clean, as it will endure fumigation without suffering in the least.

MENISCIUM.

Although the genus *Meniscium* contains but a comparatively small number of species, these are sufficiently distinct to render it interesting; the majority of them are strong-growing, handsome plants, but one at least amongst them (*M. simplex*) is of such small dimensions that it is frequently used in Fern-cases, a purpose for which it appears particularly well adapted. Nearly all Menisciums have a beautiful veining quite peculiar to them. Being swamp-loving subjects, they are useful for planting in Ferneries near the margin of water, a place where few Ferns grow very satisfactorily. They thrive luxuriantly in a mixture of half loam and half fibrous peat, with a few pieces of crocks or charcoal intermixed. Though their roots, which are of a fleshy and brittle nature, are fond of moisture, they have a great dislike to stagnant water.

Menisciums are usually propagated by division of their crowns, but they may also be easily and more rapidly increased by means of their spores, which germinate freely when sown in a warm and moist position.

M. palustre.

Synonymous with *M. serratum*.

M. serratum.

M. palustre is another name for this very decorative species, native of Mexico, the West Indies, Brazil, and Peru. Its simply-pinnate fronds, 3ft. to 4ft. long, and 1ft. or more

MENISCIUM—*continued.*

broad, are borne on stout, glossy, brownish stalks 1ft. to 3ft. long. The leaflets, of a somewhat leathery texture, oblong-spear-shaped, with a heart-shaped base, and sharp-pointed at the extremity, are loosely set lin. to 3in. apart; they are 6in. to 12in. long, $\frac{1}{2}$ in. to 2in. broad, finely toothed on the margin, very dark glossy green on the upper surface, and paler below, where the most beautiful venation, the principal attraction in the plant, is shown by alternate lines of very conspicuous ridges and furrows. The sori are disposed twelve to twenty between the midrib and the edge.



Fig. 103. *Meniscium simplex*, a beautiful miniature species well suited for Fern-case culture.

M. simplex.

This charming, miniature species, is a native of Chusan, Hong-Kong, and Formosa. It is as totally different in habit and in general aspect as it is in size from any other species belonging to the genus. The barren and fertile fronds are similar in shape but entirely distinct: both are produced from a wide-creeping rhizome of a firm nature, and borne on slightly pubescent stalks 1ft. or more in length in the case of the fertile fronds, but only 4in. to 6in. long

MENISCIUM—*continued*.

in the barren ones. Both kinds of fronds are simple, oblong-spear-shaped in general outline (Fig. 103), heart-shaped and sometimes eared at the base, and somewhat undulated at the margin; the barren ones are 6in. to 9in. long and 2in. to 3in. broad, the fertile ones are smaller, and both are of a somewhat leathery texture and dull green colour. The reddish sori, disposed eight to twelve between the midrib and the edge, frequently become confluent and completely cover the under-surface of the fertile fronds. This species is well adapted for growing in a Fern-case, where it thrives remarkably well, and makes a pleasing contrast with other Ferns of a lighter or more finely-divided character.

MICROLEPIA. See *Davallia*.

MICROSORIUM. The plants formerly classed under this name are now divided between *Nephrodium* and *Polypodium*.

MOHRIA.

A monotypic genus, the species being the pretty Frankincense Fern, which is of very easy culture. All that it requires in the way of soil is a mixture of about equal parts peat, leaf mould, and sand, with the addition of small pieces of sandstone or soft brick-dust. Syringing overhead must be carefully avoided, or it will cause the fronds to turn brown and decay in a short time. The plant is essentially a greenhouse subject, and should receive all the light possible.

Propagation is readily effected from spores, which are abundantly produced, and which germinate very freely, producing young subjects in a remarkably short space of time.

M. caffrorum.

This handsome Fern, popularly known as *M. thurifraga*, is a native of South Africa, Madagascar, and the Mauritius and Bourbon Islands. Being of a gracefully pendulous habit, and essentially distinct from any other drooping Fern, it is very useful for growing in hanging baskets of small or medium size, as its elegant fronds, produced from a close, tufted crown, and borne on stalks 3in. to 4in. long, more or less densely clothed with scales of a reddish-brown colour, sometimes attain 1½ft. in length and 4in. in breadth. The barren ones are tripinnatifid, being furnished with oblong-spear-shaped leaflets, cut down to a

MOHRIA—*continued*.

narrowly-winged rachis into leaflets of a soft, papery texture, deeply cleft and again conspicuously toothed. The fertile fronds are longer than the barren ones, from which they also differ by being conspicuously contracted and by having their leaflets rounded at the edges: this contraction of the lobes over the spore masses gives them a very elegant appearance. The rachises and the under-surface of both kinds of fronds are more or less densely clothed with very narrow scales of a pale brown colour. When bruised, the plant emits a strong odour of frankincense. *M. c. achilleæfolia* is a form much resembling the leaves of the Yarrow (*Achillea millefolia*). It is much dwarfer in habit than the type.

M. thurifraga.

Synonymous with *M. cafferorum*.

NEPHRODIUM.

In this immense genus of Buckler Ferns are included species remarkable for their decorative qualities, and others unequalled for their hardiness. Necessarily they have a very wide geographical range: in it may be found species suitable for the tropical Fernery, for the greenhouse, and even for the open air. Plants of all dimensions are found amongst the Nephrodiums. Whatever their size, however, all are of easy culture, whether planted out on the rockery, where all Nephrodiums seem to thrive, or grown as pot plants. They, however, require a richer soil than most other Ferns.

The more robust kinds thrive in a mixture of loam and peat, in about equal proportions, with a small part of cow-manure previously dried and well mixed together, and an additional sprinkling of silver sand; for the smaller and consequently slower-growing species, less loam and more sand should be used.

Most Nephrodiums, especially the strong-growing kinds, are quite indifferent as to shading; a little sunshine acts as a strengthening agent, making their foliage much more lasting during the winter months than could otherwise possibly be the case. They all require a good supply of water at the roots all the year round, but principally during the

growing season. Although they do not actually suffer from occasional waterings overhead, it is very doubtful if they derive any benefit therefrom: the foliage of many being of a soft texture, soon gets spotted and loses its beauty if allowed to remain in a wet condition for any length of time. In any case, the plants must not be kept close; confinement in the case of *Nephrodiums* means not only an invasion of thrips, their greatest enemy, but also that brownness of mature fronds which often puzzles the amateur grower, but which, by the practical man, is never mistaken for insect depredations. The only way to avoid such unhealthy appearances is to grow the plants in well-ventilated houses, where moisture cannot condense on their fronds.

Nephrodiums are easily and rapidly propagated by spores: the species with creeping rhizomes may also be increased by the division of these organs, in March and April.

N. æmulum.

This handsome British species is commonly called the "Hay-scented Buckler Fern" on account of the fragrance that is emitted by the dried fronds when crumpled between the fingers. It is readily distinguished from any other comprised in the genus by its peculiarly crisped appearance. It is of easy culture, and may be grown with success in nearly any degree of shade, entirely excluded from the sun, or in a situation exposed to the action of its full rays; but in the latter position it is of less luxuriant habit, whereas in the shade it will unfold its fronds abundantly and make a noble object. It is an evergreen species, thriving best in a mixture of sandy loam and leaf-mould in about equal proportions. There are few noteworthy varieties.

N. albo-punctatum.

Under this name is known a pretty evergreen stove species, native of Guinea, Natal, Fiji, &c., that has an appearance of being variegated owing to the fact of the upper surface of its leaflets being covered with small white dots.

N. atratum.

This is synonymous with *N. hirtipes*.

N. cristatum

The Crested Shield Fern or Crested Buckler Fern of this country, and the Crested Wood Fern of America, is

NEPHRODIUM—*continued.*

a beautiful species, of upright habit. Its narrow-oblong, spear-shaped fronds, usually 1ft. to 1½ft. long, 3in. to 5in. broad, and borne on tufted stalks 6in. or more long, sparingly clothed with egg-shaped, light-coloured scales, are rendered very attractive through the bold character of their fructification, which is almost black soon after the covering has been shed. They are produced from a rootstock creeping just below the surface of the ground, 5in. to 6in. long, chaffy with large, thin, light brown, ovate scales, which also cover the stalks and are more or less persistent on the lower part of them. The leaflets, of a soft, papery texture, are broadly triangular near the base, being more elongated near the centre of the frond; they are cut down nearly, or quite, to the base below into broad, blunt, oblong, slightly-cleft leaflets, which are also of a blunt nature. The numerous round sori are disposed close to the midvein. *N. cristatum* is somewhat difficult to grow successfully for any length of time unless planted in peaty soil near the water.

N. cuspidatum.

This greenhouse species, native of Ceylon, is valuable either as a pot plant or for the rockery. It is of compact habit and of easy culture, producing in abundance from a decumbent, fleshy stem its handsome fronds 2ft. to 3ft. long, 8in. to 12in. broad, borne on succulent, round stalks that are barely 1ft. long, and densely furnished at the base with pale straw-coloured, chaffy scales. The leaflets, spear-shaped and sharply toothed on the margins, are somewhat papery and of a glossy dark green colour, which, however, is relieved by the refreshing claret colour of the stalks. The sori, disposed in rows close to the mid-vein, are covered with a fugacious involucre.

N. cyatheoides.

A very handsome, but rare, greenhouse species, native of the Sandwich Islands and Sumatra. Its ample fronds, simply pinnate, 2ft. to 3ft. long, 1ft. or more broad, and borne on strong, naked, glossy, greyish stalks 1ft. to 2ft. long, are furnished with closely-set, spreading leaflets, 4in. to 6in. long and about 1in. broad. These leaflets have their extremity sharp-pointed and their edge irregular and very deeply toothed; they are of a somewhat leathery texture, of a pleasing light green colour, and their veinlets, disposed in groups of from ten to twelve on each side, often show a sorus on each, close to the main vein.

N. decompositum.

This very handsome, greenhouse species, native of Australia, Tasmania, New Zealand, Tahiti, and the Fiji Islands.

NEPHRODIUM—*continued.*

is very variable. Its fronds, 1ft. to 2ft. long and 1ft. broad, are produced from a wide-creeping rhizome, and borne on firm stalks 1ft. to 1½ft. long, and scaly only at the base. They are broadly triangular, with their lowest leaflets much the largest, sometimes measuring 9in. long and 4in. broad: these are divided into spear-shaped and more or less deeply-cleft leaflets, with unequal-sided, deeply-cleft, and lobed segments. The rachis and under-side of the frond, which is of a soft, papery texture, are more or less woolly, and the rather large and prominent sori are placed midway between the midrib and the edge. This species is of comparatively easy culture. It is usually of medium growth, exceedingly useful for table-decoration, and also for forming an edging in the rockery in front of taller kinds.

N. dilatatum.

The Broad, Prickly-toothed, Buckler Fern is world-wide in its distribution. In England it is so common that no locality need be specified. Still, on account of its decorative qualities and its hardihood, it is one of the most valuable Ferns for the adornment of the rockery or the shrubbery. It grows very well upon elevated positions and in exposed situations, although it will attain greater size and beauty when accorded a shady spot than when grown in full exposure to light. If grown as a pot-plant, it must be allowed a moderate space for its roots, and it prefers a compost of fibrous loam, peat, and sand, in about equal proportions. When sheltered, it retains its fronds through the winter. It may be freely increased by means of its spores, which ripen about September and germinate very freely. The finely-divided fronds attain 6ft. in length and 1½ft. in breadth; they are dark green above, paler below, and their leaflets are more or less twisted or contorted. Still, the plant varies considerably with its habitat. In dry places the fronds are smaller and less divided than when the plant grows in wet. The sori are near the mid-vein, and at first are kidney-shaped, finally becoming circular. Its forms are very numerous.

N. dissectum.

This very handsome, strong-growing, stove species (better known as *N. membranifolium*) is found in New Caledonia, Ceylon, Madagascar, and the Philippine Islands, &c. Its ample deltoid fronds, borne on rather slender stalks 1ft. or more long, clothed towards the base with narrow scales of a dark brown colour, are from 1ft. to 5ft. long and 1ft. to 3ft. broad. The lower leaflets, which sometimes are simply pinnatifid, with broad, blunt lobes

NEPHRODIUM—*continued.*

(Fig. 104), and sometimes 1ft. long and pinnate, with similarly pinnatifid leaflets, are of a soft, papery texture and of a bright green colour. The sori, copious, and generally disposed at a little distance from the edge of the leaflets, are covered by a flat involucre.

N. erythrosorum.

This greenhouse species, native of Japan and China, produces from a thick, underground-creeping stem, broadly spear-shaped fronds, 1ft. to 1½ft. long and 8in. to 12in. broad, borne on stalks 6in. to 9in. long, and more or less



Fig. 104. Nephrodium dissectum, a strong-growing, handsome widely-distributed species.

densely clothed with narrow scales of a dark brown or blackish colour. The leaflets are spear-shaped, and the lowest, which are also the largest, frequently measure 6in. long and 1½in. broad; they are cut down to the stalk below into oblong, bluntish leaflets 2in. to 3in. broad, and with slightly-toothed edges. The texture, though of a papery nature, is firm, and both surfaces are naked. The sori are disposed near the midrib, six to nine to a pinnule, and are covered by flat involucre of a bright red hue when young—hence the specific name. It has proved perfectly hardy in London; but it becomes deciduous. When treated as a cool indoor subject, its magnificent fronds, of a beautiful bronzy

NEPHRODIUM—*continued.*

hue in a young state, but turning with age to a dark shining green, remain on the plant all the year round. Easily propagated from spores.

N. Filix-mas.

In the Male Fern, or the Common Buckler Fern, the handsome fronds are broadest in the middle, narrowing towards the base, and to a sharp point at their summit; they are produced from a large, somewhat upright stem of a woody nature, covered with thick, brown, overlapping scales, which also extend to the strong stalks. They are 2ft. to 3ft. long and 8in. to 12in. broad, and are furnished with spear-shaped leaflets 4in. to 6in. long, about 1in. broad, cut down very nearly to the rachis into close, blunt, regular, nearly entire lobes of a papery texture, the lower ones rather shorter than the others. The abundant and large sori are covered with a large, convex indusium. On account of its hardihood and of its easy culture, the Male Fern may be considered one of the very best either for town or for country treatment, as it bears smoke better than any other British Fern. It is of noble habit, and when planted in naturally sheltered places, becomes almost an evergreen, most useful for ornamenting the rockery and shrubbery. Like many other Ferns, it looks much handsomer when planted out, especially if disposed upon an irregular surface, in clumps of six or eight strong plants each, with a few pieces of stone or rock, which greatly add to their appearance laid in between and among them. It is readily propagated from spores, which are usually ripe about midsummer, and also from division of the crowns, which is a much slower process. More than a hundred varieties are enumerated.

N. fragrans.

This is a lovely little greenhouse plant (Fig. 105), usually known in North America as the Fragrant Wood Fern, on account of the pleasant odour—compared by some authors to that of the Violet and by others to that of the common Primrose—which is emitted by the fronds in a fresh state, and by which it may be readily distinguished.

N. hirtipes.

Under the name of *Lastrea atrata*, this very handsome hardy species is better known in gardens; it is a native of the Himalayas and the Neilgherries. The general habit of the plant is that of our common *N. Filix-mas*; but its gracefully-arching fronds, 2ft. to 3ft. long, 8in. to 16in. broad, and produced from a short, thick, and very fleshy stem, rarely measuring 6in. above the ground, are borne on tufted

NEPHRODIUM—*continued.*

stalks 1ft. or more in length. The long, rough, black or very dark, chaffy scales with which these stalks are densely clothed, give a most conspicuous appearance to the whole plant, which is also rendered all the more decorative by the way in which the fronds are disposed, forming as it were a natural vase of beautiful dark green colour. A singular character, quite peculiar to this plant, is that during the winter the stalks get very soft and brownish at their base, and the fronds have then a tendency to fall around the plant; in that state, however, they retain their colour and

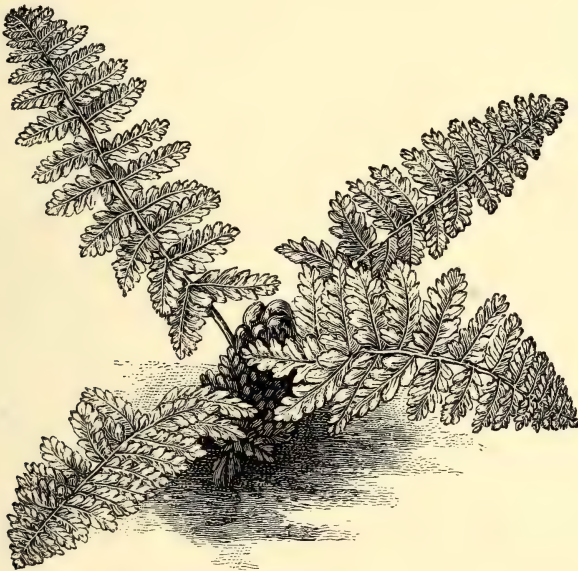


Fig. 105. *Nephrodium fragrans*, the fragrant Wood Fern of North America.

freshness for several months if only held up by a little black thread, which can easily be concealed. Also known as *Nephrodium atratum*.

