

BOTANISCHES INSTITUT  
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AN ACCOUNT  
OF  
EXOTIC  
CULTIVATED FERNS,

DESCRIBED BY SMITH & TH. MOORE, F.B.S.,

(Curator of the Botanic Garden, Chelsea),

WITH

GENERAL HINTS ON THEIR CULTURE,  
SYNOPSIS OF GENERA AND SPECIES,

(POLYPODIACEÆ GRAMMITIS TO PLATYLOMA.)

ILLUSTRATED BY FORTY-FOUR ENGRAVINGS,

WARD'S FERN HOUSE AND FERNS, WARINGTON'S PLANT CASE, ETC.

(UNPUBLISHED.)

LONDON.

1858.



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AN ACCOUNT

EXOTIC

ORIENTAL FURNITURE

DESCRIBED BY SMITH & THE MUSEUM

(Part of the London and Paris Exhibition)

AND

GENERAL NOTES ON THEIR CONSTRUCTION

SYNOPSIS OF GENERAL AND SPECIAL

CHARACTERISTICS OF THE ART

ILLUSTRATED BY FORTY-FOUR ENGRAVINGS

AND FIVE PLATES OF PHOTOGRAPHIC REPRODUCTIONS

(Completed by)

BOSTON

1876



## INTRODUCTION.

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THE Ferns form a group of plants which are considered as the most highly developed of that large class which produce no visible flowers, and of which other familiar and recognizable groups are the Mosses, the Lichens, the Sea-weeds, and the Funguses. These, as a whole, were well named Cryptogamous plants by Linnæus, inasmuch as the process by which their seeds, or the equivalent of seeds, are produced, are hidden and mysterious, compared with what we are enabled to observe in those orders of vegetation,—higher orders as they are termed,—which produce perfect flowers as the medium by whose agency their seeds are organised.

Among the groups into which Cryptogamous plants are separated for the convenience of classification, the Ferns are known by possessing a certain degree of vascularity in their structure, and by producing spores—that is minute reproductive atoms—of only one kind, within little one-celled cases or receptacles that are collected into groups occupying a portion, rarely the whole, of either the back or the margin of their leaves. The true Ferns have their young leaves rolled up spirally, and in gradually unfolding present the form of a crozier; but a small group, differing chiefly in having their young parts folded and not rolled up, and which may be considered as spurious Ferns, are conveniently associated with them.

In briefly describing what is the structure of Ferns, and the terms applied to the modifications of their respective parts, with sufficient distinctness to render the descriptions of the species which occupy another part of these pages the more intelligible, it will be convenient to consider them as consisting of four series of organs—the roots, the stems, the fronds, and the fructification.

The roots of Ferns are fibrous, and we believe, in all the true Ferns, are covered with a pile of soft close hairs or down, not unfrequently of a ferruginous or rust-colour, and they generally grow more or less matted or entangled, especially if they are in contact with any hard surface, such as the rocks or tree-trunks on which many of them grow naturally; and the same is observed when they are placed under the circumstances which attend their artificial cultivation. The true roots must not be confounded with the stems, which sometimes creep extensively beneath the soil, and have, more or less, the appearance of thick fleshy roots. The roots of the spurious Ferns consist of thick straight rigid fibres.

The stems, or rhizomes, assume two perfectly distinct forms. In some Ferns, as already intimated, they creep extensively either beneath or upon the surface of the soil, or over the rock or trunk which supports them. These throw up their fronds at intervals, the growing point of the stem being in advance of the youngest fronds, and the fronds themselves being



more or less distant. In other Ferns, the proper stem may be considered as consisting chiefly of a growing point, from the centre of which the young fronds are developed, the bases of the older fronds forming the trunk, which is gradually decaying at one end and extending at the other; the proper roots being protruded from between the bases of the older fronds. Stems of this structure, which is called the tufted mode of growth, assume either an erect or decumbent position,—in the former case sometimes elongating and becoming caudiciform, and in the latter becoming more or less creeping, though obviously differing in habit from the creeping stems first described. These distinct modes of development, Mr. Smith—the active Curator of the Royal Botanic Garden at Kew, and probably the best practical pteridologist in the kingdom—has lately proposed to adopt as the basis of a new method of classification—a method displaying much ingenuity and depth of observation, but which it is to be feared, if generally applied, would, practically, throw almost insuperable impediments in the way of the study and knowledge of Ferns, by the altered nomenclature which would be necessary; and theoretically, is hardly to be admitted as having greater claim to precedence than the system which is founded on the nature and variations of the fructification and venation, and which is now so extensively adopted.

In the group of Marattiaceæ, the rhizome is usually thick and fleshy, and more or less globose.

The fronds of Ferns are those parts which have the appearance of leaves, and for general purposes may be considered as the equivalents of leaves, though there are some technical objections to their being regarded as leaves proper. The fronds consist of two parts—the stipes or stalk, and the leafy portion which it supports; which latter is generally meant when the term frond is used descriptively. The stipes is either adherent to the stem, or there is at or near its base a natural joining or articulation, at which, when its functions are no longer in play, it separates spontaneously. When this latter structure occurs, the frond is said to be articulated with the stem. Sometimes the leafy parts of the frond are articulated in a similar way, but this occurs less frequently. The continuation of the stipes through the leafy part in the Ferns having divided fronds, is called the rachis.

The fronds—in the leafy part—are either simple or more or less divided, and have different terms applied to them, according to the nature of the division. If a frond is separated into distinct leaflets, and these are simple, it is said to be pinnate (Fig. 5, 36, &c.); if the leaflets, called also pinne, are again divided into distinct leaflets, they are said to be pinnate, and the frond is bipinnate; when they are again divided the frond becomes tripinnate, and so on. If the divisions are not distinct, but are united at the base, and are not otherwise divided, they are then pinnatifid (Fig. 2, 14, &c.); and so, when twice or thrice divided on the same plan, they become bipinnatifid, tripinnatifid, and so on. Fronds very much divided, that is, more divided than tripinnate, are in general terms called decompound. These and similar terms, descriptive of form, are applied in the same sense as in other departments of botany: such are flabellate, palmate, pedate, sagittate, &c.

The fronds are traversed by a series of veins, which are, in fact, the ramifications of the system of vascular structure, which forms the main bulk of the stipes and rachis. The midrib of a frond or pinna is sometimes called the costa: the first series of branches from this are the veins, the secondary series the venules, and the tertiary series the veinlets (Fig. 13, 59, &c.). The arrangement of these different series of veins in the substance of the frond is called the venation.