N. hispidum.

This lovely, greenhouse species, native of New Zealand and Australia, is a well-marked plant of medium dimensions. The elegantly-arching fronds, 1ft. to 1½ft. long, 8in. to 12in. broad, of a somewhat triangular shape, and produced from a stout, creeping rhizome, are borne on wiry, brown stalks 1ft. to 1½ft. long, clothed with rough, nearly black, narrow scales. The spear-shaped leaflets have their lowest leaflets larger than the others, each leaflet being cut down

NEPHRODIUM—*continued.*

to a winged stalk into small, oblong or linear, sharply-toothed lobes of a leathery texture, dark green colour, and particularly shining nature. The abundant and conspicuous sori almost entirely cover the under-side of the fertile fronds. A species particularly adapted for growing in a Fern-case in the dwelling-room, where, in the company of *Todeas* and other *Filmies*, it will be found to thrive admirably. Either as a pot plant or planted out it forms a beautiful and interesting object.

N. lepidum.

A remarkably elegant, greenhouse Fern, which originated at the Pine-Apple Nursery, Edgware Road, London. It may be a distinct species, though it has all the appearance of a deeply-contracted form of the popular *N. patens*, of which it possesses most of the outward characters.

N. membranifolium.

Synonymous with *N. dissectum*.

N. molle.

On account of its free growth and prolific character, this greenhouse species, of medium dimensions, is frequently met with; it is a variable plant, with a remarkably wide range of habitat—Cuba, Mexico, Peru, Brazil, the Himalayas, Hong Kong, New Zealand, &c. Its spear-shaped fronds, 1ft. to 2ft. long, 8in. to 12in. broad, and borne on tufted, somewhat slender stalks 1ft. or more in length and slightly scaly at the base, have their leaflets, 4in. to 6in. long, $\frac{3}{4}$ in. broad, of a soft, papery texture and pale green colour, cut about half-way down to the midrib into narrow, blunt lobes (Fig. 106); the lower leaflets are placed at a little distance from each other, and are rather shorter than the others, which become more closely set as they approach the summit. The sori are distant from the midrib, and are covered with a very hairy involucre of a purplish colour. It succeeds under either stove or greenhouse treatment. It does well either grown in a pot or planted out in the rockery, where it forms a capital background, showing off to advantage other and choicer Ferns, and in which position it soon multiplies, as it is readily propagated from spores. Several varieties of *N. molle* have been produced under cultivation, the most distinct being *N. m. corymbiferum* and *N. m. grandiceps*.

N. montanum.

This interesting, hardy species, known as the Mountain Buckler Fern, has spear-shaped fronds, produced from a dense, clustered crown; they are borne on short, tufted stalks, furnished at their base with chaffy scales of a light brown colour, are 1½ft. to 2ft. long, 6in. to 8in. broad, and

NEPHRODIUM—*continued.*

furnished with leaflets 3in. to 4in. long, lin. broad at the base, of a soft, papery texture, and of a brilliant green colour. These leaflets are cut down to a broadly-winged stalk into close, oblong, blunt lobes, the lower ones, distantly placed, being gradually dwarfed to mere auricles.



Fig. 106. Nephrodium molle, one of the species largely grown for market work.

The round and moderate-sized sori are disposed in rows near the edge of the lobes, and covered with a thin involucre of a peculiarly white colour. This species is most effective when planted in masses on the rockery. It does not take very kindly to transplanting, although, with a little care, it may successfully be removed. It also makes a handsome specimen when grown in a pot; in either case thorough drainage is necessary, and the soil best suited to its

NEPHRODIUM—*continued*.

cultivation is a compost of four parts of fibry peat and one part each of leaf-mould and sandy loam, with a free admixture of silver sand. *N. montanum* is one of the least variable of the British Ferns; but it has produced a few varieties.

N. opacum.

This garden name is applied to a plant having the appearance of a thick-leaved, dull form of the popular *N. erythrosorum*, and said, like that species, to be a native of Japan. Its fronds, however, never show, even in their young state, the beautiful tints which form the principal ornament of *N. erythrosorum*; yet it is a most useful Fern, as its foliage is rarely affected by gas, smoke, or London fog.

N. Otaria.

In gardens, this Japanese species is better known as *Lastrea aristata*. Its robust fronds are produced from a thick, fleshy, underground rhizome, which delights in finding its way in any material of a rough or coarse nature—peat, partly-decayed vegetable matter, or even partly-decomposed moss; they are borne on stalks 6in. to 12in. long and of a scaly nature, and their leafy portion usually measures 1ft. or more in length. The terminal leaflet is 4in. to 6in. long, 1in. to 1½in. broad, and sharply pointed at its extremity, and it shows on both sides finely-toothed lobes reaching about a quarter of the way down to the midrib; there are also from three to six spreading, lateral leaflets on each side of the frond, the lower ones being distinctly stalked. The texture is leathery, and the colour a bright, shining green. This is a very ornamental and exceedingly useful plant, to which a certain character of distinctness is imparted by its large, conspicuous, closely-set sori, which cover nearly the whole under-side of the fronds. The plant known in commerce as *Lastrea aristata variegata*, though usually considered as a form of this species, is undoubtedly a variety of *Aspidium aristatum*.

N. patens.

An extremely ornamental, greenhouse species, with a very extensive range of habitat. In North America it is called the Spreading Wood Fern. It is likewise found in Polynesia, Japan, Angola, tropical America, &c. The fronds vary according to the habitat, the largest of the North American species seldom being more than 2ft. in length and 10in. in breadth; they are borne on roundish, pale green stalks, which also vary from a few inches to sometimes 1ft. in length, and which emerge from an oblique rootstock of a chaffy nature. The leaflets, 4in. to 9in. long and ½in. to ¾in. broad, are cut down about three-quarters

NEPHRODIUM—*continued.*

of the way to the rachis into narrow-oblong, nearly sickle-shaped lobes, both surfaces of which are pubescent with fine, white, sharp-pointed hairs. The rather small though conspicuous sori are disposed sometimes nearer the margin than the midrib, and furnished with a roundish or kidney-shaped, persistent involucre, covered with hairs like those of the frond. There is a garden form, *N. p. superbum*, that far surpasses the type in elegance.

N. prolificum.

This greenhouse or even hardy species, introduced from Japan, is of comparatively small dimensions. Its fronds, which are produced from a succulent crown showing very little above the surface of the ground, and borne on green, wiry stalks 6in. to 9in. long, are of a somewhat elongated-triangular form, seldom exceed 1ft. in length, and are tripinnate. It produces, either in the axils of the leaflets or, less frequently, on the margins of their lobes, innumerable leafy buds, by which it is easily and rapidly propagated. The abundance of the sori and their colour are also very characteristic, for the under-side of the lobes is entirely covered with conspicuous spore masses of a beautiful red when young, turning later on to a deep purple. Undoubtedly a Fern deserving a place in every good collection.

N. pubescens.

A very handsome, evergreen, stove species, native of the West Indies, and one which, in general appearance, somewhat resembles the better-known *N. decompositum*.

N. Richardsi multifidum.

This variety is no doubt one of the handsomest of all Ferns. The fronds differ from those of the typical plant in having their extremities, as well as those of the leaflets, cleft into numerous narrow, pointed, spreading, finger-like lobes. Its fronds, which are produced in great abundance from a short, succulent, decumbent stem, measure about 2ft. in length and 8in. in breadth at their widest part; they are borne on round stalks 10in. to 15in. long, of a pale green colour, and slightly downy when young. The leaflets, which are upwards of 4in. long in the broadest part of the frond, terminate in a dense tuft of long, narrow divisions, the extremity of the fronds being also divided into two or more branches consisting of numerous thread-like segments. The singular and elegant character of this useful plant is enhanced by its bright green colour and the arching habit of its fronds. It reproduces itself true from spores.

N. (Lastrea) Standishii.

This is the popular name for *Aspidium laserpitifolium*.

NEPHROLEPIS.

Although not a large genus, yet *Nephrolepis* (Ladder Ferns) contains some of the most valuable Ferns for planting on rockwork. A peculiarity of the genus is the indefinite growth of the fronds. According to the most capable observers, there is no necessary limit to the apical development of the fronds on mature plants. All *Nephrolepises* are



Fig. 107. *Nephrolepis Duffii*, an elegant, graceful species, one of the best for pot culture.

most tenacious of life, and when it so happens that, through want of moisture at the roots, their leaflets drop off, the plants soon recover; for, after a few weeks of attentive nursing, another crop of fresh foliage usually takes the place of the fronds previously destroyed. The fronds, which in some kinds attain 4ft. in length, are in most, if not in all, cases produced from crowns disposed at various intervals on long, thin, rapid-growing rhizomes of a wiry nature. This is a feature peculiar to the plants contained in this genus, and by which means most

of them are rapidly increased, especially the reputed barren forms, such as *N. Duffii* (Fig. 107), *N. rufescens tripinnatifida*, and the fertile but very variable *N. davallioides furcans*, which, when propagated from spores, produces plants showing their crested character in a more or less marked degree. Where it is desired that these should be increased, they should be planted in a shallow bed of coarsely-broken peat, chopped sphagnum, and silver sand, in about equal parts: in this the rhizomes can freely run and produce young plants, which may be safely severed from the parent when they have developed three or four fronds. Besides the usual rhizomes already alluded to, a few species, such as *N. Bausei*, *N. cordifolia*, *N. philippinensis*, &c., are also provided at the roots with small succulent tubers, which likewise produce young plants in a remarkably short time.

All the species are well adapted for basket culture, being of an elegant drooping character; they have also a curious propensity for taking possession of the outer surface of the baskets and growing all round them, thus making perfect balls of gracefully pendulous foliage, which, provided the plants are well supplied with water at the roots all the year round, remain a long time in perfect condition. On account of the jointed nature of their leaflets, the fronds are of little use in a cut state, as they only last good for a comparatively short time. The plants are specially useful for covering walls and pillars, as they require but very little soil, and can almost be kept thriving on moisture alone. Many of them may be propagated from spores, which germinate freely.

N. acuta.

This very handsome, strong-growing, stove species, also known in gardens under the names *N. biserrata*, *N. ensifolia*, *N. platyotis*, *N. punctulata*, *N. splendens*, &c., is often mistaken for *N. exaltata*, which it only resembles as far as size and general aspect are concerned. It is found in Cuba, Guatemala, Peru, Brazil, Polynesia, Hong Kong, &c. Its massive arching fronds, 2ft. to 4ft. long and 8in. to 12in. broad, are borne on tufted stalks 4in. to 8in. long,

NEPHROLEPIS—*continued.*

of a naked or slightly scaly mature. The somewhat leathery leaflets, 4in. to 6in. long and $\frac{1}{2}$ in. to lin. broad, are acute, the edge being entire or slightly notched, the upper side eared, and the lower side rounded at the base. The sori are disposed near the margin. There is a useful crested variety of this usually grown for market under the name of *N. ensifolia Westoni*.

N. Bausei.

This garden-raised plant is one of the most distinct of the whole genus. Its numerous, somewhat erect fronds, more than 1ft. long, leafy from the base, and of a soft, bright green colour, have a peculiarly graceful appearance, produced by the feathery nature of their leaflets, which, instead of being entire, as is the case with others of the same genus, are divided nearly to the midrib. This and the dense dwarf habit of the plant render it very striking. It originated among some seedlings of *N. pluma*, and, like that species, thrives equally well in a stove or in an intermediate house, and is entirely deciduous. This plant reproduces itself true from spores. It should be kept sufficiently moist in water to prevent shrivelling.

N. biserrata.

Synonymous with *N. acuta*.

N. cordifolia.

From a decorative point of view, this is perhaps the most useful of all the known species; it thrives well under cool treatment. It is more extensively known in gardens under the name of *N. tuberosa*, and sometimes is also met with under those of *N. imbricata* and *N. obtusifolia*. Its habitat extends from Cuba and Mexico to Brazil and Peru, and from Japan and India southward to Australia and New Zealand. It is of intermediate size and somewhat erect in habit. The fronds, borne on tufted, wiry stalks slightly scaly at the base, are 1ft. to 2ft. long, and seldom more than 2in. broad. The numerous leaflets, about lin. long and $\frac{1}{3}$ in. broad, are very closely set, sometimes overlapping; their base is rounded or heart-shaped on the lower side and distinctly eared on the upper side; they are usually blunt, have their edge entire or slightly notched, and are of a rich, dark green colour. The sori, disposed in a row about half-way between the midrib and the edge, are covered with a firm, distinctly kidney-shaped involucre, oblique or opening towards the outer edge.

N. c. compacta.

A most elegant form of the above species. Its arching fronds spread in all directions from a common centre; they

NEPHROLEPIS—*continued.*

are from 1½ft. to 2ft. long, and are furnished with leaflets from the base. This variety thrives equally well in the intermediate house or in the stove, and reproduces itself freely from spores.

N. c. pectinata.

Undoubtedly this may be regarded as one of the gems of the genus. Its close, compact, yet graceful habit, coupled with the greyish colour of its comparatively short and slender fronds, borne on perfectly naked stalks, make it unique. Either grown in a pot or in a basket of small dimensions, or planted in a perpendicular wall, it is most useful. Unlike most of the other species and varieties, it produces fine bushy plants in small pots suitable for table decoration, and it is not uncommon to find in a 10in. basket as many as 150 gracefully pendulous, slender fronds seldom exceeding 1½ft. in length. The species is one of those most readily propagated from spores.

N. davallioides.

This magnificent, stove species, is a native of the Malayan Archipelago, the East Indies, and Java. Its vigorous constitution and the graceful habit of its arching fronds, 2ft. to 3ft. long, 1ft. broad, and borne on stalks 1ft. or more long, make it a plant of no ordinary merit. These fronds are symmetrically disposed in a fibrous crown, which sends forth on all sides stolons of a wiry nature and of great length; these delight in creeping on the surface of the ground or in some very loose material, such as partly-decayed moss, sending up here and there tufts of new fronds. The stalks on which the fronds are borne are stout, round, channelled in front, and scaly at the base only. The leaflets, 4in. to 6in. long and ½in. to 1in. broad, are of two distinct forms, the lower ones being barren, opposite, somewhat spear-shaped, and toothed at the edges. The upper portion only of the fully-developed fronds is fertile, differing in that respect, as well as in general appearance, from all other known species. The fertile leaflets, which are also opposite, are longer and narrower than the barren ones; their lobes are much deeper, and each of these is terminated by a single sorus. This is a Fern which should be in every collection; for covering walls of large dimensions or for planting on dead Tree Ferns it has no equals; a good specimen of it makes a particularly attractive exhibition plant, as the barren and fertile portions of its fronds are as distinct as those of the better-known *Asplenium bifforme*. The spore masses are covered by a kidney-shaped involucre.

NEPHROLEPIS—*continued*.**N. d. furcans.**

Among the many crested Ferns in cultivation, this singular as well as beautiful form is one of the most distinct and highly decorative. Its most striking characteristic is the furcation of the leaflets, which are either alternate or opposite and closely set along the midrib, whereas those of *N. davallioides* are set much farther apart. In the barren leaflets, which in fully-developed plants are situated only on the lower portion of the frond, and which generally are few in number, the furcation is less marked and sometimes only rudimentary; in the fertile leaflets it is twice or even three times repeated at the extremities of the first divisions, becoming more complex towards the summit of the frond, where it often forms quite a large tassel, whose weight gives the fronds an elegant, pendulous habit. This plant is valuable for growing in large baskets, in which it never fails to prove very attractive. Although spores are freely produced, it is best propagated by means of the young plants produced from rhizomes in the ordinary way, on account of the numerous and extreme variations which take place among the seedlings.

N. Duffii.

This pretty stove species, native of the Duke of York's Island, in the South Pacific, is one of the most interesting of the whole genus. Its compact habit, its comparatively small dimensions, and the bright glossy colour of its beautifully-tasselled fronds, give it a prominent place in a group of Ferns naturally rich in decorative subjects. Its curious, irregularly-pinnate fronds are borne on slender stalks covered with reddish-brown, downy scales at their base. Instead of these fronds being produced loosely, as in most other *Nephrolepises*, they are densely crowded—the outcome of closely-clustered crowns; they seldom measure more than 2ft. in length, and are terminated by very handsome crests, which vary in size according to the temperature in which the plant is grown. A moist heat is required to induce it to show its true characters. *N. Duffii* can only be propagated by division of the crowns, an operation easily performed at almost any time of the year, but with greater safety in early spring; or by young plants produced from the rhizomes, which, however, are not so plentiful as in other species. It is one of the best Ferns for pot culture, its somewhat upright habit making it less suitable than other species for baskets, brackets, and wall-coverings.

N. ensifolia.

Synonymous with *N. acuta*.

NEPHROLEPIS—*continued.***N. exaltata.**

One of the commonest of the genus, this stove species is also one of the most popular. From Lowe's description and particulars, we gather that it was introduced by Mr. Anderson to the Royal Gardens, Kew, in the year 1793. Its habitat includes the Neilgherries, South Florida, Mexico, the West Indies, Central and South America, South Asia, &c. Its fronds, 2ft. or more long and 3in. to 6in. broad, are borne on tufted, firm stalks 4in. to 6in. long, of a naked or slightly scaly nature. The somewhat leathery leaflets are $1\frac{1}{2}$ in. to 3in. long, $\frac{1}{4}$ in. to $\frac{1}{2}$ in. broad, and usually sharp-pointed, with the edge entire or slightly toothed, the upper side eared, and the lower rounded at the base. The sori, disposed near the margin of the leaflets, are covered with a firm and distinctly kidney-shaped involucre. Being of a particularly accommodating nature, *N. exaltata* thrives well under other Ferns in places which possibly would otherwise remain bare. It is also well adapted for planting on a cool rockery, either in out-of-the-way corners or on rocks near water; but, wherever it is planted, care should be taken to give it plenty of room, so as to ensure the full development of its beautiful fronds. *N. exaltata* is a rapid grower, and soon forms very ornamental masses when planted out; but when left alone it has a tendency to overrun any more delicate Ferns near it.