Great variety of venation is exhibited among the Ferns, the various modes in which it



occurs being so distinctive and so constant that this feature is, by many good botanists, employed to furnish auxiliary, or even sometimes primary, characteristics for the distinguishing of the genera. The principal forms of venation have been distinguished by names, which we will endeavour to explain by the aid of references to the figures illustrative of the genera. When the veins are unbranched, they are said to be *simple* (Fig. 7, 81, &c.); and the same applies to venules and veinlets similarly circumstanced. Sometimes they are branched once or oftener in a dichotomous manner, and are then said to be *forked* (Fig. 2, 69, &c.); sometimes the veins are *pinnately costæform*, that is, resembling a midrib and having the venules or branches either simple or forked (Fig. 9, 41, 61, 81, &c.). In some they are *equal*, that is, produced alike on both sides of a central midrib (Fig. 49, 67, &c.); in others they are *radiate*, and have no midrib (Fig. 32, 77, &c.); in others they are *eccentric*, or produced from one side of a marginal rib (Fig. 72). In all these cases the apices of the veins may terminate at or within the margin of the frond or of its divisions (as seen in Fig. 22, 23, 44, 70, &c.), when they are said to be *direct* and *free*; but similar forms of venation may occur, having the apices of the veins of either the primary, secondary, or tertiary series combined in some way or other. If the whole system of venation is uniformly combined, so as to form a complete network, it is then said to be *reticulated* or *netted* (Fig. 20, 29, 38, 89, 92, 101, &c.). If the simple, or dichotomous, or pinnately costæform veins are united by a continuous vein parallel with and close to the margin, this form of venation is called the *transverse marginal* (Fig. 25, 51, &c.). Sometimes the apices of the venules of one series or fascicle combine with the apices of the adjoining series, and this is called *anastomosing*: of this arrangement there are some modifications, such as the *angular anastomosing* (Fig. 10, 61, &c.), and the *arcuate anastomosing* (Fig. 8, 11, &c.), which varieties are further modified by producing from their exterior side one or more outwardly directed (and called *excurrent*) tertiary veins or veinlets, which are either free, terminating in the areoles or margin (Fig. 10, 12, 59, &c.), or anastomose with the next superior venules (Fig. 61, &c.). In some forms of reticulated venation the venules are irregularly combined, the areoles or meshes producing from their sides certain simple or forked variously directed veinlets, which terminate within the unequal-sided areoles. This arrangement of the venation is called *compound anastomosing* (Fig. 14, 31, 57, 71, &c.). The veins are said to be *external* when they are more or less superficial, distinct, or elevated above the surface of the frond, and *internal* when they are immersed in the substance of the frond; in which latter case they often become indistinct, and are to be seen only after careful maceration of the frond. In these definitions we have mainly adopted Mr. Smith's terms and explanations.

From some part of the venules or veinlets, which part becomes thickened, the fructification is produced on what is called the receptacle, which organ is said to be terminal when it is situate at the apex of the vein or venule (Fig. 11); medial when situate between the base and the apex (Fig. 70); axillary when on the point of forking (Fig. 83); and compital when seated on the angular crossing or points of confluence of two or more venules or veinlets (Fig. 14). It consists, in most cases, of one-celled spore-cases or sporangia, more or less completely girt by an elastic ring, but in some cases, of sporangia which are many-celled or destitute of the ring. These spore-cases are mostly collected into masses, which masses usually consist of multitudes of crowded spore-cases, and are the sori. The latter are either round (Fig. 14, 57, 67, &c.) or elongated; sometimes amorphous, that is of no determinable form (Fig. 23, 29, 30, &c.). In most cases they are dorsal, that is situate on some part of the back of the frond; but sometimes they are marginal (Fig. 77, &c.), or extra-marginal (Fig. 75, 89, &c.). The elongated sori are oblong (Fig. 1, 50, &c.), or linear (Fig. 47, 49, 51, &c.), or continuous (Fig. 38, 71, &c.);



and either form an angle with the midrib, when they are said to be oblique (Fig. 51), or run parallel with the margin (Fig. 38), or with the midrib (Fig. 44). The sori are in some of these groups entirely exposed on the surface of the frond, and in others are covered by a scale or membrane of the same form as the sorus, and which completely invests the receptacle in the earlier stages of development. This cover is the indusium proper, and takes some modification of either a plane, vaulted, or cup-shaped form. The entire margin or lobules of a frond are sometimes changed in texture, and form an accessory indusium, which is more or less conjoined with the proper indusium, and thus constitutes a marginal cyst containing the spore-cases and opening exteriorly: it may be vertical (Fig. 76) or reflexed (Fig. 79); urn-shaped (Fig. 76), calyciform (Fig. 83), or two-lipped (Fig. 78). Sometimes the fertile fronds are contracted, and inclose the sori by their revolute margins, which thus constitute an universal indusium (Fig. 3, 58, &c.).

The further differences of structure, and the various modifications which occur and serve to distinguish the groups from one another, will be explained further on. One of the most striking of these differences is the paniculate arrangement of the sori, which occurs among the Osmundaceæ, and some of the Schizæaceæ and Ophioglossaceæ. The fructification of the Marattiaceæ is also of a very peculiar nature.

As we have in most cases adopted Mr. Smith's views of genera and species, we have also, in these succinct explanations of terms and of structure, endeavoured to assimilate our remarks with the definitions which accompany his paper, in *Hooker's Journal of Botany*, in order to secure the advantages of uniformity in terminology.—M.





## GENERAL HINTS ON FERN CULTURE.

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THE Ferns naturally divide into three principal groups, as regards the climatal conditions affecting their cultivation—the hothouse species, the greenhouse species, and the hardy species,—of which latter, a somewhat more tender subdivision needs the protection of a cold frame.

In the pure atmosphere of a rural situation, the hardy race of Ferns require only to be planted in suitable conditions of shade and moisture, in order to secure their healthy development; and many of what are called frame species, if placed under such conditions in a sheltered position, will not suffer any injury from climatal causes, especially if they are at all guarded from excess of wet. But in the smoky sooty atmosphere of crowded cities, none but a very few of the most robust of the hardy sorts will even survive, unless sheltered by some permanent covering, such as glass. To cultivate even the hardy sorts, then, in such murky situations, where they become especially valuable from their cheerful aspect and the often impossibility of cultivating flowering-plants, a complete covering of some kind is indispensable, and this is best constructed of glass. No artificial heating is necessary for them; but, merely an inclosure which may shut the plants up, and seclude them, as far as practicable, from the fuliginous atmosphere of a thickly inhabited locality. The size might vary from the small glazed case on the window-ledge, to the inclosed court-yard; and, in either case, according to the space, the interior should be disposed in the picturesque style to which the dignified title of rock-work is generally applied. Such an arrangement of the surface is, at least, the most appropriate, both as to the wants of the plants, and as to their adaptation to an ornamental purpose. If grown in pots a low pit is most suitable; but for convenience sake it should be contrived so that a pathway inside, with sufficient head-room, may afford facility of access.

The greenhouse species may be grown in a similar pit-like structure, with the addition of sufficient means of heating to exclude frost. The plants are undoubtedly best situated, as well as most effective, when planted out on rock-work among winding pathways; but if it is preferred to grow them in pots, any simple and convenient form of low close pit may be adopted.

The same considerations, except as to the heating, apply to the culture of the stove species. For a very limited collection a small pit would be best, on account of the economy of keeping up the necessary heat; but where the collection is considerable a larger house, with rock-work embankments of tasteful and irregular outline, should be preferred; and the plants, when arranged with a due regard to their habit on the different positions rock-work affords, will find themselves in such congenial situations, as to develop to the full all those luxurious and graceful characteristics for which



the Ferns are so much prized. The accompanying vignette of Mr. Ward's Fern-house, shows something of the effect which is produced by plants disposed in this semi-natural way, although in this instance other plants are seen to accompany the Ferns.



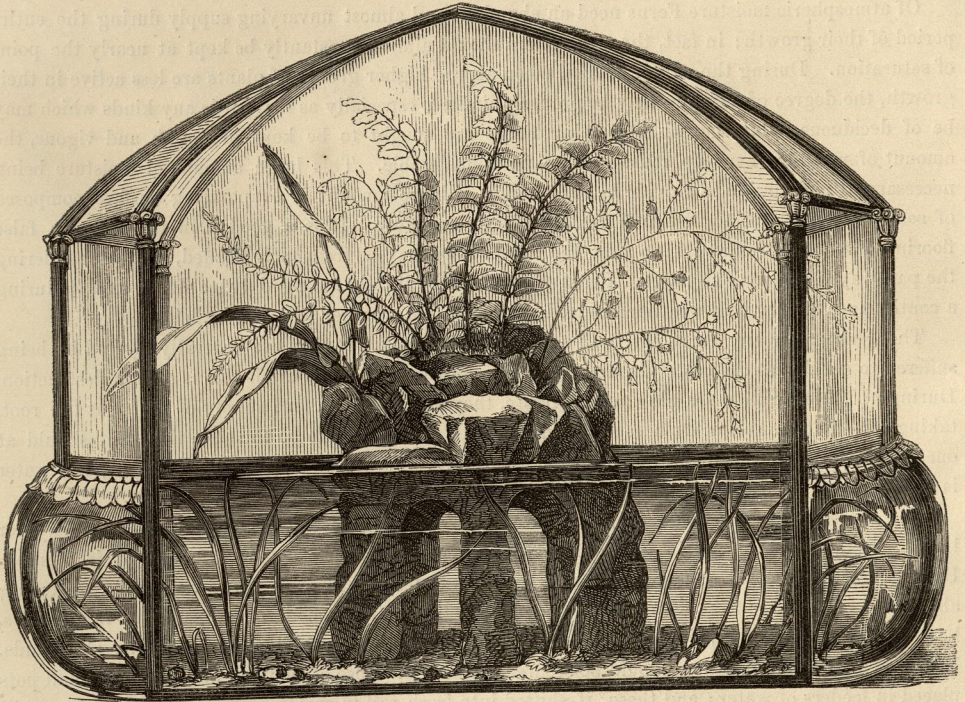
MR. WARD'S FERN-HOUSE.

Such a structure, as the accompanying figure represents, is in truth, a Wardian Case on a large scale. For all the greenhouse species nothing is better adapted than the modifications of the ordinary Wardian Case, of a size suitable to occupy convenient positions near the windows, in drawing rooms, on staircase landings, and similar situations; or, if it be preferred, that modification of the Wardian Case to which the name of Warrington Case is applied (in which aquatic botany and zoology is brought within the domestic range) may be adopted. The principle of the Warrington Case is exemplified in the accompanying figure, which shows how, in some measure, the two objects may be combined.

Wardian Cases are very easily managed. For the sake of durability the case should have a metallic box fitted within for the soil and roots; and this should have an outlet—to be closed at pleasure—at the lower part communicating with the outside, by which all superfluous water may be drained off whenever water is applied. But for this it would be impossible to avoid the presence of stagnant water, which is most injurious to vegetation generally. Then a series of reversed flower-pots, and a layer of small lumps of old brick or freestone, from the size of an egg upwards, should be spread over the bottom, and on this six inches or more of the rougher turfy or lumpy parts of soil, well mixed with pure silver sand and smaller fragments of brick or burnt clay, in the proportion of about one-third. The soil is to be placed on this foundation. It should consist of equal parts of good mellow maiden



loam and light turfy peat, mixed with a third equal portion, consisting, bulk for bulk, of silver sand and of fragments of brick or soft sandstone of the size of nuts. This compost will suit any Fern, and with this the lower part of the case is to be filled up. A few smallish lumps of sandstone, or of pumice-stone, should be employed to raise up some rocky elevation, according to fancy, above the surface level; and the spaces between these stones are to be filled up firmly with the same kind of soil. The case is then ready for planting; or, if the space is limited, it is better to plant as the piling up of the stones proceeds, because then the roots of the Ferns can be more readily disposed among



THE WARINGTON PLANT CASE.

the soil. All species which grow naturally against rocks or trees should, however, rather be fixed firmly and compactly to the masses of stone, and, provided the atmosphere is made congenial to them, they will soon throw out their little rootlets, and fix themselves securely; whilst, if planted directly in the soil, some of them at least would fail to grow, and none would thrive so well.

After planting, a thorough watering should be given; and all the superfluous water that will drain away in the course of three or four hours should be allowed egress by the outlet at the bottom, which may then be closed until another watering takes place. Afterwards the case is to be closed, and should remain so, except when it may be opened to view the plants; or, if any indications of mildew are observed, it may be opened for half an hour daily to check any such tendency. If the aspect where they are placed is not a shady one, artificial shading should be resorted to in all periods of bright sunshine. Under this treatment it will be some time—months perhaps, the period varying with the amount of moisture which is permitted to escape by evaporation—before another watering is needed; but when it is perceived that moisture is required, a thorough watering should be given as at first, allowing all that is superfluous to drain away before closing up the case.

The necessary heat for structures devoted to Ferns cannot be better supplied than by the agency of a hot-water apparatus, constructed on a good principle; and in the case of tropical Ferns, a portion of the heating pipes should be so placed as to throw a degree of warmth about the stages on which



the pots are placed. If this is not attended to, especially when the stages are of stone or slate, the quantity of water necessarily thrown over them, in order to keep up the atmospheric moisture, is apt to produce an injurious chilliness about the roots, sometimes fatal to the more delicate kinds. The hardy species, as already mentioned, do not require artificial heat. The greenhouse species merely require to be preserved from frost in winter, or, say in a temperature of 40°, increased to 50° and 60° in spring. For the stove species an average night temperature of 55° to 60°, and day temperature of 65° to 70°, is proper in the winter months; the temperature in the rest of the year averaging 65° at night, and from 70° to 80° by day.

Of atmospheric moisture Ferns need an abundant and almost unvarying supply during the entire period of their growth; in fact, the atmosphere should almost constantly be kept at nearly the point of saturation. During the winter season, when all the higher groups of plants are less active in their growth, the degree of moisture may be properly limited, especially as it regards any kinds which may be of deciduous habit; but when growing Ferns are sought to be kept in health and vigour, the amount of moisture kept up must always be considerable. This large amount of moisture being necessary, it is desirable to provide in Fern-houses a large amount of evaporating surface, composed of some porous material that will readily absorb moisture. It is a good plan to employ a false flooring of wooden trelliswork, so that the actual floor may be frequently flooded, without rendering the pathways inconveniently wet. Ferns should also be lightly syringed twice daily, except during a continuance of very dull weather: indeed, oftener in hot weather will be beneficial.