N. e. Piersoni.

An interesting and beautiful variety raised by Mr. F. R. Pierson, of Tarrytown, New Jersey. Instead of possessing comparatively narrow fronds, as in the type, this form bears them 7in. in width. Moreover, they are furnished with secondary divisions some 2in. wide that go to make it even more interesting than the plumose form of *N. rufescens*.

N. imbricata.

Synonymous with *N. cordifolia*.

N. obtusifolia.

Synonymous with *N. cordifolia*.

N. philippinensis.

Of comparatively small dimensions and compact habit, this lovely species succeeds equally well under either stove or greenhouse treatment. Its narrow fronds, seldom exceeding 1ft. in length, are quite erect and produced from thickly-tufted crowns. On each side of the midrib, which is of a bright shining brown colour, are the leaflets, set very closely together, and affecting a deflexed position; they are

NEPHROLEPIS—*continued.*

of a pleasing dark green colour, leathery in texture, strongly eared at the base, and finely toothed at the edges. The curious position of the leaflets and the upright habit of the whole plant make it a most interesting Fern.



Fig. 108. *Nephrolepis rufescens tripinnatifida*, a graceful strong-growing variety equally well adapted for pot culture and for planting out.

N. Piersoni.

This beautiful plumose Fern, although catalogued as a species, is regarded as a form of the well-known *exaltata*.

N. platyotis.

Synonymous with *N. acuta*.

NEPHROLEPIS—*continued.***N. punctulata.**

Synonymous with *N. acuta*.

N. rufescens.

Although sometimes regarded as a variety of *N. acuta*, this remarkably handsome plant appears to be sufficiently distinct to rank as a species. The upright habit of its fronds, 2ft. to 3ft. long, the rusty-coloured woolly nature of their stalks and of the under-surface of the leaflets, and the deeply-cleft character of the leaflets, render the plant of more interest than a mere variety of *N. acuta*.

N. r. tripinnatifida.

This free-growing, stove variety, is one of the most distinct and beautiful of all the strong-growing kinds, and is a native of the Fiji Islands. Its fronds have a particularly upright habit, and are 2ft. to 3ft. long and 4in. to 6in. broad; they are of a lovely bright green colour, which forms a pleasing contrast with the reddish tint of their rachis. They possess a peculiarly massive, yet feathery appearance, produced by the broad leaflets, of a soft, papery texture, being regularly and constantly tripinnatifid, their margins being on both sides deeply cleft and covering each other in a graceful and most effective manner, much in the way of the better-known and very popular Welsh Polypody. This variety is very useful either for pot culture or for planting out in the warm Fernery. Like nearly all plumose forms of species of Ferns already in cultivation, it has proved entirely barren; but, being provided with the wiry, running rhizomes, peculiar to the genus, it may be easily propagated by the same method as that employed for commoner kinds, which produce young plants on their rhizomes at intervals. Fig. 108.

N. splendens.

Synonymous with *N. acuta*.

N. tuberosa.

Synonymous with *N. cordifolia*.

NIPHOBOLUS. See **Polypodium.**

NIPHOPSIS. See **Polypodium.**

NOTHOCHLÆNA.

The Gold and Silver Maiden-hairs found in this genus are closely related to *Cheilanthes*, from which they differ only by the absence of a distinct involucre, and with which they are connected by gradual intermediate stages.

Some of the members of this genus require stove temperature all the year round, while others succeed best under greenhouse treatment. In that respect they are like *Gymnogrammes* and *Cheilanthes*, which, on account of either the woolly or the golden or silvery nature of the under-side of their foliage, they also resemble in general appearance. It is not even unusual to find on the same plant fronds the under-sides of which are adorned with quite different colours—white, creamy, pale, or deep yellow. The slender black-stalked species have much the appearance of Maiden-hairs, and one often hears *N. flavens* and *N. nivea* so described.

Most of the plants belonging to this genus are of a somewhat delicate nature, requiring more than usual care, especially during the winter, to preserve their foliage, which, from its constitution, in many cases possesses the property of retaining moisture and is therefore apt to decay. An important fact to notice is that, from whatever part of the globe they come, all the *Nothochlænas* are invariably found on rocks much exposed to the sun, but so situated that the plants get a good supply of moisture at the roots. The majority of the species are of erect or semi-erect habit, although a few are particularly well adapted for growing in baskets of small or medium dimensions, in which they display their elegant fronds to advantage. In any case they should not be kept in a close or a moist place, a somewhat airy situation being indispensable to all of them. If grown in pots, a mixture of good fibrous peat and small pieces of sandstone in about equal proportions is all that is required; but great care must be taken to ensure perfect drainage, as stagnant water at the roots is highly injurious. Finely-sifted soil should be carefully avoided, as also should overhead syringings.

Nothochlænas are almost invariably propagated from spores, which, in some cases, germinate freely, but many of the species may also be increased by division of the crowns, an operation that is best performed from March to May.

NOTHOCHLÆNA—*continued***N. chrysophylla.**

A synonym of *N. flavens*.

N. dealbata.

A very elegant little plant, of slender habit; it is a native of North America, and requires cool treatment. The fronds, borne on slender, wiry, chestnut-brown stalks 4in. to 6in. long, are deltoid, 3in. to 4in. each way, and tripinnate, their distant leaflets being again divided into blunt, oblong lobes of a somewhat leathery texture; they are pale green on their upper surface, and coated with pure white powder beneath.

N. flavens.

An extremely elegant, South American species, better known in gardens under the name of *N. chrysophylla*, is one of the most popular of the whole genus. The plant is graceful in appearance, and the bright golden powder with which the under-surface of its abundant Adiantum-like fronds is covered, forms a pleasing contrast with the slender, black, shining stalks on which they are borne. It thrives best in a basket, and should be kept close to the light and in a warm house, at least during the winter. The tripinnate fronds are borne on densely-tufted, glossy, chestnut-brown stalks 4in. to 8in. long, are produced from a thick rhizome covered with dark brown scales; they are 4in. to 9in. long, 2in. to 4in. broad, broadly triangular, and furnished with leaflets disposed somewhat far apart. The leaflets are somewhat loosely set, nearly wedge-shaped, of a slightly leathery texture, and of a bright green colour on their upper surface, while their under-side is densely covered with a bright yellow powder. The brown sori extend from the edge nearly to the midrib.

N. Hookeri.

This thoroughly distinct, greenhouse species, native of North America, must not be confounded with *N. Hookeri* of Lowe, which is only a form of *N. niva*. In general appearance this pretty little plant much resembles the better-known *Gymnogramme triangularis*. Its five-pointed, star-shaped fronds (Fig. 109), about 3in. each way, are produced from a short-creeping rootstock, at the end of which the wiry, reddish-brown, smooth, shining stalks, about 6in. long, are clustered. The frond consists of a middle portion of broadly-triangular form, supported on a short but narrowly-winged stalk, and of two lateral divisions, which are stalkless. The upper surface of the fronds is smooth and of a dull, rather dark shade of green, while the powder

NOTHOCHLÆNA—*continued*.

with which the under-side is copiously coated varies greatly in colour, sometimes being almost white or pale sulphur-yellow, while on some specimens it is of quite a deep yellow, inclining to orange.



Fig. 109. One of the star-shaped fronds of the pretty *Nothochlæna Hookeri*.

N. lanuginosa.

A pretty and delicate, greenhouse species, easily distinguished from all others by the dense, white, woolly substance which covers its fronds. It is one of the few species native of the South of Europe, and is well adapted for growing in the crevices of the cool rockery, where it should be planted with very little soil around it, and in an elevated and exposed situation.

N. Marantæ.

This exceedingly pretty, greenhouse or even hardy species is found in the Himalayas, in Syria and Tauria, in the Azores, and Madeira. From a rhizome of a woody nature, and densely covered with bright rusty-coloured, narrow scales, are produced some broadly spear-shaped fronds, 4in. to 12in. long, 1½in. to 3in. broad, and borne on

strong, wiry stalks 3in. to 6in. long; they are bipinnate, being furnished with spear-shaped leaflets cut down to the rachis into close, oblong, entire, thick, leathery leaflets. The upper surface, of a pale green colour, is naked, while the under-side is thickly covered with reddish-brown scales. The sori are disposed all along the margins of the leaflets. This Fern not only prefers, but really requires, thoroughly cold

NOTHOCHLÆNA—*continued.*

treatment. Messrs. J. Backhouse and Son, of York, grow it to perfection with very little trouble. All through the summer it is grown out in the open, and during the winter the plants are simply put into cold frames, where the frost often penetrates, and where they are protected only from excessive wet.

N. Newberryi.

A very pretty, greenhouse Fern, native of the southern counties of California. It is easily distinguished from all other North American species by the division and the colour of its broadly spear-shaped fronds, 3in. to 5in. long, borne on nearly black stalks of the same length, and produced from a thick, creeping, more or less branched rootstock, covered with very narrow, dark brown scales. These fronds are tripinnate, and a few of the leaflets near the midribs being again divided, are thus almost quadripinnate.

N. nivea.

This lovely, stove species, of small dimensions, deservedly one of the most popular in cultivation, is a native of the Andes, from Mexico to Peru. In general aspect it resembles *N. flavens*, though not quite so robust, and of a slenderer and more drooping habit. The most distinctive character of this extremely interesting plant, however, is the dense, pure silvery-white powder covering the under-side of its flexible fronds, and through which the abundant and naked sori protrude; these sori are disposed all round the margins of the small, roundish leaflets. This character fully accounts for the common name of Silver Maidenhair Fern; the blackness of the stalks adds to the delusion, as their slender and shining nature is very similar to that of most *Adiantums*. A most useful plant where baskets of small dimensions are required for the warm house; it should be kept very near the light, and in a position where no overhead waterings are likely to reach it.

N. sinuata.

A beautiful stove or intermediate house Fern, found in Peru, Chili, and Mexico, &c. On account of the length of its gracefully-pendulous fronds, it should be grown, if possible, in a hanging basket—really the only way to show off to advantage its lovely fronds, which are 1½ft. to 2ft. long, 1in. to 3in. broad, and borne on firm yet flexible stalks 2in. to 4in. long and of a chestnut-brown colour. These fronds are simply pinnate, being provided with short-stalked, egg-shaped or oblong leaflets, disposed alternately along the stalk, and varying from entire and undulated to deeply cleft. The texture is thick and leathery, the upper

NOTHOCHLÆNA—*continued*.

surface is pale green and slightly hairy, while the under-side is densely coated with small, narrow, rusty-brown scales. The black and abundant sori are disposed along the edges of the leaflets, which are slightly inflexed.

N. trichomanoides.

One of the handsomest among the rare species met with in collections, and one which, when well grown, never fails to attract attention. The particularly decorative and drooping habit of its narrow fronds, 6in. to 12in. long and rarely more than 1½in. broad, the peculiar white colour of their under-surface, due to a combination of white, star-like scales and fine mealy powder intermixed, render this plant one of the most striking of the whole genus. It is a native of Jamaica and Cuba. The fronds, produced from a central crown and borne on tufted, firm stalks 2in. to 4in. long, of a chestnut-brown colour, and slightly scaly, are simply pinnate. The oblong, blunt leaflets show some conspicuous, blunt lobes, all of a somewhat leathery texture, white underneath, and belted all round the margin with an even and uninterrupted band of very conspicuous and ornamental, black spore masses. For a medium-sized hanging basket, *N. trichomanoides* has few equals, as its abundant fronds are most elegantly pendulous. It requires to be grown in a light compost of either fibrous peat or leaf-mould and silver sand. It thrives best in the intermediate house, where its fronds are fairly enduring, provided they are kept perfectly dry at all seasons.

OLEANDRA.

Although not an extensive genus, *Oleandra* embraces some of the most interesting trailing Ferns in cultivation. With the exception of the Oleander-like *O. neriiformis*, all the species make good specimens either trained upon stems of dead Tree Ferns, which they readily ascend and quickly cover, or grown on mounds of peat. None but very fibrous peat should, however, be used; thick turfs of it should be placed one above another, and tightly fastened together by means of wooden pegs so as to form a pyramid. Another way of employing Oleandras is to use them for covering pillars indoors; but as they take possession of any genial surface, fastening themselves to it by means of short, fibry roots, it is indispensable that these should be provided with proper nourishment as the rhizomes

extend. The best plan is to fix round the pillar a wire cylinder of 2in. to 3in. mesh, which should be filled up, as the rhizomes extend, with a mixture of two parts of fibrous peat and one of sphagnum, rammed tolerably close. For hiding pillars, walls, or unsightly upright supports, the *Oleandras* are quite as useful as the better-known *Davallias*, and do not require any more special attention; although not perhaps quite such rapid growers, they possess the advantage of retaining their foliage longer than is the case with most *Davallias*. All the species known to cultivation require stove treatment and abundance of water at the roots throughout their growing season, and they are greatly benefited by occasional syringings overhead during the summer. Although *Oleandras* may be propagated from spores, they are usually increased by division of the rhizomes between April and September.

O. articulata.

An evergreen species, native of Natal, the Mascarene Islands, the Seychelles, and the Guinea Coast; it is specially adapted for growing on small pyramids of peat. Its simple, undivided fronds are produced about 2in. apart, from firm, more or less upright, wide-climbing rhizomes, from which they hang gracefully. They are borne on slender stalks 1in. to 2in. long, with the joint close to the base, and their leafy portion, 6in. to 12in. long, 1½in. to 2in. broad, and of a somewhat leathery nature, has the midrib beneath slightly scaly. The sori in this species form two irregular rows of orange-brown dots, often some distance from the midrib. This is one of the smallest-habited plants of the genus, and looks well covering the stem of a dead Tree Fern. Its foliage is of a pleasing shade of light green, and the veining is exceedingly pretty.

O. nodosa.

A beautiful, free-growing species, native of the West Indies and Guiana, where it has been found covering the stems of dead trees. It is readily distinguishable from all others by the trailing nature and satiny gloss of its shoots, and by the disposition of its fructification, which is irregularly scattered. The plant is of medium size, of a cheerful, bright green colour, and easily cultivated, especially when planted on partly-decayed vegetable matter. The veining of the fronds is particularly attractive and very conspicuous when seen from below, as they are of a semi-transparent,

OLEANDRA—*continued.*

though somewhat leathery texture; they are 6in. to 12in. long, $1\frac{1}{2}$ in. to $2\frac{1}{2}$ in. broad, slightly wavy, and pointed at their summit. The stalks, 2in. to 6in. long and often blackish, are jointed not far from the base. The abundant and conspicuous sori are scattered, but placed nearly all in the inner half of the frond.

OLFERSIA. See *Acrostichum*.

ONOCLEA.

Onoclea and *Struthiopteris* (Sensitive and Ostrich-feather Ferns) have been united by Mettenius, the plants, of a hardy nature, being natives of North America, Sikkim, Japan, and Eastern Europe. These plants require an abundance of water at the roots all the year round, and are best adapted for planting out in the hardy rockery or Fernery, as pots scarcely afford them sufficient accommodation for the full development of their rhizomes or stolons, which, in some instances, extend a very long distance. There are two very widely distinct sorts of fronds—the barren ones, which are numerous and produced early in the spring, and the fertile ones, which are few in number and produced late in the summer. The fertile fronds are contracted, much shorter than the others, and very rigid. The soil which *Onocleas* prefer is a compost of three parts of good strong loam and one of leaf-mould. Great care should be taken that at all times of the year their roots should be kept in a damp state. *Onocleas* may be increased by means of spores, but their propagation is effected usually by division of their underground rhizomes, or of their stolons, an operation which, as the plants are of a deciduous nature, is best performed from October to March.

O. germanica.

This beautiful species (usually found in gardens under the name of *Struthiopteris germanica*), and known as the Ostrich Fern, has broadly-spear-shaped fronds that seldom exceed 4ft. in length under culture. In North America, again, its barren fronds attain 10ft. in length; but under cultivation these are much shorter, narrowed from the middle to the base, and abruptly terminate in a point at their summit; they are furnished with numerous stalkless leaflets,

ONOCLEA—*continued.*

the lowest being wavy and thrown back, and many of them pinnatifid. The leaflets are of a light green colour and of a soft, papery texture, and they are frequently injured by late spring and early autumn frosts. The fertile fronds, produced only in autumn or late in the summer, are disposed in the middle of the crown and perfectly erect; they are much shorter than the barren ones, and much contracted. The lobes of the leaflets have their margins much recurved, so that the whole leaflet forms a somewhat articulated, pod-like body. The sori are covered by a delicate, cup-shaped involucre of a very short-lived nature.