Though scarcely any Ferns thrive in a constantly wet soil, yet they are generally injured by being suffered to get dry at the root. Indeed, with some of the more fickle kinds this is certain destruction. During all the time they are growing, therefore, they should have a free supply of water at the root, taking care that the soil never becomes soddened. If this is seen to be the case, the plant should at once be repotted, so that its drainage may be corrected. When the plants are dormant, less water is necessary.

The Water Fern (*Ceratopteris thalictroides*) is an exception to the case just named. This, after being potted, should be set in water of sufficient depth to cover the pot in which it is planted. Under these conditions, and supplied with a tropical temperature, it grows vigorously, producing abundance of sporules, from which it may be increased. A simple mode of propagating this species, however, is afforded by the proliferous buds which are developed numerously on the old fronds. Young plants from this source should be secured towards the close of summer, and kept in small pots placed in feeders of water; and these, if shifted into fresh soil in spring, and set in warm water, will soon produce fertile fronds.

When Ferns are grown in pots, and have become well established, the majority of them like to have plenty of pot room, provided the pots are well drained. Thus a plant of a free-growing kind, bearing fronds of a foot or so in length, may have a pot nearly or quite a foot in diameter; and so in proportion to the size of the plants, provided always that excess is not indulged in, and that when any appearance of overpotting is observed it is speedily remedied.

Ferns are less attacked by insects than most other plants, but they are sometimes infested by one of the large species of coccus, which spreads rapidly, and if suffered to accumulate is very troublesome to remove, and renders the plants filthy and unsightly. Some of the tender-foliaged kinds are sometimes attacked by green-fly, which are to be destroyed, as soon as perceived, by fumigation with tobacco, which is also the best method of destroying the thrip, which is apt to infest the hardier sorts when they are placed in a high temperature, and, if too dry an atmosphere is maintained, sometimes spreads over a collection, and occasions much annoyance.

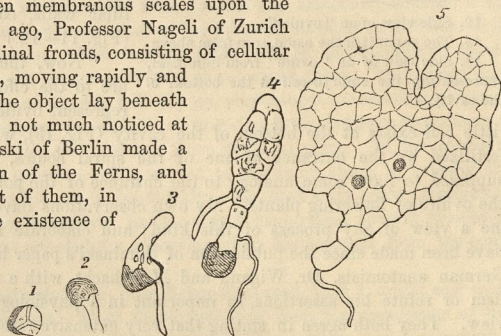
Ferns are propagated by division or by their spores. Some increase very readily, and others only with the greatest unwillingness. All the creeping-stemmed species are increased without difficulty, by detaching portions of the caudex or rhizome furnished with fronds and roots, and placing them in a close frame, after potting them, until they are established. Some of the ferns of this habit, however, which prefer to adhere to the surface of damp stone, or the bark of wood rather than to be potted in



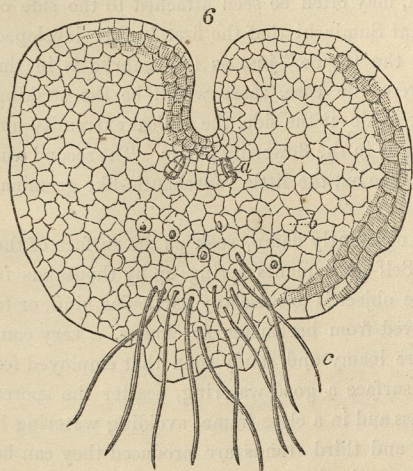
soil, such as *Trichomanes* and others, should have the portions of their rhizome firmly fixed against the stone or wood, and then must be kept close and moist until they get established. The tufted-growing species, where they readily produce lateral crowns, are increased by detaching these with their roots and potting them separately; but others of this habit so seldom produce any other than their central crown, and this indivisible, that it scarcely ever becomes possible to increase them by this means. Many species are viviparous, and these are readily increased by fixing a frond in contact with the surface of the soil, and detaching the young plants after they have become rooted. A few others produce young plants at the apex of their fronds, thus affording a means of increase. But the most general mode of increase is by means of the spores, which are the analogues of the seeds of flowering plants, and which are in most cases produced very abundantly. We quote the following account of their germination from Mr. Henfrey's paper on this subject in the *Gardeners' Magazine of Botany* (vol. iii., p. 22):—

"It has long been known that when the spores of the Ferns germinate, they first produce little disks of green cellular tissue, lying like collections of little green membranous scales upon the surface on which they are growing. A few years ago, Professor Nageli of Zurich observed a peculiar structure upon these little germinal fronds, consisting of cellular bodies, from which were discharged spiral filaments, moving rapidly and apparently voluntarily through the water in which the object lay beneath the microscope. The discovery of these organs was not much noticed at the time, but subsequently Count Leszczyc-Suminski of Berlin made a complete series of observations on the germination of the Ferns, and published an elaborate and fully-illustrated account of them, in which he not only confirmed the statement of the existence of these so-called *antheridia* of the Ferns, but showed that there existed *two kinds* of cellular organs upon the young germ frond, which organs he considered to represent the two sexes, and to correspond to the antheridia and pistillidia of the mosses.

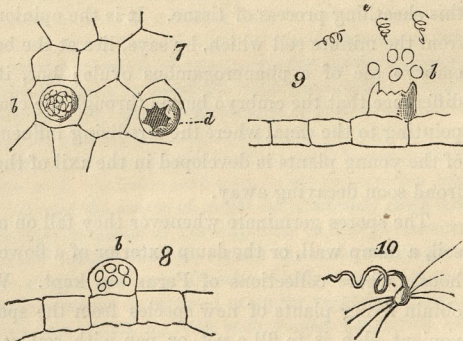
"I have examined these structures, and can confirm completely, in most respects, the account Suminski has given of their general structure; but my observations have not yet been sufficiently extended to enable me to give an opinion on the physiological questions relating to them, which I shall presently speak of. In the first place, therefore, I will describe these bodies as I have seen them, and in a manner which will enable any one possessing a microscope to repeat them for himself.



1, 2, 3, 4, 5. Successive stages of development from the spore shown at Fig. 1. In Fig. 5 are seen two of the antheridia.



6. A germinal frond (it is a simple cellular plate like the leaf of a Moss): *a* are two "ovules;" *b* a number of "antheridia;" *c* root fibrils.



7. A more highly magnified view of a piece of the frond with two "antheridia," one containing the vesicles (*b*), the other burst (*d*).

8. Side view of *b* in the last figure.

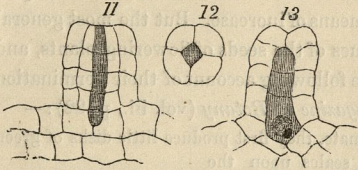
9. The same bursting to discharge the vesicles, which again discharge the spiral filaments *e*.