O. sensibilis.

Undoubtedly this beautiful Fern is one of the oldest, if not even the very oldest, of exotic Ferns introduced to Europe from North America. Its main attraction lies in the pleasing, soft, pale green colour of the lovely barren fronds, broadly triangular in outline, long-stalked, and cut down nearly to the midrib into oblong-spear-shaped leaflets,

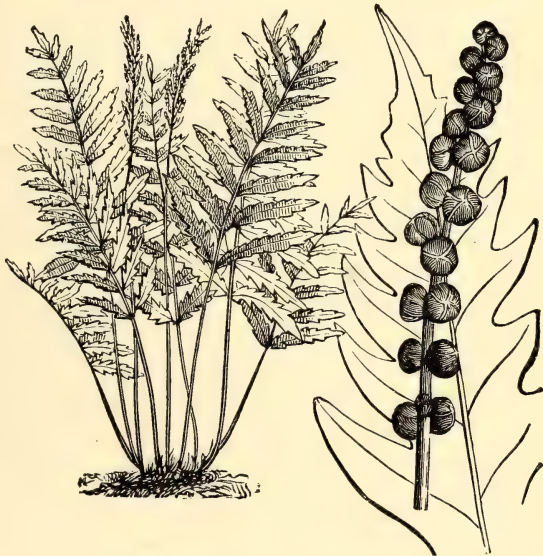


Fig. 110. Onoclea sensibilis, showing habit and portions of fertile frond and barren leaflet.

which are wavy or slightly toothed at the margins. The middle of the frond is winged from the basal or from the second pair of leaflets, the wing at the base being very narrow, but gradually widening towards the summit. These barren fronds sometimes reach $1\frac{1}{2}$ ft. in length, especially when the plants are well established in a naturally and constantly moist part of the rockery, and, as they are borne on stalks of about the same length, they measure about 3 ft. in height, a result never attained under pot-culture. The texture is soft and papery, the surfaces are perfectly smooth, and the under-side is slightly bluish. The fronds do not last long when cut, even when put in water, but shrivel almost immediately, showing a disposition to fold

ONOCLEA—*continued*.

their leaflets face to face, for which reason, Eaton says, the plant has received the popular name of Sensitive Fern. The foliage of this Fern is also very sensitive to a cold temperature, for the first autumn frosts always destroy it, and the late spring frosts which we sometimes experience in May and June have the same injurious effects. These remarks apply to barren fronds only, which are by far the handsomer and the more numerous. Fertile fronds are not very common, and are so unlike the barren ones that no one unacquainted with the plant would suppose them to be related to each other. Both kinds are produced from a thick, fleshy rhizome which runs underground; the fertile ones stand about half the height of the barren ones, and are perfectly rigid and nearly black when fully developed. Another peculiarity is that they dry up in winter, but remain erect during the following summer, so that a fruiting plant often bears fertile fronds of two years' growth. The involucre with which the sori are covered is globose, and bursts at the summit. Fig. 110.

ONYCHIUM.

Although four species belonging to this genus are known in cultivation, the two most extensively grown—*O. auratum* and *O. japonicum*—are extremely elegant, and possess some useful decorative qualities. Their fronds are so light and finely cut, and of such a pleasing colour, that they are specially adapted for mixing with cut flowers, amongst which they look as graceful as some of the finest *Adiantums*, and remain fresh much longer. While *O. auratum* produces its ample and handsomely decomposed fronds from a single crown, thus forming a sort of miniature *Pteris tremula* with finely-divided foliage, *O. japonicum*, on the contrary, produces them from numerous underground rhizomes, making thick tufts of graceful and pleasing foliage, green on both sides; whereas that of the former species, when in a fertile state, is of a beautiful golden colour beneath, which gives the plant quite the appearance of a golden Fern. The colouring, however, is due, not, as in *Gymnogrammes* and *Nothochlænas*, to the presence of powder, but to the indusia, which are of a bright, rich golden hue. These two most interesting species differ alike in

habit and in the treatment that they require. While *O. japonicum* thrives well in a cool house—in fact, will not stand stove treatment, under which it is soon attacked by thrips—*O. auratum* requires a stove, or at least a good intermediate house, all the year round. The same compost suits them both, viz., a mixture of fibrous loam, peat or leaf mould, and silver sand, in about equal proportions. Both should be potted loosely, as they have great aversion to hard soil at any time. Care must also be taken to ensure their fronds being kept dry at all seasons, as if allowed to get wet they soon turn to a darkish brown colour and begin to decay.

O. japonicum is easily propagated from spores, which germinate freely, or by division; but the same cannot be said of *O. auratum*, which no doubt would be equally popular if its propagation were more rapid; the fact of its forming only single crowns prevents its increase by division. The only mode of dealing effectually with this handsome species is, therefore, by means of seedlings, which come up freely enough, but which have a natural tendency to damp off just above ground while in a young state.

O. auratum.

This lovely, evergreen, stove species is a native of the Malayan Peninsula and Islands. The barren and the fertile fronds are of similar dimensions, but otherwise different. Both kinds are borne on stout, erect, naked stalks, 6in. to 12in. long, of a pale brown colour. The barren ones, 1ft. or more in length and 8in. to 12in. broad, are quadripinnatifid; their lower leaflets, somewhat triangular and spreading, are 4in. to 6in. long, and furnished with numerous leaflets and segments of a somewhat triangular shape; their ultimate divisions are often wedge-shaped and trifid at the summit. The fertile fronds are readily distinguished at first sight by their less divided nature, and by the pod-like appearance of their leaflets, which are seldom more than $\frac{1}{2}$ in. to 1in. long and $\frac{1}{8}$ in. broad. The upper surface of both kinds of fronds is of a beautiful bright glossy green, while the under-surface of the fertile ones is rendered very attractive by the rich golden colour of its sori, which are covered with an involucre of parchment-like texture. In potting or planting this species, the utmost care should be

ONYCHIUM—*continued.*

taken to keep the crown well above the surface of the soil, which must be thoroughly drained.

O. capense.

This is a garden name for *O. japonicum*.



Fig. 111. *Onychium japonicum*, a very pretty and useful species of a little known genus.

O. japonicum.

This greenhouse species is undoubtedly the most useful of those in cultivation, being freer in growth and producing its fronds in greater abundance than any other. These, however, are of a semi-deciduous character, 1ft. or more in length, 6in. broad, egg-shaped, and quadripinnatifid.

ONYCHIUM—*continued.*

The lower leaflets of the barren ones are 4in. to 6in. long, spear-shaped, and furnished with numerous, usually triangular, leaflets and segments. Unlike those of *O. auratum*, the segments in this species, both fertile and barren, are uniform, being all narrow-linear, a little tapering below, and gradually sharp-pointed. The fronds are produced from a short-creeping rhizome, and borne on slender, erect, naked, straw-coloured or pale brown stalks 6in. to 12in. long; they are of a somewhat leathery texture and of a bright, shining green colour on both sides—hence the common garden name of *lusidum*. This useful species is a native of Japan, China, and Northern India. The sori, of a bright brown colour, are covered with a pale involucre of a parchment-like texture, and occupy nearly the whole under-surface of the segments. Fig. 111.

O. lucidum.

A garden name for *O. japonicum*.

OSMUNDA.

Though not extensive, this highly interesting genus comprises some species which are very ornamental in a cool house; while some make beautiful objects for the hardy Fernery. Osmundas are commonly called Flowering Ferns, and are on that account regarded with more than usual interest. Most of them are deciduous, and, with the exception of *O. javanica*, whose general appearance is much nearer that of a glossy, thick-foliaged Lomaria than anything else, they all more or less resemble one another.

Osmundas are easily cultivated, even in common garden soil; but if planted out, a spot should be selected for them by the side of water, so that, while the heads of the plants are in the open and fully exposed to the air, the roots may be kept constantly wet. If anyone will take the trouble to prepare for these magnificent Ferns a mixture of swamp mud and good loam, and will keep their roots supplied with abundant moisture, the result will be all that can be desired. If, however, there is any difficulty in procuring the materials just named, a mixture of turfy loam and fibrous peat will suit them very well, and the addition of a portion of river sand will

induce the development of roots, which will run in all directions, and thus insure the production of numerous robust fronds. Though requiring an abundance of water at the roots at all times of the year, the plants dislike being syringed overhead. The propagation of *Osmundas* is invariably effected by means of spores, which are produced in abundance and germinate very freely.

O. cinnamomea.

This very handsome and perfectly hardy species is usually considered as a purely North American plant. It has, however, a very wide range of habitat. It is of robust growth and compact habit, and when deprived of fertile fronds its general appearance is very similar to that of *O. Claytoniana* (*O. interrupta*, as that species is usually called in gardens); in fact, in the absence of fructification it is not always easy to distinguish one from the other. When well grown, the crown of fronds of this species rivals in density that of *O. Claytoniana*, and the barren fronds, which in this case are by far the more numerous, are of almost the same shape and dimensions as those of that species. *O. cinnamomea* is generally of more upright habit, but the most striking difference between the two species, discernible only when in a barren state, is that in the plant under notice the summit of the frond is decidedly sharp-pointed, as is also the summit of each.

O. Claytoniana.

Of all the known species of the genus, this is the most conspicuous. When growing in a favourable situation and allowed ample room, it forms a crown of fronds several feet in diameter. The outer fronds, which are generally barren, are borne on tufted, loosely-woolly stalks, which are 1ft. or more in length and clothed with loose, woolly material when young, though naked when mature; they rise nearly erect on their stalks, but, instead of retaining their upright position, like those of *O. cinnamomea*, they gradually bend away from the centre and curve outwards in all directions (Fig. 112), thus forming a most elegant, vase-shaped plant of large dimensions.

O. interrupta.

A garden name for *O. Claytoniana*.

O. javanica.

A handsome and very distinct, stove species, also known as *O. Presliana* and *O. Vachelli*. It is of somewhat rigid

OSMUNDA—*continued*.

habit, and is found growing in a natural state from Kamtschatka to Java and Ceylon. The peculiar fronds, which in general appearance greatly resemble those of a *Lomaria*, are 1ft. to 3ft. long, 8in. to 12in. broad, and simply pinnate, being provided with leaflets distinctly barren or fertile. The barren ones, of a leathery texture, dark green colour,



Fig. 112. *Osmunda Claytoniana*, a distinct species whose fronds are so disposed as to form an elegant vase-shaped plant.

and glossy, are 4in. to 8in. long, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, wedge-shaped at the base, and often slightly stalked, their edge being either entire or sometimes sharply toothed. The fertile leaflets, which are usually disposed on each side of the stalk, and in the centre of the frond, are shorter, and made up of numerous close but distinct, oblong, stalkless clusters.

O. Presliana.

Synonymous with *O. javanica*.

OSMUNDA—*continued*.**O. regalis.**

Though generally considered as a British Fern, this stately and deservedly popular species may well be classed among the most useful and most decorative of the exotics of strong growth. Not by any means common in all parts of the United Kingdom, in places congenial to its growth *O. regalis* is found plentifully, and in such positions forms huge masses. *O. regalis* is the typical Flowering Fern, and in this country varies little in general appearance. Its rootstock is so covered with overlapping stalk-bases of former growths and by interlacing roots that the whole forms a massive, spongy clump of great thickness; and a peculiarity of this species resides in its sending out strong, blackish rootlets in great abundance, some of which creep in an upward direction between the scales, while others pierce directly through them, thus binding the whole together and giving it great strength and solidity. Most of the fronds, which are borne on firm, erect, naked stalks 1ft. to 1½ft. long, and are of variable length and more or less graceful habit, according to the position in which the plants grow, are barren and strictly bipinnate. When fertile they have their upper part transformed into a bipinnate, paniced mass of fructification formed of cylindrical leaflets. The barren leaflets, 6in. to 12in. long and 2in. to 4in. broad, are furnished with stalkless or short-stalked leaflets 1in. to 2in. long, ½in. to ¾in. broad, of a soft, papery texture, and of a full, herbaceous green colour. If grown in pots, the Royal Fern must have good drainage and an abundant and continuous supply of water. It is easy of cultivation, and may be readily propagated from spores, which germinate freely. *O. r. cristata* is a form differing essentially from the type in its totally distinct habit, in the size of its tasselled thick-textured fronds, and crested leaflets.

O. r. japonica corymbifera.

This very distinct and beautiful, Japanese Fern, of dwarf habit, is unquestionably the best *Osmunda* for decorative purposes, and especially for pot culture, yet introduced. The compact, dwarf habit of the plant, the distinct cristation of the leaflets, and the peculiar soft colour of the fronds, which makes a pleasing contrast to every other Fern, combine to give this *Osmunda* a unique character. This variety reproduces itself true from spores; although usually deciduous, it retains its foliage all the year when kept in a warm greenhouse.

O. Vachellii.

This is identical with *O. javanica*.

PELLÆA.

In habit of growth, as also in geographical distribution, the Cliff Brake Ferns, or Pellæas are closely allied to *Cheilanthes*, from which they differ principally through the continuous nature of their involucre. The distinguishing characters of the plants belonging to this genus reside in the disposition of the sori. These are within the margin, terminal on the veins, which in nearly all cases are free, at first dot-like or decurrent on the veins, but soon running into a line; also in the character of the involucre, which is formed of the more or less changed edge of the frond, quite continuous and sometimes very narrow. The genus includes *Allosorus*, *Cheiloplecton*, *Holcochlæna*, and *Platyloma*.

All the Pellæas are of small or medium dimensions, and are very useful for planting in rockeries or in small hanging baskets, in which positions they are much more effective than when grown in pots. They require but little soil, and a comparatively exposed situation suits them best. They flourish in a compost of a light and very porous nature, such as a mixture of two parts peat, one part loam, and one part silver sand, or, better still, pulverised old mortar, in which their thin, fibrous roots delight to run. Pellæas should not at any time be allowed to get dry at the roots; yet, on the other hand, their foliage should never be wetted. They prefer being kept close to the light, which is never too strong for them, provided they are sheltered from the direct rays of the sun. Most of the known species are readily propagated by spores, which are abundantly produced and germinate freely. Those species provided with running rhizomes may be propagated by division during March and April.

P. adiantoides.

In gardens, this vigorous, West Indian, greenhouse species, is extensively grown under the names of *Pteris adiantifolia*, *P. adiantoides*, and *P. latifolia*. The whole plant is of a particularly dark green colour, and its general appearance is that of a large form of *P. hastata*.

PELLÆA—*continued*.**P. alabamensis.**

Cheilanthes alabamensis (Kunze) is another name for this very pretty North American greenhouse species. The broadly egg-shaped fronds, borne on wiry, polished, blackish stalks 2in. to 4in. long, and covered at the base with fine woolly scales of a reddish-brown colour, are produced from a short-creeping and branched rootstock, which is covered with similar scales. They are 4in. to 8in. long, 1½in. to 2in. broad, bi- or tripinnatifid, and furnished with numerous leaflets of a somewhat leathery texture. The leaflets are closely placed, and cut down nearly to the midrib into numerous narrow-oblong segments, most of which are entire, but the lowest are sometimes again pinnatifid; they are naked on both surfaces, and the sori are covered by a rather broad involucre of a parchment-like texture.

P. Breweri.

A remarkably pretty, greenhouse Fern, native of North America. The delicate little fronds, 2in. to 3in. long, scarcely lin. broad, narrow-oblong, simply pinnate, borne on tufted, round, very fragile, chestnut-brown stalks 2in. to 3in. long, and chaffy only at the base, are produced from a short, stout, ascending rootstock, densely clothed with narrow, light brown scales. The leaflets are usually opposite, the upper ones egg-shaped, undivided and stalkless, the lower ones cleft down the centre nearly to the base into two unequal parts, of which the lower is the smaller, each the same shape as the upper leaflets, and not toothed or further divided, the larger part being about ½in. long and ¼in. broad. The fronds are of a thick but scarcely leathery texture, pale green, and naked on both surfaces. The sori, disposed in a continuous, marginal line, are covered by a broad, thin, and nearly transparent involucre.

P. calomelanos.

To the dark brown colour of its strong, tufted, upright, polished stalks, which are 4in. to 6in. long and slightly scaly towards the base, this beautiful greenhouse species owes its name. The fronds, 4in. to 8in. long and 3in. to 6in. broad, are somewhat deltoid, and twice or thrice divided to the midrib. The rigid, spreading leaflets are sometimes simply pinnate, but frequently are twice pinnate; their leaflets, borne on rigid, though slender, black, shining stalks, are ½in. to ¾in. each way, and vary in contour from blunt-heart-shaped to triangular-halbert-shaped, and, with the two sides often unequal at the base. The texture of the fronds is leathery, and they are smooth and of a lovely bluish-green in colour on both surfaces. The sori, disposed in

PELLÆA—*continued*.

a broad line along the margin of the leaflets, soon hide the narrow, thin, and transparent involucre. This species is a native of Cape Colony, Zambesi Land, &c.

P. cordata.

Mexico and the Andes of Peru are the habitat of this handsome greenhouse species. Its broadly spear-shaped fronds, 1ft. or more in length and 4in. to 6in. broad, are borne on strong, erect, straw-coloured stalks 6in. to 9in. long, polished, but clothed below with small, pale, spear-shaped scales when young. The leaflets, of the same shape as the fronds, are provided with a straight rachis, the lower ones being slightly branched at the base; their short-stalked segments, oblong or egg-shaped, rounded or heart-shaped at the base, $\frac{1}{2}$ in. to 1in. long, and half as broad, are of a somewhat leathery texture, and blunt at the extremity. The sori are disposed in broad, marginal lines, which soon hide the involucre.

P. c. flexuosa.

In gardens, this North American variety is usually found under the name of *Platyloma flexuosa*. The handsome fronds, produced from a rather slender rootstock clothed with narrow, brown scales, are borne on stalks several inches long, more or less furrowed along the front, gradually passing into a more or less zigzag stalk.

P. falcata.

This decorative, greenhouse species is found in Tropical Hindostan, the Malayan Peninsula, Australia, New Zealand, Tasmania, &c. The fronds, produced from a wide-creeping, slender, underground rhizome, and borne on strong, erect stalks 3in. to 6in. long, more or less hairy and scaly, are oblong-spear-shaped, 6in. to 18in. long, 1in. to 2in. broad, and only once divided to the midrib. They are formed of twelve to thirty or more pairs of stalkless, or nearly stalkless leaflets, $\frac{1}{2}$ in. to 1in. long and $\frac{1}{4}$ in. to $\frac{1}{2}$ in. broad, and usually a larger terminal one; all are spear-shaped or oblong-spear-shaped, usually terminating in a sharp point, and often slightly sickle-shaped, wedge-shaped, enlarged, or heart-shaped at the base; their texture is leathery, and their colour a dark, dull green above, paler beneath. The sori are disposed in a continuous, broad, marginal line extending from the base nearly to the summit of each fertile leaflet, and soon hide their narrow involucre.