10. One of the spiral filaments or "animalcules" more magnified.

"The germinal frond must be taken very young, while yet not more than one-eighth of an inch in diameter, and before any sign of the first leaf appears rising from its upper surface. The little frond will then be found in the shape of a rounded or heart-shaped disk, formed of delicate green cells (Fig. 6); a single layer, except in



the middle, having been gradually developed into this form through the stages represented in the preceding figures (Fig. 1—5). To see the peculiar organs, the disc-like cellular plate must be carefully laid face downwards upon a slip of glass, and washed clean, gently removing the grains of soil with a camel-hair pencil from among the rootlets. When placed under the microscope, a number of projecting cells (Fig. 6, *b*) are generally found scattered about the frond. These are seen to be again filled with minute vesicles (Figs. 7 and 8), which escape by the bursting of the protruding cell, either spontaneously or by slight pressure on the glass covering the object (Fig. 9). As the vesicles emerge they burst also, and from them springs out a spiral thread-like body, thickened at one end, and furnished with cilia (Fig. 10). These, the so-called animalcules, swim about



12. Side view of an "ovule."

13. The summit of the same, seen from above.

13. Side view of an "ovule" from Suminski, representing the embryo-cell at the bottom of the cavity.

with great rapidity, shooting forward, and continually whirling round on their own axes. To see them clearly their motion must be stopped by adding a little solution of iodine. On the thickened part of the frond, near the notch, are to be found in most cases, not always, cellular structures of larger size, and more complicated (Fig. 6, *a*). They consist of conical papillae, with cellular walls, containing a cavity in the centre (Fig. 11—12.)

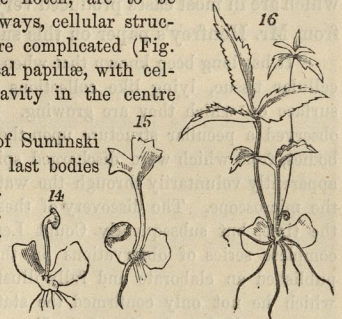
"Now, the statements of Suminski are to the effect that these last bodies represent ovules, and that a little cell exists at the bottom of the cavity (Fig. 13), which becomes fertilized by the entrance of one of the spiral bodies, in a manner supposed to have some analogy to the entrance of the pollen-tube into the ovules of flowering plants. My own observations have not afforded me a view of any process of this kind; and elaborate investigations have been made since the publication of Suminski's paper by two skilful German anatomists, Dr. Wigand and M. Schacht, with a view to confirm or refute his assertions, so important in a physiological point of view. They both agree in stating that very extensive research has failed to reveal anything like an entrance of the spiral bodies into the so-called ovules; and M. Schacht further avers, that in the young stages of the 'ovules,' at which stage Suminski states the fertilization takes place, the cavity is closed up."

The evidence is so far against Count Suminski's views, though the probabilities are in favour of them; and, at all events, the import of the remarkable structures remains to be cleared up. The first leaf emerges from the substance of the cellular thickening of the germinal frond, which is carried up a little way in a kind of sheath. The "ovule," or several, may often be seen attached to the side of this sheathing process of tissue. It is the opinion of Count Suminski that the first leaf is developed from the minute cell which, he says, lies at the bottom of the "ovule," just as the embryo is in the embryo sac of a phanerogamous ovule; but, if this were the case, there would be the striking difference that the embryo bursts through the coats of the ovule at the side, the radical extremity not pointing to the canal where the fertilizing influence enters, as in the flowering plants. The second leaf of the young plants is developed in the axil of the first, and so on, the little Marchantia-like germinal frond soon decaying away.

The spores germinate whenever they fall on a surface constantly damp, such as the surface of the soil, a damp wall, or the damp exterior of a flower-pot. Self-sown plants spring up by thousands in houses where collections of Ferns are kept. When the object is to raise any particular kind, or to obtain living plants of new species from the spores derived from herbarium specimens, a very convenient plan is to fill a pot or pan with soil rather more loamy and sandy than that employed for potting, the pan being well drained. After giving the surface a good watering, scatter the spores evenly over the surface, and set the pan under a close glass and in a close frame, avoiding watering if possible until they have germinated. When the second and third fronds are produced they can be handled, and should be transplanted into nursery pots, or otherwise as may be convenient. After they have reached this stage, their progress is rapid.

Another method of raising Ferns from the spores, much more exact in its results, has been described by Mr. Deane, of Clapham, in the following interesting letter\* addressed to Mr. Ward:—

\* Ward On the Growth of Plants in Closely-glazed Cases. London: Van Voorst.



14, 15, 16. Germinating Ferns (*Pteris serrulata*), with the young leaves springing up from the germinal frond.



"When Suminsky's work on the development of Ferns first came into my hands, a strong desire to repeat his observations led me to seek for seedlings where they were most likely to be found, namely, in my own Fern-case, at Kew, and other conservatories; but I soon found such sources were unsatisfactory, for, although I could obtain abundance of plants in which the organs of reproduction (?) described by him were clearly discernible, yet I could rarely find the moving ciliated bodies said to perform such an important part in their development. There were, too, differences, evidently specific, that I could not comprehend, and which were a bar to anything like correct observation. It was therefore obvious, if the investigation were to be followed up successfully, that some means must be devised for raising an unlimited supply of any desired species.

"The usual method of sowing Fern-seed, by scattering it over damp, sandy mould, is very uncertain, for the mould itself will frequently contain the seeds of other species; and even if the crop of plants come true to the sowing, it is difficult properly to separate sand and other extraneous matter from the young frond, previously to placing it under a microscope, without danger of injuring its delicate structure. My plan, therefore, was to procure some soft, porous, potter's ware—material that should readily imbibe and retain moisture—upon which to sow the seed desired to be raised. While searching for such material, I met with a peculiarly fine and soft sandstone admirably adapted for the purpose. This I prepared by breaking it into pieces of from one to two inches square and less than one inch thick, afterwards rendering the faces parallel and smooth by rubbing them on a flat stone. The reason for thus adjusting the size and smoothness of the pieces was simply to facilitate their being placed, for observation, on the stage of a microscope. Before sowing the seeds on these prepared pieces, they were baked in an oven, to destroy any organic life that might be lurking about them. They were then piled in dishes, moistened with distilled water, and covered with bell-glasses, preparatory to receiving the seed. The seed to be sown was obtained from a recently-gathered frond, laid fruiting side down, between two sheets of white paper, on the top of which was laid a book, or piece of board, to keep them in place. In the course of three or four days the seed was discharged from the capsules, and removed to the damp stone, by turning the stone down upon it, of course taking care that the seed did not lie too thickly. In about sixty hours germination had commenced, and henceforth daily progressed into maturity. In this way I have raised several species of Ferns without a failure; abundant means being thus afforded for observing their development from the commencement of germination up to the perfect plant.

"I have been repeatedly told by those who have attempted to raise Ferns from seed, that I might sow what I pleased, but something I did not want would spring up. Most likely such had been the experience of my informants, although the reason for it was not obvious. My experiments proved the contrary, and demonstrated most unequivocally that, by observing the requisite conditions, any species may be raised, if the seed sown be fresh and fully matured.

"This principle of raising Ferns is applicable to several important purposes, besides that of the facility it affords for observing and studying the laws of their development. In the first place, many kinds now rare and valuable, or even unknown, in this country, from the difficulty of bringing them home, even with the protection of Mr. Ward's glazed cases, might be introduced with facility by sowing the seeds in the country where they grow on some suitable material, whether sand-stone, Bath brick, tile, wood, bark, or even charcoal; wood or bark suggests itself in the case of such as are parasitic in their habits, and inclosing them in a small glass case—a case so much smaller than would be required for full-grown plants that it might be a cabin companion for a long voyage. Secondly, it is frequently desirable, even in this country, to raise particular species with some greater degree of certainty than, from various ill-understood causes, is generally found practicable. Again, experiments on this principle may be tried in a great variety of ways, until the true habits of obscure species are accurately determined. Some Ferns are impatient of removal: such may be raised from seed on suitable pieces of stone or wood, and afterwards introduced into pots or crevices in walls and rock-work prepared to receive them.

"I conceive that a Ward's case, artificially filled with such admirable sand-stone as my experiments have been made upon, but which I am sorry not to be able to tell you the source of, might be judiciously sown with seeds of small moisture-loving Ferns, and form one of the most exquisite of drawing-room or cottage conservatories, and which, in its gradual progress to maturity, would delight the eye, expand the understanding, and warm the heart in love and gratitude towards the Author of that portion of Creation which is truly the most beautiful, as well as most essential, to our healthy and happy existence on earth—I mean the vegetable kingdom.

"No kind of vegetation that I am acquainted with has ever struck me with such wonder, admiration, and delight, as the little crops of Ferns raised in the way I have now endeavoured to show; and nothing would please me better than to see others deriving similar enjoyment from this simple and accessible source. Any one who makes a garden of this kind under a bell-glass, must observe that the material on which the seed is sown is so porous that the requisite amount of moisture will pass to the top, by capillary action, when applied to the bottom of it; also, that with an abundance of light, the sun must not shine directly upon it."



## SYNOPSIS OF THE GENERA.

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**POLYPODIACEÆ, R. Brown.**—*Spore-cases pedicellate (rarely sessile), with a vertical (rarely oblique) elastic nearly complete ring.*

**Tribe I. POLYPODIEÆ, J. Smith.**—Sori round, oblong, or linear, without a special indusium. Sometimes the margins of the segments of contracted fertile fronds are revolute, and simulating an indusium.

Section I. *Orthophlebieæ, J. Smith.*—Veins all distinct or free.

1. **GRAMMITIS, Swartz.**—*Veins* simple or forked internal, the soriferous *venule* sometimes very short. *Sori* oval or oblong, oblique, lateral.

2. **POLYPODIUM, Linnæus.**—*Veins* simple, forked or pinnate. *Sori* circular, rarely oval or oblong, uniserial, solitary, or irregular; sometimes immersed in a deep cyst, terminal or lateral.

3. **STRUTHIOPTERIS, Willdenow.**—*Fronds* (fertile) with contracted conniving indusiiform margins to the moniliform pinnae, the segments wholly occupied by round confluent *sori*; *spore-cases* lateral, the base of the pedicels concrete, and forming an elevated thickened receptacle. *Veins* pinnate.

4. **ALLOSORUS, Bernhardi.**—*Veins* forked, terminating within the indusiiform margin. *Fronds* dissimilar; the fertile with contracted conniving indusiiform margins. *Sori* round or oblong, becoming confluent, terminal.

5. **NOTHOCHLÆNA, R. Brown.**—*Veins* forked, pinnate, or bifurcate. *Sori* round, solitary or laterally confluent into a linear continuous or interrupted marginal band, terminal.

6. **GYMNOGRAMMA, Desvauz.**—*Veins* forked or pinnate; *venules* simple. *Sori* oblong or linear, simple or forked, oblique, often becoming confluent, medial; *spore-cases* superficial, often occupying nearly the whole length of the venules, and sometimes echinate.

Section II. *Symphlebieæ, J. Smith.*—Veins anastomosing or reticulated.

7. **MENISCIUM, Schreber.**—*Veins* pinnately costæform, the opposite pairs of *venules* angularly or arcuately anastomosing, and producing from their junction an excurrent sterile *veinlet*, which is free or united with the venules above it. *Sori* linear, somewhat transverse, arcuate or crescent-shaped, continued across the junction of two anastomosing venules, medial, at length confluent.

8. **GONIOPTERIS, Presl.**—*Veins* pinnately costæform, the lower (or more) opposite pair of *venules* angularly anastomosing, and producing from their junction a free or anastomosed excurrent sterile *veinlet*. *Sori* round, medial, or costal, sometimes echinate.



9. GONIOPHLEBIUM, *Presl.*—*Veins* forked or pinnately costæform, the lower exterior *venule* free and fertile, the rest angularly anastomosing, and producing from their junction an excurrent free, often fertile, *veinlet*. *Sori* round, in one or more transverse parallel rows, naked or squamiferous, terminal.

10. CYRTOPHLEBIUM, *R. Brown.*—*Veins* forked or pinnately costæform, the lowest exterior *venule* free and fertile, the rest arcuately or angularly anastomosing, producing from their exterior side two or more excurrent free, usually fertile *veinlets*, which are sometimes very short, or sometimes united with the next superior venules, thus forming two series of areoles between each two primary veins. *Sori* round, naked, arranged in two rows between and parallel with the costæform veins, or irregular, terminal, or lateral.

11. NIPHOBOLUS, *Kaulfuss.*—*Veins* internal, indistinct, pinnate; *venules* parallel, transversely anastomosing, producing from their exterior side two to five or more free or irregularly anastomosing *veinlets*. *Sori* round, terminal, in parallel transverse rows between the veins, sometimes irregular and usually confluent, protruding through dense stellate pubescence.

12. PHLEBODIUM, *R. Brown.*—*Veins* pinnate or variously branched; *venules* arcuately or angularly anastomosing, producing on their exterior side or at their angular junction two or more conniving *veinlets*, which are sporangiferous on their combined apices or point of junction. *Sori* round, oval or rarely oblong-linear, transversely uniserial, biserial or multiserial, sometimes irregular.

13. DRYNARIA, *Bory.*—*Veins* pinnate, parallel or flexuose; *venules* compoundly anastomosing, producing sori at the angles or points of confluence, and from their sides variously directed free sterile *veinlets*. *Sori* round or oblong, naked, or squamiferous, superficial or deeply immersed, uniserial, or in one or two oblique rows between the veins, or irregular.

14. DICTYMIA, *J. Smith.*—*Venation* uniform, reticulated, internal, the transversely uniserial sori compital, or produced at the confluence of the *venules*; *receptacle* immersed. *Sori* large, oblong.

15. DRYMOGLOSSUM, *Presl.*—*Venation* uniform, compoundly anastomosing, producing variously directed free *veinlets*. *Sori* linear, continuous, marginal or intramarginal, produced on the transverse sides and junctions of the *venules*, forming a broad pilose or squamiferous marginal soriferous line.

16. TENIOPSIS, *J. Smith.*—*Veins* simple, parallel, the apices combined transversely by the *receptacle*. *Sori* linear, continuous, immersed in an intramarginal groove.

17. VITTARIA, *Smith.*—*Veins* simple, parallel, the apices combined transversely by the marginal *receptacle*. *Sori* linear, continuous, immersed in a marginal groove facing outwards.

18. ANTROPHYUM, *Kaulfuss.*—*Venation* uniform, reticulated, the sides of the areoles more or less sporangiferous. *Sori* linear, continuous or interrupted, reticulated, the *receptacle* immersed in the substance of the frond.