P. hastata.

More generally found in gardens under the name of *Pteris hastata*, this highly-decorative, strong-growing,

PELLÆA—*continued.*

greenhouse Fern, has a somewhat extensive habitat, being found from Cape Colony northward to Natal, Zambesi Land, the Mascarene and the Cape de Verde Islands, and Abyssinia. The fronds, 1ft. to 2ft. long, are borne on wiry, erect, dark chestnut-brown, highly-polished stalks 6in. to 12in. long; they are oblong in shape and bi- or tripinnate, their leaflets varying from simply pinnate to copiously



Fig. 113. *Pellaea hastata*, a strong-growing and highly decorative species; barren fronds only are shown.

bipinnate. The leaflets, of a soft, papery texture and yellowish-green colour, are egg-shaped when barren, except the terminal ones, which usually are distinctly halbert-shaped and undulated on their margins: these characters are much more conspicuous when the plant is fertile (Fig. 113 shows barren fronds only). The fronds are smooth on both surfaces, and the sori, disposed in a continuous, marginal line, are provided with a somewhat narrow, thin involucre, nearly or quite hidden when the spores are ripe.

PELLÆA—*continued*.**P longimucronata.**

This is synonymous with *P. mucronata*.

P. mucronata.

This very pretty, North American, greenhouse species is also known under the names of *P. longimucronata* and *P. Wrightiana*. Its interesting fronds, deltoid and bipinnate, 3in. to 6in. long and 1in. to 3in. broad, are produced from a short, thick, knotted rootstock that is densely chaffy with very narrow scales of a dark brown colour, and are borne on strong, erect, dark brown, polished stalks 2in. to 4in. long. The leaflets of the barren fronds are almost stalkless, roundish or egg-shaped, rounded or even somewhat heart-shaped at the base, but provided with a minute, semi-transparent, sharp point, or mucro, at their extremity. Those of the fertile fronds are rolled in nearly to the midveins and therefore very narrow, often longer than the barren ones, curved upwards, and terminate in a sharp, mucronate point—hence the specific name. All are of a leathery texture and of a pale, glaucous-green colour on both surfaces. The sori are completely hidden by the broad, leathery involucre, which is permanently rolled over them.

P. ternifolia.

An interesting and pretty species, native of Tropical America. The very elegant, pendulous fronds, 6in. to 12in. long, 1in. to 1½in. broad, and borne on tufted, erect, dark chestnut-brown stalks 2in. to 4in. long, polished above, but densely scaly at the base, are narrow-spear-shaped, and have from six to twelve or more pairs of leaflets. These are always opposite, of a leathery texture, and beautiful glaucous-green in colour on each side; they are cleft down nearly to the base into three narrow, rigid segments, with inrolled edges, thus forming a sort of claw. The involucre is formed out of the edge of the frond, and remains rolled over the spores till they attain their full maturity.

P. Wrightiana.

Synonymous with *P. mucronata*.

PHEGOPTERIS. See **Polypodium.**

PHLEBODIUM. See **Polypodium.**

PHYMATODES. See **Polypodium.**

PLATYCERIUM.

Elk's Horn and Stag's Horn Ferns (*Platycerium*) constitute a small family, well marked, through the repeatedly-forked character of the fertile fronds of most of the species resembling Stag's Horns.

With the exception of *P. alcicorne*, which thrives best in an ordinary greenhouse temperature, all the *Platycteriums* require stove treatment. They succeed best and become most effective when planted in the fork of an ordinary tree-branch or in an artificial wall-pocket made of virgin cork. *P. alcicorne* also has a most pleasing appearance when grown as a basket plant, as its roots, which usually produce young plants on their surface, soon make a perfect ball, imparting a singular effect, growing as it does in all directions—sideways, head downwards, &c.—with equal vigour. The compost which suits them best is a mixture, in about equal parts, of rough, fibrous peat and sphagnum. The plants are particularly fond of strong light, and should receive water at the roots with moderation. The best way to keep them in good condition in that respect is to soak them thoroughly, and then to wait until the foliage begins to droop and to present a soft, withered aspect before soaking them again. *Platycteriums* are usually propagated by means of young plants produced from the adventitious buds on their roots. *P. grande*, however, has never been known to produce any, and consequently it must be propagated by means of spores; this method, though somewhat slow, is also resorted to for other species when required in great quantities.

P. alcicorne.

Although the commonest species of the genus, this is an extremely interesting Fern, found growing on branches of trees in Australia, Java, the East Indies, Madagascar, and Peru. It is of easy culture, thriving equally well in the greenhouse, the cool conservatory, or the stove. Of all known *Platycteriums*, it is the one which grows the quickest and which is the most easily propagated from the young plants produced on its roots. Its barren fronds are rounded and convex, with edges waved and lobes spreading, and are downy when young. The fertile fronds are 2ft. to 3ft. long, clustered, of a somewhat upright habit, twice or thrice forked, and of a thick, leathery texture; their strap-shaped and bluntish ultimate divisions have the fructification disposed in the last forks and at their base in very irregular patches, and the under-surface is covered with a thin, cottony down. In the variety *majus*, which requires

PLATYCERIUM—*continued.*

a warmer temperature than the species, the foliage is much larger and the entire plant shows a much more robust habit. (Fig. 114, for which we are indebted to Messrs. James Veitch and Sons). There is also a seedling variety *Mayii*, that emanated from Mr. H. B. May's collection. Its segments are wider than those of the type, and the divisions are longer.



Fig. 114. *Platycerium alaicorne majus*, an Australian variety with much larger fronds, and of more robust habit than the type.

P. grande.

A magnificent stove species, a native of North Australia, Singapore, and the Philippines. The barren fronds, which are very large, stalkless, nearly round, and ascending, have their upper portion divided into a number of broad, blunt segments of a spongy texture and pale green colour, covered when young with a light, woolly substance, which gradually disappears as the frond becomes mature. The fertile fronds, 4ft. to 6ft. long and of a pendulous nature, are usually produced in pairs and provided with a broadly wedge-shaped disk: this becomes completely covered with the fructification, which forms a large triangular patch, and it bears at each corner a repeatedly-forked division extending a good distance beyond it, but always remaining barren.

PLATYCERIUM—*continued*.**P. Hillii.**

This very handsome Queensland Fern is very closely related to *P. alcicorne majus*—so much so that, until the plants attain their full development, it is very difficult to distinguish one from the other. The repeated forking of the frond divisions differentiate it from *majus*; while it is altogether stiffer in habit.

PLATYLOMA. See *Pellæa*.

PLEOCNEMIA. See *Nephrodium*.

PLEOPELTIS. See *Polypodium*.

PLEURIDIUM. See *Polypodium*.

POLYBOTRYA. See *Acrostichum*.

POLYPODIUM.

An exceedingly large genus—the most extensive, in fact, of the Natural Order *Filices*. As now understood, it comprises *Campyloneuron*, *Cyrtomiphlebium*, *Dictyopteris*, *Dipteris*, *Drynaria*, *Eupolypodium*, *Goniophlebium*, *Goniopteris*, *Grammitis*, *Niphobolus*, *Phegopteris*, *Phlebodium*, *Phymatodes*, *Pleopeltis*, and *Pleuridium*.

The Polypodiums, both British and exotic, are of two different structures and of various habits. A small proportion of them, such as our common "Oak" and "Beech" Ferns (*P. Dryopteris* and *P. Phegopteris*), are deciduous, and provided with slender rhizomes which delight in running underground, especially in partly-decayed vegetable matter; the foliage of these species, as a rule, is of a soft, papery texture. The majority of them, however, are of an evergreen nature, having fronds of a somewhat leathery texture, produced from rhizomes which prefer being kept above or close to the surface of the ground. Those species which are provided with underground rhizomes may be either grown in pots or planted in any part of the stove, the cool Fernery, or the outdoor rockery, according to their native habitats; and for these, a mixture composed of two parts fibrous loam, one part leaf mould, and one part sharp silver sand, answers all requirements. This treatment also applies to the species

in which the fronds are produced from a single crown. The epiphytal species (those provided with rhizomes of a thickness varying from that of a quill pen to that of a man's thumb), which do not burrow, but keep near, or even on, the surface of the soil, require good fibrous peat, or, better still, half-decayed leaf mould, in which silver sand is not needed, but to which a fourth part of fibrous loam may be added to give it cohesion. Whether grown in pots or planted in the rockery, these species should have good drainage and comparatively shallow pots or pockets. The epiphytal species are particularly adapted for covering Tree-Fern stems and for growing in hanging baskets, in which positions their rambling habit is shown to great advantage.

P. aureum and its varieties are among the most popular of all the species. The value of these Ferns for decorative purposes is sufficiently attested by the fact that thousands of them annually find their way to Covent Garden Market; some growers, indeed, make quite a speciality of them, as much on account of their rapid growth as because of their distinct habit. Although the fronds have a natural tendency to be produced from a single rhizome, the plants may, by judicious treatment, be rendered useful as pot subjects. To obviate this mode of growth, the extremity of the rhizome is entirely cut off when only about 2in. long, the result of that operation being the production of several lateral rhizomes growing out of the mutilated one in all directions, thus making bushy and compact plants. Being evergreen and strong growers, *P. aureum* and its varieties require substantial food; a mixture consisting of about equal proportions of fibrous peat, loam, and silver sand suits them best. They must also receive a liberal supply of water at the roots while growing, as well as occasional waterings with weak liquid manure.

The majority of Polypodiums are propagated by division of their rhizomes, which operation may be carried out at almost any time of the year; but a few species grown extensively for decorative purposes

are more rapidly propagated by means of their spores, which are abundantly produced, germinate freely, and produce better-shaped plants than those obtained from division of the rhizomes.

P. aureum.

This deservedly popular species, which thrives equally well under either greenhouse or stove treatment, is common in the West Indies, and in South America as far as Brazil, &c. It is a strong-growing, bold species, and, owing to the glaucous tint of its massive foliage, conspicuous. In very young plants the fronds are simple or three-lobed, but in fully-developed specimens they are 3ft. to 5ft. long and 9in. to 18in. broad, and are composed of a long, narrow-spear-shaped terminal leaflet, and of a variable number—from five to fifteen—of horizontal, entire, but undulated leaflets, 4in. to 9in. long, about 1in. broad, and separated from each other by more or less rounded and open sinuses, leaving a wing or border of about $\frac{1}{2}$ in. along each side of the rachis. The lowest two leaflets are sometimes distinctly separated from the rest and are usually slightly decurved. The popular appellation of "Golden Polypody," may be derived from the shining nature and bright brown colour of the scales with which the older portions of its rhizomes are covered, or it may be due to the intense golden colour of the under-side of its fertile fronds, which is produced by the presence of the enormous quantity of spore masses, disposed irregularly in one, two, or three series, and from which, when ripe, a most profuse, fine, bright yellow powder escapes, and covers the upper surface of the fronds that are beneath them. There are in commerce three plants closely related to *P. aureum*. These are: *P. a. areolatum*, *P. a. pulvinatum*, and *P. a. sporocarpium*. The last, commonly met with in gardens under the name of *P. glaucum*, is certainly the handsomest of the group to which it belongs, being of a bluish tint not even approached by any of the others.

P. Billardieri.

This very useful and highly-ornamental, greenhouse species, native of New Zealand, Australia, Tasmania, &c., is provided with wide-creeping rhizomes of a woody nature, densely clothed with dark-coloured and glossy scales, from which the fronds are produced. These fronds usually stand upright, and are borne on firm, erect, glossy stalks 4in. to 8in. long; they vary in shape from oblong-spear-shaped and quite entire, to 1½ft. long and half as broad and deeply pinnatifid. In young or freshly-divided plants the simple fronds predominate, whilst in old-established ones they are

POLYPODIUM—*continued.*

nearly all pinnatifid, being composed of narrow-spear-shaped leaflets of a leathery texture, deep green in colour and naked on both sides. The large, round sori are disposed in single rows close to the midvein, and are so distinctly immersed in the frond as to form protuberances on the upper side. This species is a particularly shallow-rooting plant; it flourishes best in a flower-pan, in a mixture in which fibrous peat predominates.

P. Catharinæ.

An easily-cultivated, evergreen, stove species, a native of Brazil. Its simply-pinnate fronds, 6in. to 12in. long and 3in. to 5in. broad, are produced from a wide-creeping rhizome clothed with dark brown, spreading scales, and borne on erect, naked stalks 4in. to 6in. long and of a glossy nature. The texture of their leaflets, which are 1½in. to 3in. long and ¼in. to ½in. broad, is somewhat leathery, and their colour is dark, dull green. The large, round sori are disposed in single rows close to the midrib. *P. Catharinæ* of gardens is synonymous with *P. loriceum latipes*.

P. chnoodes.

For growing in hanging baskets, this West Indian and Venezuelan stove species, of drooping habit, is very useful. Its elegant fronds, 1ft. to 2ft. long and 4in. to 9in. broad, are cut down to the rachis, into distinct, sickle-shaped, opposite leaflets 2in. to 4in. long, ½in. to ¾in. broad, heart-shaped at the base, of a soft, papery texture, light green in colour, and finely hairy on both surfaces. They are produced from a stout rhizome densely clothed with soft, spreading scales of a dull brown colour, and borne on erect, slender, naked stalks 4in. to 6in. long. The spore masses are disposed in two series on each side of the main veins. This species was once known as *P. dissimile*.

P. conjugatum.

From Queensland comes this handsome species, which has long pinnately-divided, shining, lance-shaped fronds, springing from a stout creeping rhizome. The leaflets are alternate and lanceolate, with wavy margins. The sori, which are borne in two rows, between each of the primary veins extend from the midrib to the margin. A favourite exhibition plant.

P. coronans.

Synonymous with *P. Heracleum*.

P. cuspidatum.

Synonymous with *P. persicæfolium*.

POLYPODIUM—*continued*.**P. dissimile.**

Synonymous with *P. chnoodes*.

P. drepanum.

A very handsome, greenhouse species, native of Madeira, with fronds 1½ft. to 3ft. long, 8in. to 12in. broad, produced from a short, upright stem, and borne on tufted stalks, which are 1ft. to 1½ft. long and densely clothed with dark-coloured scales at their base. The lowest leaflets, which are also the largest, often measure 8in. in length and 3in. in breadth; the leaflets are spear-shaped, unequal-sided, conspicuously-eared on the upper side, and truncate on the lower side at the base, with a broad, uncut centre and numerous teeth. The fronds are of a leathery texture, with both sides nearly naked. The very prominent and abundant sori are disposed irregularly in rows on each side of the midvein, and eventually become confluent.

P. Dryopteris.

This exceedingly pretty, dwarf-growing, hardy species, popularly known as the Oak Fern, has a most extensive range of habitat—Northern India, the Western Himalayas, Manchuria, Japan, &c. Of the four native Polypodies with deciduous foliage, *P. Dryopteris* is undoubtedly the one most generally known and most deservedly appreciated. On account of the peculiarly bright pea-green colour of its fronds, and of its close and compact habit, it is much admired and frequently used for forming in the hardy Fernery edges which, all through the summer, possess a freshness looked for in vain among all other Ferns of dwarf habit. These fronds, produced from a wide-creeping rhizome of a very slender nature, and borne on slender stalks 6in. to 12in. long, naked upwards and slightly scaly below, are deltoid, and generally measure from 6in. to 10in. each way. Their lower leaflets are much the largest (Fig. 28), and the spear-shaped leaflets are slightly notched. They are of a soft, papery texture and smooth on both surfaces. The abundant but minute sori, of a light brown colour, are scattered over the whole under-side of the frond. A peculiarity noticeable in this species consists in the development of the fronds, the rolled-up leaflets of which, in a young state, resemble three small balls or green peas placed on wires. In planting the Oak Fern, a spot where moisture and shade can always be depended upon should, if possible, be selected, and a shallow bed made of a compost of two parts of fibrous peat, one part of leaf mould, and a free admixture of silver sand, or, better still, of broken sandstone. If grown in pots for a cool frame or for the greenhouse,

POLYPODIUM—*continued*.

where it makes most pleasing objects, the above mixture will be found equally suitable; but in either case avoid putting in too much soil; a depth of 3in. to 4in. is quite sufficient. It is also indispensable that thorough drainage should be secured, for water remaining stagnant about its roots is very injurious to *P. Dryopteris*. In planting, great care must also be taken to prevent the rhizomes from being buried too deeply, in which case they seldom grow; they must be kept only just below the surface of the soil, through



Fig. 115. Polypodium Heracleum, one of the most distinctive of all Polypodies.

which it is advisable to allow the tips to protrude. Planting should take place about April, and a moderate watering must follow, after which the soil requires to be kept constantly moist. Although totally deprived of foliage during four or five months of the year, the Oak Fern should never be allowed to get dry at the roots, for the rhizomes soon shrivel up and the spring growth then only produces small or deformed fronds, as the plants are much weakened. It is also advisable to give pot specimens a slight covering during the winter, though they do not require this attention when planted out. This species, readily increased by division, does not appear to have produced any constant variations; though several more or less curious forms of it have from time to time been noticed.