19. HEMIONITIS, *Linnaeus.*—*Venation* uniform, reticulated, the sides of the nearly equal areoles sporangiferous. *Sori* linear, reticulated, superficial, subsequently confluent.

20. CERATOPTERIS, *Brongniart.*—*Fronds* dissimilar, flaccid. *Veins* transversely elongated, and distantly anastomosing. *Sori* linear, continuous, parallel, superficial, occupying the lengthened transverse sides of the *venules*, and concealed by the reflexed conniving margins of the segments.

Tribe II. ACROSTICHEÆ, *J. Smith.*—*Sori* amorphous, that is, not of any definite form, without a special indusium.

Section I. *Orthophlebieæ*, *J. Smith.*—*Veins* all distinct or free.

21. ELAPHOGLOSSUM, *Schott.*—*Veins* internal, simple, or forked; *venules* parallel, their apices clavate, terminating in a thickened margin. *Sori* dense, usually covering the whole under surface of the fertile fronds, which are smaller than the sterile ones.

22. STENOCHLENA, *J. Smith.*—*Fronds* (fertile) contracted. *Veins* (sterile) simple or forked; *venules* parallel, their apices exerted forming cartilaginous serratures, or conniving and forming a thickened margin. *Sori* densely covering the under side of the linear narrow pinnæ, which have membranous revolute margins.



23. *POLYBOTRYA*, *Humboldt*.—*Fronds* (fertile) contracted. *Veins* pinnate, simple; *venules* free, external. *Sori* occupying one or both sides of the spiciform segments of the contracted fronds.

Section II. *Symphophlebica*, J. Smith.—*Veins* anastomosing or reticulated.

24. *OLFERSIA*, *Raddi*.—*Fronds* (fertile) contracted and soriferous on both surfaces. *Veins* forked, parallel, internal, their apices combined with a transverse continuous marginal vein. *Sori* dense, occupying the whole surface of the fertile fronds.

25. *ANETIUM*, *Splitgerber*.—*Veins* uniform, reticulated, the areoles elongate trapezoid or hexagonal. *Spore-cases* sparingly scattered over the under surface, often collected into small groups or lines.

26. *HYMENODIUM*, *Fee*.—*Fronds* (fertile) contracted. *Veins* uniform, internal, reticulated, forming large elongated trapezoid hexagonal areoles. *Sori* densely covering the under surface of the fertile fronds. *Rhizome* decumbent, criniferous.

27. *ACROSTICHUM*, *Linnaeus*.—*Fronds* contracted in the fertile pinnæ. *Veins* uniform reticulated, forming small elongated usually tetragonal and parallel areoles. *Sori* densely covering the under surface of the fertile pinnæ. *Rhizome* erect, caudiciform.

28. *PLATYCERIUM*, *Desvauz*.—*Fronds* dissimilar, stellately pubescent, the fertile forked. *Veins* repeatedly forked and distantly anastomosing; *venules* internal, compoundly reticulated, with variously directed free *veinlets* terminating in the areoles. *Sori* forming irregular patches near the extremities of the fronds or on special lateral thickened lobes; *receptacle* consisting of an accessory layer of parallel anastomosing *veinlets* crossing the sterile ones, and producing crowded linear lines of spore-cases.

29. *CYRTOGONIUM*, *J. Smith*.—*Fronds* (fertile) contracted. *Veins* pinnately costæform; *venules* arcuately or angularly anastomosing, producing from their exterior sides or points of confluence one or more excurrent free or irregularly anastomosing *veinlets*. *Sori* occupying the under surface of the fertile fronds, or crowded on the venules.

30. *GYMNOPTERIS*, *Bernhardi*.—*Fronds* (fertile) contracted. *Veins* uniform or costæform; *venules* compoundly anastomosing, producing variously directed, straight or curved, free *veinlets*, terminating within the areoles. *Sori* universal on the under surface of the fertile fronds.

Tribe III. *PTERIDEÆ*, *J. Smith*.—*Sori* round or elongated, transverse, marginal, intramarginal, or costal, furnished with a special lateral indusium, free at the inner edge, and attached at the exterior side of the sporangiferous receptacle, which is parallel with the midrib or margin.

Section I. *Chilosorea*, J. Smith.—*Sori* marginal.

31. *ADIANTUM*, *Linnaeus*.—*Costa* excentric or wanting; *veins* unilateral or radiating, forked; *venules* direct, their apices terminating in the axis of the indusium. *Sori* round, reniform, oblong or linear, continuous or interrupted; *indusium* venose, sporangiferous on its under surface.

32. *CHEILANTHES*, *Swartz*.—*Veins* forked; *venules* direct, their apices free and sporangiferous. *Sori* round, solitary or contiguous, often becoming confluent; *indusium* usually reniform, rarely oblong, and including more than one sorus.

33. *HYPOLEPIS*, *Bernhardi*.—*Veins* forked or pinnate, the lower exterior *venule* soriferous. *Sori* round, marginal opposite the sinus of the segments, partly concealed by a spurious indusium formed of a reflexed marginal crenule.

34. *PLATYLOMA*, *J. Smith*.—*Veins* forked; *venules* direct, free, and sporangiferous at the apex. *Sori* oblong, laterally confluent into a broad marginal band; *indusium* narrow, attached to the outer side of the broad sporangiferous receptacle.

35. *DORYOPTERIS*, *J. Smith*.—*Veins* nearly uniform, internal, reticulated, forming elongated oblique areoles. *Sori* linear, continuous; *indusium* narrow.

36. *LITOBROCHIA*, *Presl*.—*Veins* external, elevated, arcuately and angularly anastomosing, forming



unequal areoles, sometimes reticulated only near the midrib or margin. *Sori* linear, continuous, or interrupted; *indusium* narrow.

37. LONCHITIS, *Linnaeus*.—*Veins* reticulated, producing unequal areoles. *Sori* oblong or linear-arcuate, produced on the apices of four or five convergent venules, which terminate in the sinus of the segments; *indusium* linear.

38. PTERIS, *Linnaeus*.—*Veins* forked; *venules* free, or their apices combined by a sporangiferous receptacle; the inferior pair sometimes arcuately or transversely anastomosing, forming a single row of elongated costal areoles. *Sori* linear, continuous or interrupted, usually occupying the sides only of the segments; *indusium* plane, linear, its base often sporangiferous.

39. ONYCHIMUM, *Kaulfuss*.—*Veins* simple, direct, free, or combined at their apices by a transverse sporangiferous receptacle seated in the axis of the indusium. *Sori* short, linear, continuous, usually becoming confluent and covering the whole of the segment; *indusium* plane, linear, slightly intramarginal, the free margins of opposite indusia conniving over the midrib.

Section II. *Metasoreæ*, J. Smith.—*Sori* intramarginal or costal.

40. LOMARIA, *Willdenow*.—*Fronds* dissimilar, the fertile contracted. *Veins* (sterile) forked, scarcely evident in the fertile fronds; *venules* direct, free, with club-shaped apices usually terminating within the margin. *Sori* linear, elongate, continuous, arising from a thick elevated receptacle, often occupying nearly the whole disk; *indusium* vaulted, revolute, and conniving, at length replicate and torn, seated on or within the margin.