POLYPODIUM—*continued.***P. Heracleum.**

This really magnificent, large-growing, stove species, native of Java and of the Philippines, is the *P. coronans* of gardens, but not of Wallich; it is also frequently found under the name of *P. morbillosum*. Its stalkless fronds, 3ft. to 6ft. long and 2ft. or more in breadth, are usually disposed in a crown (Fig. 115), and are produced from a stout, short-creeping rhizome of a woody nature, clothed with long, silky scales of a bright brown colour, except near the extreme end, where they are whitish. These fronds, which are deeply pinnatifid, are of a light green colour and of a stiff, harsh texture; their upper surface is covered with minute, short, whitish hairs, while the midrib of the frond is crowded with brown hairs, especially near the base, where they are longer. The small sori are irregularly scattered over the whole of the under-surface.

P. irioides ramo-cristatum.

Queensland again is the home of this decorative, much admired, robust-growing variety, which differs from the type in having the tips of the leathery fronds lobed, some of them having as many as a dozen segments. The fronds are of a bright green colour.

P. Meyenianum.

In gardens this stove species, popularly known as the "Bear's-paw Fern," is as ornamental as it is distinct. It is a native of the Philippine Islands, where it is said to grow on branches of trees. It is provided with a rhizome of a particularly stout nature, and densely clothed with narrow, crisped scales $\frac{1}{2}$ in. long and of a bright rusty-brown colour. From these singular-looking rhizomes are produced fronds 2ft. to 3ft. long and 8in. to 12in. broad; their lower part is cut down nearly to the midrib into oblong, blunt, entire lobes, while their upper portion is furnished with numerous close leaflets 4in. to 6in. long. The fertile part of the frond, which usually extends about one-third of its length, bears a bright yellow spore mass, the fructification hanging out so prominently that it gives the plant quite the appearance of what is commonly called a "flowering Fern" (Fig. 116). In gardens this curious and beautiful species is sometimes met with under the names of *Aglaomorpha Meyeniana* and of *Drynaria philippinense*. As a rule, the Bear's-paw Fern is a difficult plant to manage in pots, but it thrives apace when treated like a *Platynerium*—grown either on a stump, in a shallow pan, or in a hanging basket. Care should be taken not to bury its

POLYPODIUM—*continued.*

rhizomes. The soil should be pure fibrous peat, on which the rhizomes should at first be pegged down, free scope being allowed for their extension.



Fig. 116. The Bear's-Paw Fern, *Polypodium Meyenianum*, one of the handsomest of all the Polypodies, and by reason of the way the fructification stands out, the species is referred to as a Flowering Fern.

P. morbillosum.

Synonymous with *P. Heraclium.*

P. musæfolium.

The fronds of this massive-growing, stove species, native of the Malayan Islands, are rendered very handsome

POLYPODIUM—*continued.*

by their conspicuous venation; they are produced from a woody rhizome clothed with egg-shaped scales of a dull brown colour, and are from 1ft. to 3ft. long, 3in. to 4in. broad, and stalkless. The lower part of the fronds is broadly winged to the very base; their extremity is sometimes sharp-pointed, but more generally bluntish; they are mostly simple, though occasionally pinnatifid or deeply lobed and crowded together, of a leathery texture, and pale green in colour. The very numerous dark, reticulated veins terminate before they reach the edge of the fronds. The small and very abundant sori sometimes cover the whole of the under-surface, upon which they are irregularly scattered. In gardens this species is frequently confounded with *P. Heracleum*.

P. pectinatum.

One of the prettiest stove species in cultivation, this Fern is also known as *P. Wageneri*. It is a native of the West Indies, Mexico, Brazil, &c. The usual dimensions of the fronds, which are produced from a stout, scaly, underground rhizome, are 1ft. to 2ft. in length and 2in. to 6in. in breadth; they are cut to the rachis into numerous closely-set, horizontal, entire leaflets, 1in. to 3in. long, of a soft, papery texture, and of a deep, dark green colour. The rich yellowish-brown sori are disposed in long rows, midway between the midrib and the edge.

P. persicæfolium.

This handsome, strong-growing, stove species, native of Java, is the *P. cuspidatum* of Blume. It closely resembles the better-known *P. subauriculatum*, from which it is readily distinguished by the leaflets being narrowed at the base and the lower ones distinctly stalked. The abundant and prominent spore masses are distinctly immersed.

P. Phegopteris.

This handsome and interesting, hardy species, botanically known as *Phegopteris polypodioides*, is the common "Beech Fern," a species with a range of habitat extending from Iceland and Lapland to Japan, Etruria, and Greece, and from Greenland southward to the United States of America. It is difficult to understand why this Fern should bear a popular appellation so singularly inapplicable, for the name has no reference to either its shape or its haunts. The fronds are 6in. to 9in. long, 4in. to 6in. broad, and somewhat deltoid in shape; they are borne on slender, naked stalks 6in. to 9in. long, and are cut down nearly to the rachis into close, blunt, entire or slightly-toothed lobes. The lowest or basal pair of lobes of each frond are suddenly

POLYPODIUM—*continued.*

deflexed. The texture is soft and papery, and the underside of all the leafy portion is slightly hairy. The sori are disposed nearer the edge than the midrib. Like the Oak Fern, the species under notice may with advantage be planted out in the open fernery or grown in pots, and the compost recommended for that pretty species is equally



Fig. 117. Polypodium Phegopteris multifidum, a beautiful variety having the fronds irregularly multifid.

suitable for the Beech Fern, but a greater depth—about 6in.—must be allowed, as it roots much deeper into the ground. Care must also be taken not to bury the rhizomes deeply, but to keep them barely below the surface of the ground. A moist, shady place is indispensable, as the plant is particularly partial to an abundant and constant supply of water, and to frequent syringings during the growing season. When cultivated in pots in a cool house, the

POLYPODIUM—*continued.*

Beech Fern is nearly evergreen, as its old fronds, though discoloured and generally broken at the base, remain on the plants almost until the new ones make their appearance. There is a variety, *multifidum*, that differs from the type in being irregularly multifid. Fig. 117.

P. pustulatum.

A distinct and very useful, greenhouse species, native of Australia and New Zealand. Its singular fronds, produced in great abundance from a copiously-branched, wide-creeping rhizome of a woody nature and covered with narrow, dark brown scales, are borne on stalks 1in. to 3in. long. They vary in shape from entire, 3in. to 9in. long, $\frac{1}{4}$ in to $\frac{3}{4}$ in. broad, and narrowed to both ends, to 1ft. to 1 $\frac{1}{2}$ ft. long, 3in. to 4in. broad, and cut down to a broadly-winged rachis throughout into spear-shaped lobes. These fronds are of a papery texture, dark green in colour, with beautifully-marked veins darker still, and smooth on both sides. The conspicuous circular spore masses are disposed in a single series along the margin of the lobes, and distinctly immersed. This plant is of easy culture; it is well adapted for growing in dark places where hardly any other Fern would thrive, and for planting in such positions on stones or rock-work, which it rapidly covers and to which it clings with a remarkable tenacity.

P. refractum.

This very handsome, stove species, native of Brazil, produces from an upright-growing rootstock its pinnate fronds, about 1ft. long, 6in. broad, and furnished with spear-shaped leaflets. These leaflets are eared on both sides at the base, sinuated on their edges, of a stiff texture, and glossy on both sides, the lower ones being conspicuously deflexed. The abundant minute, black spore masses are irregularly scattered over the whole of their under-side.

P. Reinwardtii.

This is synonymous with *P. sub-auriculatum*.

P. Schneiderii.

Fern-lovers consider this the most striking and at the same time the most interesting hybrid artificially raised. It originated among some seedlings of *P. aureum* and *P. vulgare elegantissimum*, the spores of which had been purposely sown together. While in a young state the offspring showed very little difference from *P. aureum*, but its fronds, at first entire and conspicuously undulated, became more and more divided, and on the same plant one could at one time see fronds entirely similar to *P. aureum*, and others

POLYPODIUM—*continued*.

partaking to a great extent of the divided character peculiar to *P. v. elegantissimum*. As the plant increased in age and in size, the cutting of its fronds also became more distinct, for, while they retained the glaucous colour of those of *P. aureum*, and were produced from a similarly thick, fleshy rhizome clothed with silvery scales, they were divided quite as much as those of *P. v. elegantissimum*, and eventually became of a broader and more triangular shape, their leafy portion measuring 9in. each way.

P. sub-auriculatum.

This stove species, native of Malaysia and the Philippine Islands, is probably one of the best-known and most extensively cultivated of the whole genus. It is a very useful and decorative plant, and as a basket Fern for the warm house it has hardly any equal, its graceful fronds, which are produced from a wide-creeping rhizome clothed with small, dull-coloured scales, attaining 8ft. to 10ft. or more in length and 8in. to 12in. in breadth. They are borne on firm, naked stalks 6in. to 12in. long and of a glossy nature; their leaflets, 4in. to 6in. long and $\frac{1}{2}$ in. to 1in. broad, are slightly toothed in young plants, whereas in older specimens the fronds have their leaflets set farther apart and narrower, with smooth edges, rounded or even eared at the base. The sori, as in several other species, are immersed in the leaflets, forming little protuberances on their upper surface. *P. Reinwardtii* is synonymous with this species. *P. subauriculatum* can advantageously be utilised for covering dead trunks of Tree Ferns; in such positions it makes a very beautiful object, and grows apace, as it delights in sending its roots and rhizomes into partly-decayed vegetable matter. In the centre of a warm conservatory it makes a Fern surpassing all others in elegance, and where there is plenty of height to allow the fronds space to hang, a specimen with numberless fronds 10ft. to 12ft. long is a sight not easily forgotten. If grown in a basket, it will derive great benefit from a small portion of chopped sphagnum added to the mixture of the soil, and will stand a fair amount of strong light.

P. trichodes.

In general appearance this magnificent, delicate-looking, greenhouse species is not unlike a gigantic *Asplenium* (*Athyrium*) *Filix-fœmina*.

P. verrucosum.

A really magnificent, stove species, of large dimensions, native of Malaysia and the Philippine Islands. Its distinctly-pinnate fronds, 3ft. to 4ft. long and 1ft. broad, are

POLYPODIUM—*continued.*

borne on firm, erect, naked stalks, $1\frac{1}{2}$ ft. to 2ft. long, and are of a slender, pendulous habit; they are furnished with numerous leaflets 6in. to 8in. long, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, quite entire, and slightly hairy on both sides. The spore masses, disposed in one regular row on each side of the midrib, are prominent, and, being deeply immersed, form distinct protuberances on the upper surface of the frond.

P. vulgare.

Of the five Polypodies recognised as British, *P. vulgare*, known as the Common Polypody, is the only ever-green one; it is as highly ornamental in midwinter as at any other time of the year. It is one of the oldset Ferns accepted as truly British. Although the dimensions of the fronds of *P. vulgare* are greatly influenced by the situation in which it grows, it may be stated generally that they vary from 6in. to 12in. in length, and from 3in. to 6in. in breadth, that they are borne on firm, erect stalks 2in. to 4in. long, and that they are cut down nearly or quite to the rachis into close, entire or slightly toothed, usually blunt leaflets of a soft, papery, or sometimes stiffer texture and naked on both sides. It is most useful for adorning the hardy rockery, as well as being extremely decorative for cultivation out of doors, the Common Polypody and its several varieties are well

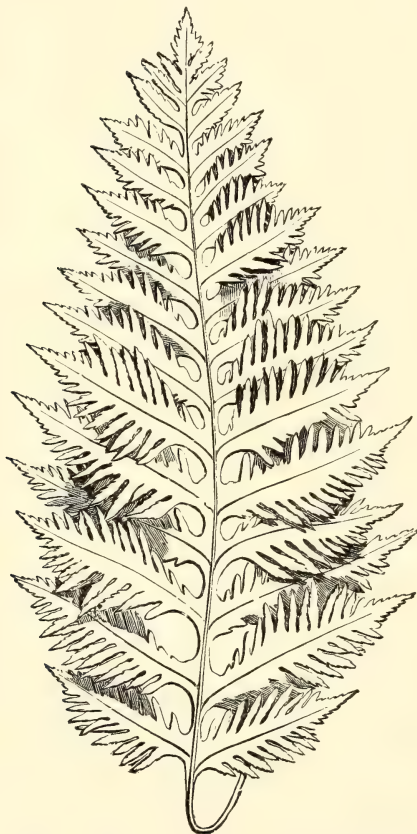


Fig. 118. Frond of the beautiful Welsh Polypody, *Polypodium vulgare cambricum*.

adapted for the ornamentation of the cool fernery under glass, where they may be used with great advantage and effect. *P. vulgare* varies to such an extent that to give even a selection would occupy too much space. Those interested will find them described in works dealing with British Ferns. Moreover, in all the more important

POLYPODIUM—*continued*.

lists issued by such specialists as Birkenhead, May, Veitch and Sons, and Bull, the chief variations from the type are recorded, with their distinctive features. No collection, however, having any pretension to be classed as representative should omit the Welsh Polypody, *P. v. cambricum*. It is rightly regarded as one of the most beautiful Ferns in cultivation. It is the true plumose form of the species, is of a dense and very pleasing habit, and is constantly barren. Its beautiful fronds (Fig. 118), which are much thinner and more delicate in texture than those of the normal plant, attain sometimes 1½ft. in length, and often measure 5in. in breadth. Although quite hardy, it makes a splendid pot plant when grown in the cold frame or in the greenhouse, the pleasing pale green colour of its foliage being particularly attractive among other Ferns.

P. Wageneri.

A synonym of *A. pectinatum*.

POLYSTICHUM. See *Aspidium*.

PSEUDATHYRIUM. See *Polypodium*.

PTERIS.

The genus *Pteris* (the Bracken or Brake), besides comprising the hardy British species *P. aquilina* and its varieties, includes numerous stove and greenhouse exotic species exhibiting very extensive variation. It includes *Amphiblestra*, *Camp-teris*, *Doryopteris*, *Eupteris*, *Heterophlebium*, *Litobrochia*, and *Pasia*.

Pterises generally require greenhouse treatment, though there are a few that will succeed under stove treatment only. They are not fastidious as regards soil; and a mixture of two parts peat, one part loam, and one part sand suits most of them. The majority of them thrive as well in a place exposed to strong light as in a shady one, but this does not apply to *P. quadriaurita argyræa*, *P. cretica albo-lineata*, *P. aspericaulis tricolor*, and *P. ensiformis Victoriae*, all of which need a subdued light, otherwise they have a stunted and burnt appearance. With the exception of a few species provided with creeping rhizomes, and which may be propagated by division, all Pterises are readily increased from spores, which are abundantly produced and germinate very freely.

PTERIS—*continued.***P. adiantoides** (*adiantifolia* of some authors).

Synonymous with *Pellaea adiantoides*.

P. argyræa.

The very popular Fern thus listed is a form of *P. quadriaurita*.



Fig. 119. *Pteris aspericaulis tricolor*, one of the finest of all Ferns, its fronds being a combination of green, white, and red.

P. aspericaulis.

A very handsome, stove Fern, of dwarf and compact habit, native of India. From an upright rootstock it yields fronds $1\frac{1}{2}$ ft. long and of a smooth, glossy nature. These are composed of one terminal and two or three pairs of lateral

PTERIS—*continued*.

leaflets, the lowest pair being usually divided into two parts; they are almost stalkless and opposite, deeply cleft or even pinnate, with narrow, sickle-shaped, rather blunt leaflets, slightly toothed at the edges and minutely white-dotted beneath. The spore masses are disposed chiefly on the middle parts of the leaflets. As the specific name implies, the stalks are rough; the leafy portion of the fronds is very attractive, being bright claret when quite young, turning to a bronzy, metallic hue, and subsequently to a bright green. The Malaysia variety, *P. a. tricolor*, is one of the most charming Ferns ever introduced, being graceful in habit, of medium dimensions, and splendidly variegated with green, white, and red. Fig. 119.

P. Bausei.

One of the most striking of all the known garden hybrids, clearly showing the distinctive characters of the parents from which it was produced. These are stated to be *P. semipinnata* and a crested form of *P. serrulata*. In habit, size, and formation of fronds, it is intermediate between the two. The very compact habit of this Fern, which retains its foliage for a lengthened period, renders it a most useful decorative plant for the warm conservatory and intermediate house. For several years this Fern was considered barren. Its fertile character was, however, proved by Mons. Arthur van den Heede, of Ghent.

P. cretica.

Deservedly one of the most useful Ferns for decorative purposes, and the few varieties which have been produced through cultivation are all worthy of special attention. It is a greenhouse species, native of Crete, Corsica, Italy, Abyssinia, Bourbon, Natal, Cape Colony, &c. Its fronds, 6in. to 12in. long and 4in. to 8in. broad, are borne on erect, wiry stalks 6in. to 12in. long. The lateral leaflets are broadest and finely toothed when barren; the lower pairs are often cleft nearly to the base into two or three narrow leaflets. They are of a somewhat leathery texture and naked on both surfaces, and the involucre is of a pale colour and of a parchment-like texture. Of the varieties produced, the more noteworthy are *P. c. albo-lineata* (Fig. 6, p. 9), *P. c. Mayii*, *P. c. nobilis*, *P. c. Ouvrardii*, and *P. c. Wimsetti*. The first two are remarkably handsome variegated Ferns.

P. elegans.

A garden name for *P. nobilis*.

P. ensiformis Victoriae.

This variety, which is exactly the same plant as *P. e. variegata* of Moore, previously introduced, is a remarkably

PTERIS—*continued.*

slender and graceful form, producing two entirely distinct sorts of fronds, the barren ones being small and prostrate, while the fertile ones, upright and abundant, are $1\frac{1}{4}$ ft. to $1\frac{1}{2}$ ft. long, composed of narrow leaflets about $\frac{1}{6}$ in. broad, and beautifully variegated throughout. Although this elegant Fern reproduces itself very freely from spores, some of the seedlings are thoroughly distinct. Among these we may particularly note *reginæ*, which has the variegation running in narrow stripes to the margins of the leaflets, and is of more vigorous growth; and *cristata*, a form with very prettily and regularly crested fronds, which are also beautifully and distinctly variegated.

P. hastata.

Synonymous with *Pellæa hastata*.

P. longifolia.

This deservedly popular, greenhouse species, particularly useful on account of its decorative qualities and easy culture, is found wild in tropical and warm temperate regions all round the world. Its broadly spear-shaped fronds are simply pinnate, 1ft. to 2ft. long, and 6in. to 9in. broad; they are borne on stout, upright stalks 6in. to 12in. long and more or less densely clothed in their lower part with narrow scales of a pale brown colour. The stalkless leaflets, 3in. to 6in. long and seldom more than $\frac{1}{2}$ in. broad, are sometimes slightly eared at the base; they are of a somewhat leathery texture and naked and dark green on both surfaces. The sori fall short of the points of the leaflets, and are covered by an involucre of parchment-like texture and of a yellowish-brown colour. Although hundreds of thousands of this species are annually grown for market, no variation has ever been found amongst them. *P. l. Mariessii*, however, is an exceedingly pretty variety, found growing wild by Mr. Ch. Mariès in Penang, is remarkable for the elegance of its fronds, which, like those of the species, are simply pinnate, and for its habit, which is compact, yet very graceful. Moreover, it comes perfectly true from spores, which are very freely produced.

P. nobilis.

This very handsome, stove species, also known in gardens under the names of *P. elegans* and *Litobrochia grandis*, is a native of Southern Brazil. Its fronds, borne on naked, wiry stalks 1ft. or more in length, vary considerably as regards both size and shape, according to the age of the plant. In its young state it produces only single, heart-shaped fronds; but those eventually produced are halbert-shaped, and finally somewhat palmate in form, with the

PTERIS—*continued*.

terminal and the upper lateral leaflets entire, and the lower lateral ones divided into two or four spear-shaped leaflets on their lower side. It then forms a beautiful object, as the fronds, thick and of a very leathery texture, are of a bright green colour, and their centre, as well as that of their leaflets and leaflets, is ornamented with a broad band of white, more intense in the middle and gradually fading towards the edges. The spore masses form a continuous line extending from the base to the tip of the divisions.

P. quadriaurita.

This species, which thrives in the cool and the warm house alike, possess a very wide range of habitat, and is accordingly very variable in habit and in dimensions. It is found all round the world within the Tropics, and a little beyond them. Its fronds vary from 6in. to 2ft. or 3ft. in length and from 4in. to 12in. in breadth; they are borne on naked or slightly rough, straw-coloured stalks usually 1ft. to 2ft. long, and consist of a terminal leaflet cut down nearly to the rachis into numerous close, parallel, narrow-oblong lobes, and of several pairs of lateral leaflets 6in. to 12in. or more in length, the lowest usually compound, with one or two similar but smaller leaflets branching from them at the base on the lower side. The texture of the fronds is somewhat leathery, and they are naked on both surfaces. The sori are often continuous along the whole margin of the segments.

P. q. argyræa.

A very handsome and deservedly popular Fern, introduced from Central India. Its fronds, including the stalks, often attain 4½ft. or 5ft. in length and 2½ft. in breadth. The leaflets, which end in a tail-like point, and their leaflets, which are usually blunt, are regularly adorned in their centre with a broad band of purest white, which forms a most pleasing contrast with the bright green colour of the other parts of the plant.

P. scaberula.

This exceedingly pretty, compact-growing, greenhouse species, native of New Zealand, is much more like a finely-cut *Davallia* than a *Pteris*. The plant is provided with wide-creeping rhizomes of a wiry nature, from which its spear-shaped and finely-divided fronds, borne on somewhat rough stalks 6in. to 12in. long, are produced.

P. serrulata.

Probably this is the commonest and best-known species in the genus, as it is also the most useful for decorative purposes. It is a greenhouse Fern of the easiest culture.

PTERIS—*continued*.

and is a native of China, where it is very common; it has also been received from Japan, &c. Its slender fronds, 9in. to 18in. long and 6in. to 9in. broad, are borne on naked,



Fig. 120. A beautifully crested variety of the very popular *Pteris serrulata*.

pale brownish stalks 6in. to 9in. long, and of a wiry nature. Their main rachis is margined with a wing which grows gradually narrower downwards, and forms the terminal leaflet at the summit of the frond. The lateral leaflets are disposed in six or more pairs, usually, but not regularly,

PTERIS—*continued*.

opposite; the upper ones are simple and 4in. to 6in. long, while the lower ones are provided with several long, narrow leaflets on each side; the edge of the barren ones is conspicuously saw-toothed, and the fertile ones show a narrow involucre of a parchment-like texture covering the spore masses. *Pteris serrulata* is extremely variable, and through its variations it is brought into close connection with *P. cretica*. Cristation is the form of variation which, as a rule, is most noticeable. *P. s. cristata* is a variety whose fronds, instead of being lengthened into a terminal leaflet, have a more or less rounded form, produced through the cristation of the leaflets, which appear to be all of nearly equal length. The original *P. s. cristata* is of upright habit (Fig. 120), but many seedlings raised from it have a more or less drooping character. Other fine forms are *P. s. gloriosa* (with a fan-like crest), *P. s. gracilis*, and *P. s. undulata*.

P. tremula.

This strong-growing, greenhouse species, commonly called the "Australian Bracken," has become a very popular Fern. Its ample fronds, 2ft. to 4ft. long and quite 2ft. broad, are borne on strong, upright, naked, bright chestnut-brown stalks 1ft. to 2ft. long. Besides the terminal leaflet, which consists of a few closely-placed, entire lobes, there are, according to the size of the fronds, from four to six pairs of lateral leaflets. The upper leaflets are simply pinnate, with entire leaflets on each side, the largest being about 6in. long and more than 1in. broad; the lower ones are often very compound, sometimes 1ft. long, and twice divided to the midrib. The fronds are of a soft, papery texture, bright green in colour, and naked on both sides. The abundant spore masses are of a pronounced reddish-brown colour, and sometimes fill up the whole of the leaflets except the midrib. There are numerous varieties, but none that call for special notice. *P. t. elegans* is a light and elegant crested form of drooping habit, smaller than the type; *P. t. Smitheana*, another fine crested form, very compact; and *P. t. Variegata* has its pinnæ variegated with silvery white.

PYCNOPTERIS. See *Nephrodium*.

RHIPIDOPTERIS. See *Acrostichum*.

SADLERIA.

Two species of stove Ferns of tree-like habit go to form this genus. Only one—*S. cyatheoides*—has

been introduced. This is a very handsome plant, combining the habit of a small *Cyathea* with the fructification of a *Blechnum*. It is a vigorous grower, requiring no special care, and thriving under warm treatment, in a mixture of two parts peat, one part loam, and one part silver sand, with abundance of moisture at all times of the year. It is usually propagated by means of spores, received from its native habitats, none of the cultivated plants having as yet shown signs of fructification.

S. cyatheoides.

This handsome plant is a native of the Sandwich Islands and Sumatra. Its fronds, 4ft. to 6ft. long and 9in. to 18in. broad, are borne on strong, upright stalks 6in. to 18in. long, naked except at the base, where they are densely clothed with long, narrow, light brown scales. The leaflets, 8in. to 12in. long and $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, are cut down to the rachis into numerous connected, narrow leaflets, barely $\frac{1}{2}$ in. broad and somewhat bluntish at their extremity. The whole of the leafy portion of the frond is of a leathery texture and of a very pleasing light green colour.

SAGENIA. See *Nephrodium*.

SALPICHLAENA. See *Blechnum*.

SCHIZOLOMA. See *Lindsaya*.

SCOLOPENDRIUM.

Comparatively few species are found in this genus, popularly known as Hartstongue from the shape of the frond of the British *S. vulgare*. The family includes *Antigramme*, *Camptosorus*, *Euscolopendrium*, and *Schaffneria*. The best known and most extensively cultivated is undoubtedly the common Hartstongue, *S. vulgare*, of which an almost unlimited number of beautiful or merely curious forms are found in gardens. These, through the extremely varied nature of the outline of their foliage, present a wonderful series of interesting departures from the normal state of the plant. They thrive best in a compost of a light, sandy nature, made up of two parts leaf mould or peat, one part loam, and one part silver sand, and are particularly useful for growing by the edge of water or in shady places, where it is often difficult to cultivate other plants with success.

With the exception of the varieties of *S. vulgare*, which are usually and with greater certainty increased by the division of their crowns (and a few by means of the bulbils produced on their fronds), the propagation of Scolopendriums is effected by spores, which are abundantly produced and germinate freely.

S. vulgare.

This ornamental hardy species is a native of various parts of Europe, Madeira, the Azores, and the Caucasus, as well as Japan, and North and South America; but there are no records of its having been found in any part of India. It is among the rarest of American Ferns. The fronds of this species are 6in. to 18in. long and 1½in. to 3in. broad; they are borne on stalks 4in. to 8in. long and hairy at the base, are strap-shaped, entire, usually bluntish at their summit, and heart-shaped at the base. Their texture is somewhat leathery and their colour usually bright green; their fructification is abundant, generally more so towards the extremity. The narrow spore masses are mostly disposed in parallel pairs, oblique with regard to the midrib, and of a brownish-black colour, which has a most pleasing effect, the contrast with the bright green tint of the frond being very striking. The really distinct varieties of *S. vulgare*, either naturally produced or resulting from cultivation, are extremely numerous, and differ so markedly from the type, that a description of the usual fronds gives but a very inadequate idea of the extensive variations found. Still, interesting as they undoubtedly are, it would be impossible to describe even a tithe of the more noteworthy of such variations. Elsewhere is illustrated one of the most remarkable in *S. v. Kelwayii* (Fig. 27); and for the rest we must refer readers to a work dealing especially with British Ferns or to the lists of nurserymen making them a speciality.

SELLIGUEA. See *Gymnogramme*.

STENOCHLÆNA. See *Acrostichum*.

STRUTHIOPTERIS. See *Onoclea*.

THYRSOPTERIS.

This genus is composed of a solitary and most interesting species. It is a thoroughly distinct plant, requiring only greenhouse temperature, shade, and an abundance of water at the roots. The fructification is totally different from that of any other

known Fern, and consists of the two or three pairs of lower leaflets of the frond being tripinnate, each leaflet becoming a raceme of stalked, cup-shaped involucre. Although fertile fronds have at various times been produced in this country and every possible attention has been paid to the sowing of their spores, there is no record of any young plants having been so raised, and the propagating of this handsome Fern has therefore been limited to the rooting of the lateral shoots which are produced on the trunk. The species *T. elegans* is a native of Juan Fernandez. It has a trunk 1½ft. high, bearing fronds 3ft. to 4ft. long, densely covered with rusty-brown scales.

TODEA.

The plants comprised in this small genus of Crape Ferns vary greatly in appearance and texture, some having leathery foliage of a very resisting nature, while that of most is finely divided, very fragile, and transparent. All require greenhouse treatment, and, with the exception of *T. barbara* and its variety, which do not suffer from exposure to air and light, all are much benefited by close confinement. Indeed, condensed moisture is absolutely necessary to their well-being, and this cannot be obtained without a close atmosphere. No sun should ever be allowed to shine on plants having filmy foliage, and the less they are disturbed at the roots the better: the hot, dry atmosphere of the summer months is undoubtedly their greatest enemy. The soil in which Todeas thrive best is a compost of peat and silver sand, to which a small portion of partly-decomposed sphagnum may be added with advantage. They are easily propagated from their spores, which are produced in abundance and germinate readily when sown under favourable conditions; but they are of comparatively slow growth, seedlings requiring a long time to develop.

T. africana.

Synonymous with *T. barbara*.

T. arborea.

A garden name for *T. barbara*.

TODEA—*continued.***T. barbara.**

This highly decorative species, also known in gardens under the names of *T. africana*, *T. arborea*, and *T. rivularis*, is a native of New Zealand, Temperate Australia, Tasmania, Natal, and Cape Colony. It is a robust-growing plant, forming in time trunks of extraordinary thickness in comparison to their height, and producing at the same time great quantities of fronds 3ft. to 4ft. long, often 1ft. broad, on stout, erect, quite naked stalks, 1ft. or more in length. Their leaflets, closely set, spreading, 6in. to 9in. long, and 1½in. to 2in. broad, are furnished with close, narrow leaflets, the edges of which are more or less distinctly toothed, while the upper ones are distinctly connected at their base. The fronds are of a leathery texture, dark green, shining, and naked on both sides. The densely-set spore masses, when mature, fill up the whole under-surface of the leaflets on which they are placed. As a decorative Fern this has few equals, especially where plants are required for very small fancy vases. Good plants of it can be grown in comparatively small pots, and its lasting qualities are unsurpassed by any other known Fern grown for the decoration of the drawing-room, it being but little affected by smoke or gas.

T. b. Vromii.

This variety, originally introduced from Belgium, is quite distinct from *T. barbara*: its fronds are much longer, less triangular in shape, and of a pale green colour; they are borne on shorter stalks, being furnished with leaflets nearly to their base, and these are also of a longer shape and less distinctly toothed. It is a quicker grower than *T. barbara*, and possesses the same decorative qualities as that useful species. In gardens it is known simply under the name of *T. Vromii*.

T. hymenophylloides.

This very handsome species, better known in gardens under the name of *T. pellucida*, forms a thick, fibrous trunk, from which its fronds, of a very transparent nature, are produced in abundance. These fronds are borne on firm, erect stalks 6in. to 12in. long, frequently measure 2ft. in length and 1ft. in breadth, and are tripinnatifid. The dark green, spear-shaped leaflets, 4in. to 6in. long and ¾in. to 1¼in. broad, are closely set, and the lowest are of about the same dimensions as the others. The closely-set leaflets, narrow-oblong in shape, ¾in. to 1½in. long, and ¼in. broad, are cut down to the midrib into simple or forked, very narrow segments. This

TODEA—*continued*.

species is of easy cultivation and reproduces itself very readily from spores.

T. pellucida.

Synonymous with *T. hymenophylloides*.

T. plumosa.

A very pretty seedling, raised in Messrs. J. Veitch and Sons' nursery, where a considerable number of plants of identical character, but differing from the supposed parent,



Fig. 121. Todea superba, a plant that merits its specific name. It is an excellent one for exhibition.

have been obtained from a sowing of *T. superba*. It is of dwarf, compact habit, and of a pale green colour when young. The surface of the fronds is moderately bristly with the small, erect segments, as in *T. intermedia*, but the fronds are shorter and more egg-shaped, and the stalks are also wanting in the woolly nature which is peculiar to that plant.

T. rivularis.

Synonymous with *T. barbara*.

TODEA—continued.**T. superba.**

This remarkable plant, known in gardens as the Crape Fern, the Prince of Wales's Feather Fern, and the "New Zealand Filmy Fern," is undoubtedly the most striking as well as the most beautiful species known (Fig. 121). It was first gathered by Forster in New Zealand, during Captain Cook's voyage. This species does not form a stem, but produces a somewhat erect, fibrous trunk, of a woody nature in the interior, reaching at the most $1\frac{1}{2}$ ft. in height. Its handsome fronds, 2ft. to 4ft. long and 6in. to 10in. broad, are borne on firm, erect stalks 2in. to 3in. long; they are tripinnatifid, and their narrow, spear-shaped leaflets are closely set, the central ones being 4in. to 5in. long and the lower ones gradually reduced. The leaflets have simple or forked linear segments, and the stalks of the leaflets are densely woolly underneath.

T. Wilkesiana.

This beautiful miniature Tree-Fern, native of Fiji and the New Hebrides, is closely allied to *T. Fraseri*, but is of larger growth, and has the lower leaflets distinct and deflexed and the stalk of a more or less hairy nature. Mr. Brackenridge describes the trunk as from 18in. to 20in. high and $1\frac{1}{2}$ in. in diameter, scaly towards the top, and producing near the base black, wiry roots about the thickness of a crow-quill, the surface of the trunk being roughened by the raised scars of fronds that have fallen off. The summit is crowned by from ten to twelve spreading fronds 2ft. or more in length, $1\frac{1}{4}$ ft. wide at their broadest part, and broadly spear-shaped. The leaflets are stalkless, oblong-spear-shaped, spreading, the two or three lower pairs distant and deflexed. The leaflets are blunt-oblong, obliquely wedge-shaped at the base, toothed, transparent, and marked with numerous small, brown spots. The stalks of the leaflets are winged and clothed with short hairs. The slender, tree-like habit of the plant gives it quite a distinct aspect amongst its allies. This interesting species requires a little warmer treatment than the others.

TRICHOMANES.

This genus, known as Bristle Ferns, is composed of over 100 species, agreeing with the Hymenophyllums in habit of growth and in delicacy of texture, the character furnished by the shape of the involucre dividing a very natural tribe into two nearly equal halves. Baker separates the genus into *Feea* and *Eutrichomanes*.

With the exception of a few species which undoubtedly require more than greenhouse tem-



Fig. 122. *Trichomanes javanicum*, one of the species with rhizomes that delight to cling to stone.

perature, the *Trichomanes* may without danger be submitted to the treatment recommended for

Hymenophyllums. When not otherwise stated, the species described may be considered as thriving under the cool treatment recommended for Filmy Ferns generally. Whereas we do not advocate for either Hymenophyllums or Todeas the use of stone, this material is essential to the well-being of certain *Trichomanes*. Many of the plants are provided with rhizomes, having a very strongly-marked power of adhesion: it is for species like *T. javanicum* (Fig. 122) and *T. radicans* especially that the stone is necessary. It may be well to note here that whenever stone is used it is necessary that a little peat of sandy-fibrous nature should be placed at its base to establish the plant.

The propagation of *Trichomanes* is usually effected by division of the rhizomes, although it also sometimes takes place by means of proliferous buds. *Trichomanes* may also be propagated by means of spores, but it is a slow process.

T. alatum.

This beautiful Fern, native of the West Indies and Brazil, is very variable in dimensions and hairiness. Its more or less broadly spear-shaped fronds, 3in. to 12in. long, 1in. to 4in. broad, and borne on tufted stalks 2in. to 4in. long and winged above, are two or three times cleft nearly to the midrib, with leaflets cut in the same way and lobes often again sharply toothed; they are of a delicately membranous texture, and of a very transparent pale green colour, which produces a charming effect when the fronds are laden with moisture. This species, also known as *T. attenuatum*, thrives best on a piece of Tree-Fern stem.

T. attenuatum.

Synonymous with *T. alatum*.

T. auriculatum.

One of the loveliest of Ferns; it is found in Japan, Formosa, Northern Hindostan, the Philippines, Java, and Guiana. Its fronds, which are almost stalkless, 6in. to 12in. long, 1½in. to 2in. broad, and twice divided nearly to the midrib, are produced from strong, wide-creeping rhizomes, and have their rachis very slightly winged throughout or above only. They are composed of shortly-stalked leaflets, obliquely wedge-shaped at the base, and exquisitely transparent. This plant is also known in gardens under the name of *T. dissectum*.

TRICHOMANES—*continued.***T. brevisetum.**

Synonymous with *T. radicans*.

T. Colensoi.

This elegant, delicate-looking species, of a particularly slender nature, was first discovered in the interior of the Northern Island, New Zealand, by the Rev. W. Colenso. Its wide-creeping, slender rhizome is naked, and its oblong-spear-shaped fronds, 2in. to 4in. long, are borne on naked stalks 1in. long; they are fully pinnate, with distant, stalked leaflets cut down quite to the stalks, and very narrow segments. This species grows best on porous stone.

T. dissectum.

A garden name for *T. attenuatum*.

T. exsectum.

A lovely species, native of Juan Fernandez and Southern Chili. The fronds, 6in. to 12in. long, produced from a wide-creeping, slender rhizome, are extremely delicate and membranous, and resemble thin, flat, much-branched, green sea-weed. Their segments are narrow, smooth, either simple or forked, and blunt. The plant thrives equally well on hard wood or stone.

T. parvulum.

This small-growing species, native of Japan, China, Java, Madagascar, &c., is a remarkably pretty plant, of easy culture either on a fragment of Tree-Fern or on a piece of fibrous peat. Its very attractive little fronds, produced from wide-creeping, thread-like, interlaced rhizomes, and borne on very short, slender stalks, are round or nearly so in general outline, wedge-shaped at the base about $\frac{1}{2}$ in. each way, and cut like a fan about half-way down from the outer edge in the direction of the base into narrow, irregular segments (Fig. 123, reduced from Col. Beddome's "Ferns of British India," by the kind permission of the author). They are of a very transparent nature.

T. radicans.

This species, extensively known under the popular name of Killarney Fern, and also called *T. brevisetum*, is undoubtedly the most beautiful of all the Filmy Ferns. It is a native of the Azores, Spain, Teneriffe, the Canary Isles, Madeira, Mexico, New Granada, Venezuela, Brazil, the Sandwich Islands, &c. The fronds are produced from a wide-creeping rhizome of a hairy nature, which has a great predilection for stone, clinging thereto with great tenacity. They are borne on stalks 2in. to 6in. long, naked or nearly so, and sometimes winged in their upper part.

TRICHOMANES—*continued.*

The leafy portion varies from 4in. to 12in. in length and 2in. to 6in. in breadth; it is three times deeply cleft nearly to the rachis, which is very narrowly winged. The leaflets are again cleft into deeply-toothed segments, and their texture, though transparent, is particularly firm. *T. radicans* is a most variable species, and some of its numerous forms are very beautiful.

T. trichoideum.

This most lovely, delicate-looking, thread-like Fern—admittedly the most finely-divided of all kinds shown in cultivation—is a native of Ecuador, Brazil, and the West Indies, where it grows on trunks of trees. It is of upright habit, with slender, creeping rhizomes, from which its



Fig. 123. *Trichomanes parvulum*, one of the gems among the small growing species.

spear-shaped fronds, 4in. to 8in. long and lin. to 2in. broad, are produced in abundance. These fronds are borne on very slender, naked stalks lin. to 2in. long, and are three times divided nearly to the rachis, which is only very slightly winged at the extremity. The leaflets are again divided into hair-like segments, which are of a membranous texture and have a central vein only.

WOODSIA.

Woodsias are small-growing, much-tufted, greenhouse and hardy Ferns, of distinct appearance and very neat habit. All are of soft texture and of a deciduous nature; their stalks are often jointed and separating at the joints. The genus is divided into *Euwoodsia* and *Physematium*.

Most Woodsias are found in cold and temperate climates. North America is particularly rich in them, and the genus is well represented in Great Britain by two species, *W. hyperborea* and *W. ilvensis*, both of which are of particularly distinct character, and rank among the rarest of our native Ferns. As a rule, Woodsias may be said to flourish where but little soil is allowed around their roots, in crevices of damp rocks, or upon the rocks themselves, generally in fairly exposed situations. They are well adapted for growing in small intermediate and hardy Ferneries, where they form suitable companions to *Asplenium Ruta-muraria*, *A. Ceterach*, *A. Trichomanes*, &c., and they may also be successfully cultivated in pots. They require a very open soil, composed of turfy peat and light loam in equal parts, with a free admixture of finely-broken charcoal, sandstone, or silver sand. Thorough drainage is essential, and the crowns of the plants should be kept above the soil and surrounded by a few small stones: the effect of this arrangement is to keep the roots in a permanently moist state without using much water, as they are particularly averse to stagnant moisture.

Woodsias are usually increased by the division of their crowns, an operation which is attended with most satisfactory results when performed during their resting period—from November to March. They may also be propagated by means of their spores, which are produced in abundance and germinate freely, especially when sown in a temperature of 65deg. to 70deg.

W. alpina.

A garden name for *W. hyperborea*.

W. glabella.

This pretty little, delicate-looking Fern, according to Baker, may be a smooth form of *W. hyperborea*. It is essentially a North American plant.

W. hyperborea.

This species, known also in gardens under the name of *W. alpina*, has a remarkably wide range of habitat, being found in the Arctic regions and on high mountains

WOODSIA—*continued*.

in the temperate zone in Europe, Asia, and America. The fronds, narrowly spear-shaped, pinnate, and 2in. to 6in. long, are abundantly produced from a clustered rootstock, hidden by a mass of stalk-bases, which persist long after the fronds have fallen off. The stalks are articulated, and, like the midrib of the leafy portion, slightly hairy beneath. The somewhat triangular leaflets are deeply cleft into roundish or egg-shaped lobes of a pale green colour.



Fig 124. Woodsia ilvensis, one of the rarest of British Ferns, but one that has a very wide range of habitat.

W. ilvensis.

Like the foregoing species, this has a very wide range of habitat; in fact, in that respect it is very similar to *W. hyperborea*, and, like that species also, it is one of the rarest of British Ferns. The spear-shaped fronds (Fig. 124), 2in. to 6in. long and pinnate, are produced from a clustered rootstock. They are provided with stalkless, blunt, oblong leaflets, broader at the base, slightly hairy above, and deeply cleft into many oblong, obscurely-toothed lobes of a dull green colour. The rachis and the secondary midribs have their under-side clothed with reddish, chaffy scales.

WOODSIA—*continued*.**W. polystichoides.**

A very pretty, free-growing species, native of Japan, with spear-shaped, simply-pinnate fronds, 8in. to 10in. long. The stalkless leaflets are about lin. long, sharply eared at the superior base, entire or slightly notched at the extremity, and slightly hairy on both sides; their colour is a bright green and their texture is thicker than that of most of the other species in cultivation.

W. p. Veitchii.

On account of the thick, silvery down with which all the parts of the plant are clothed, this is a very decorative form. As regards the dimensions, habit, and hardihood, it is equal to the typical species. This lovely variety is a native of Ta-lien-kwan, Yellow Sea, China.

WOODWARDIA.

Woodwardias or Chain Ferns are of large or medium dimensions. Their distinctive character resides in the disposition of the sori, which are narrow or narrow-oblong, and sunk in cavities of the frond placed in single rows parallel with and contiguous to the midribs of the leaflets and leaflets; they are covered by a somewhat leathery involucre, of the same shape as the spore masses, and closing over the cavity like a lid. Although only a small genus, *Woodwardia* is sub-divided, according to the nature of the veins, into three sections—*Anchistea*, *Euwoodwardia*, and *Lorinseria*.

Woodwardias are indigenous to the North Temperate zone, extending but very slightly within the tropics. They all possess a decorative character for either the cool greenhouse, the conservatory, or the hardy fernery, according to their requirements. Few Ferns are as effective as *W. radicans* or *W. orientalis*, grown either on the rockery or in a hanging basket in the conservatory; and *W. areolata* is very effective planted in a marshy part of the hardy Fernery. The compost in which these Ferns thrive most luxuriantly is a mixture in equal parts of fibrous loam, peat or leaf-mould, chopped sphagnum, and silver sand, with abundance of water at the roots all the year round. It is of the utmost importance that these plants should be strictly kept

under cool treatment, as when subjected to heat they soon become a prey to thrips and scale, whereas when grown in a cool atmosphere they are usually very clean plants. Although Woodwardias may be, and sometimes are, propagated from spores, they are usually increased by means of the young bulbils produced either towards the end of their fronds, as in *W. radicans* and its varieties, or over the whole of their surface, as in *W. orientalis*. The hardy species are also easily multiplied by the division of their rhizomes—an operation which is more successfully performed from November to March than at any other time of the year.

W. angustifolia.

Synonymous with *W. areolata*.

W. areolata.

In its native habitat this handsome species is found growing in swampy woods. The barren and fertile fronds are totally different; both kinds are produced from a root-stock sometimes 1ft. long, often branched, round, about $\frac{1}{4}$ in. thick, of a very dark brown colour, and bearing black, fibrous roots along its whole length. The barren fronds are by far the more abundant; they are borne on a short, slender stem, are 9in. to 12in. long and 6in. to 8in. broad, and are furnished with numerous pairs of oblong-spear-shaped; wavy leaflets, 3in. to 4in. long, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad, of a soft, papery texture, and naked on both surfaces. The fertile fronds, considerably taller than the barren ones, and borne on a longer and much darker-coloured stalk, are erect, and provided with narrow-linear leaflets, disposed $\frac{1}{2}$ in. to 1in. apart. *W. angustifolia* is synonymous with this species.

W. Fortunei.

Synonymous with *W. orientalis*.

W. orientalis.

A very distinct and highly decorative species, found from Japan southward to Formosa. It has somewhat the habit of the better-known *W. radicans*, to which it is closely related, but in general appearance its fronds are readily distinguished from those of that species (1) by their much more leathery texture, (2) by their deep crimson colour when young, and (3) by the numberless minute bulbs, or gemmiferous buds, which are produced on their upper surface when mature—all characters which do not exist in *W. radicans*. *W. Fortunei* is a synonym of this species.

WOODWARDIA—*continued***W. radicans.**

This exceedingly handsome, strong-growing, evergreen Fern derives its specific name from the viviparous character of its fronds, which, unlike those of the foregoing species, have only from two to four large bulbils produced at their extremity; these root into any damp material with which they may be brought into contact, rapidly forming young plants similar to the parent. Its elegantly pendulous fronds, borne on strong, round stalks 1ft. to 2ft. long, are 3ft. to 6ft. long, 1½ft. to 2ft. broad, and simply pinnate. The oblong-spear-shaped leaflets, about 1ft. long, are cut down below within a short distance of the rachis into finely-toothed, spear-shaped, bright green leaflets. Near the extremity of each frond usually one plant (sometimes as many as four) is produced, which will grow to a considerable size whilst on the frond; indeed, it is not at all uncommon to see plants with half-a-dozen fronds 1ft. long receiving all their support from the parent frond.

W. r. Brownii.

Synonymous with *W. r. cristata*.

W. r. Burgesiana.

This variety, introduced from the Azores, is of quite distinct appearance. Its very handsome, light, elegant fronds, which sometimes attain 2½ft. in length, have their leaflets and leaflets uniformly depauperated; they are of a somewhat harsh, leathery texture and beautifully saw-toothed throughout. It is as prolific as the type, and is readily propagated by the pegging-down of the bulbils borne at the extremity of the fronds.

W. r. cristata.

In this variety, which was originally discovered in the Island of St. Michael by Mr. George Brown, the leaflets and leaflets of the fronds, which are much shorter than those of the typical plant, are extensively subdivided. This variety is readily increased by the viviparous buds which are produced at the ends of the fronds, as in the typical plant, and it is also worthy of notice that the characters peculiar to *cristata* are quite apparent in young plants only a few inches high. *W. r. Brownii* is another name for the variety.

ERRATUM.

Page 14, for *Lygodium japonica* read *Lygodium japonicum*.

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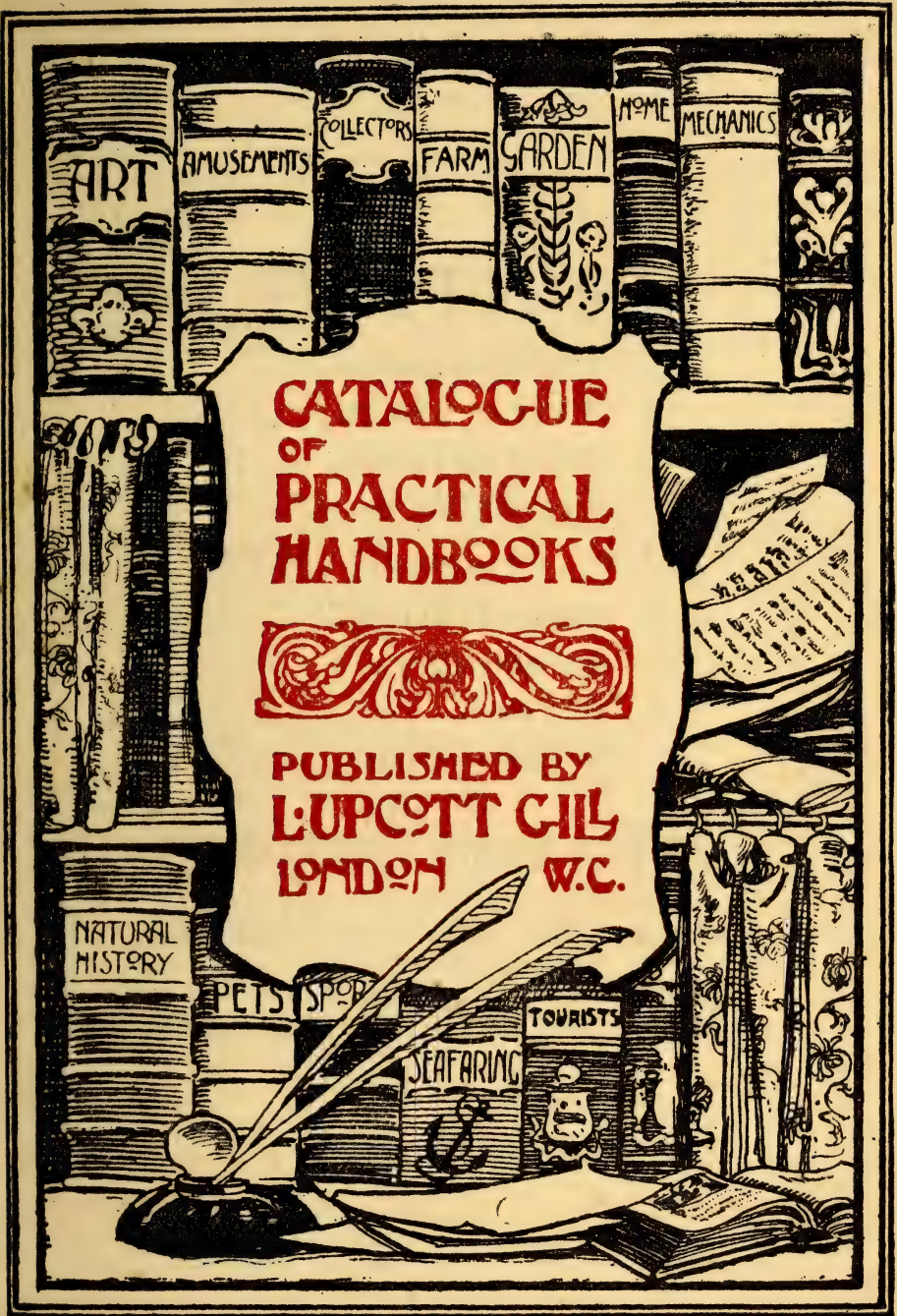
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