41. BLECHNUM, *Linnaeus*.—*Veins* (sterile) forked; *venules* direct, free, in the fertile fronds combined near the base at the point of forking by a transverse sporangiferous receptacle. *Sori* linear, continuous or interrupted, costal, rarely medial; *indusium* plane, conniving with the costa.

42. DOODIA, *R. Brown*.—*Veins* forked; *venules* arcuately anastomosing near the base, there generally soriferous, then free and direct towards the margin. *Sori* oblong, straight or arcuate, transversely uniserial or biserial; *indusium* plane.

43. WOODWARDIA, *Smith*.—*Veins* reticulated, becoming free near the margin. *Sori* oblong or linear, elongated, uniserial, immersed, produced on the transverse costal venules; *indusium* revolute, vaulted.

Tribe IV. ASPLENIEÆ, *J. Smith*.—*Sori* elongated oblique to the midrib or axis of venation borne on the superior or inferior sides, or on both sides, of the venules, and furnished with a special lateral plane or vaulted indusium.

Section I. *Orthophlebieæ*, J. Smith.—*Veins* all free.

44. SCOLOPENDRIUM, *Smith*.—*Veins* forked; *venules* parallel, direct, free, with club-shaped apices, terminating within the margin. *Sori* linear, unilateral, produced on the proximate sides of the anterior and posterior branch of each fascicle of veins, and confluent in pairs (face to face); *indusium* (of each pair) with the free margins conniving, opening by a longitudinal suture.

45. DIPLAZIUM, *Swartz*.—*Veins* forked, or pinnate; *venules* direct, free. *Sori* linear, produced on both sides of the *venules* (back to back), constituting binate sori; *indusium* plane. All, or the lower *venules* only, soriferous on both sides, the superior ones frequently producing simple sori, as in *Asplenium*.

46. ASPLENIUM, *Linnaeus*.—*Veins* forked or pinnate; *venules* direct, free. *Sori* simple, linear, oblong, or elongated, unilateral on the anterior side of the *venules*; *indusium* plane or vaulted.

Section II. *Symphlebieæ*, J. Smith.—*Veins* anastomosing or reticulated.

47. CETERACH, *Willdenow*.—*Veins* forked or pinnate; *venules* more or less anastomosing, the lower anterior one soriferous on the side next the rachis. *Sori* oblong or linear, unilateral, protruding through dense elongated scales; *indusium* obsolete.



48. NEOTTOPTERIS, *J. Smith*.—*Veins* forked; *venules* direct, parallel, combined at the apices by a transverse continuous marginal vein. *Sori* linear parallel, unilateral on the anterior side of the venules; indusium plane.

49. ANTIGRAMMA, *Presl*.—*Veins* forked; *venules* angularly anastomosing or reticulated, with the marginal *veinlets* free. *Sori* linear, unilateral on the proximate sides of the primary venules of each fascicle, usually confluent in pairs; *indusium* linear, the free margins of each pair conniving.

50. HÆMIDICTYUM, *Presl*.—*Veins* forked; *venules* parallel near the costa, anastomosing and reticulate near the margin, where they are combined by a transverse continuous vein. *Sori* linear, unilateral, on the anterior side of the parallel portion of the venules; *indusium* plane.

51. CALLIPTERIS, *Bory*.—*Veins* pinnately costæform, the opposite pairs of *venules* angularly anastomosing, the superior ones usually free. *Sori* linear, binate, produced on both sides the venules; *indusium* plane.

Tribe V. ASPIDIEÆ, *J. Smith*.—*Sori* round, rarely oblong, intramarginal, furnished with a special indusium, which is orbicular produced from the centre of the sporangiferous receptacle, or reniform or cucullate produced from its posterior side, or attached wholly round the receptacle (calyciform).

Section I. *Symploplebieæ*, *J. Smith*.—*Veins* anastomosing or reticulate.

52. HYPODERRIS, *R. Brown*.—*Veins* costæform; *venules* compoundly anastomosing, producing from their sides variously directed free sterile *veinlets*, and soriferous at the points of confluence of several *veinlets*. *Sori* small, irregular or uniserial on each side the veins; *indusium* small calyciform, very membranous, laciniate and fimbriate at the margin.

53. ASPIDIUM, *Swartz*.—*Veins* costæform; *venules* compoundly anastomosing, producing from their sides variously directed free sterile *veinlets*, and soriferous on the points of confluence of several *veinlets*. *Sori* round, reniform, or by confluence oblong, irregular, or uniserial on each side the veins; *indusium* orbicular, peltate, or reniform, and attached laterally.

54. SAGENIA, *Presl*.—*Veins* pinnate; *venules* arcuately or angularly anastomosing (compoundly anastomosing in the sterile fronds), forming unequal areoles with variously directed free *veinlets* on the apices of which the *sori* are most frequently borne. *Sori* reniform or orbicular, uniserial on each side the primary veins, or irregular, usually on the apices of free *veinlets*, sometimes on the points of confluence of two or more *veinlets*; *indusium* reniform or orbicular.

55. ONOCLEA, *Linnaeus*.—*Fronds* dissimilar, the fertile with contracted bacciform sessile segments, with membranous conniving fimbriate margins forming an universal indusium. *Veins* (fertile fronds) simple direct free; or (sterile fronds) reticulated. *Sori* round, confluent, 4—8 on each segment, medial, the pedicels of the spore-cases concrete; *indusium* (special) lateral, cucullate, very membranous.

56. CYRTOMIUM, *Presl*.—*Veins* pinnate; *venules*, except the lower exterior one, which is free and fertile, angularly anastomosing, and producing from their exterior side or angular junction, 1—3 excurrent free fertile *veinlets*. *Sori* round, medial, numerous, transversely multiserial; *indusium* orbicular, peltate.

57. FADYENIA, *Hooker*.—*Fronds* dissimilar, the fertile contracted, the sterile proliferous at its apex. *Veins* forked; *venules* anastomosing and reticulate, the lower anterior one in each fascicle free and fertile at its apex. *Sori* large, roundish- or oblong-reniform, transversely uniserial in the costal areoles; *indusium* reniform, lateral.

58. NEPHRODIUM, *Schott*.—*Veins* pinnately-costæform; *venules* angularly anastomosing, the lower or more pairs producing from their junction an excurrent anastomosing *veinlet*, the superior ones free. *Sori* round, medial, uniserial on each side the primary veins, sometimes confluent; *spore-cases* sometimes echinate; *indusium* reniform, rarely orbicular.



Section II. *Orthophlebice*, J. Smith.—Veins all free.

59. *WOODSIA*, *R. Brown*.—*Veins* forked; *venules* simple. *Sori* round, terminal or medial, at first distinct, subsequently confluent; *indusium* calyciform, nearly entire or deeply lacinated, the laciniae usually terminating in long hairs which involve the spore-cases.

60. *CYSTOPTERIS*, *Bernhardi*.—*Veins* forked; *venules* simple. *Sori* round, medial, often becoming confluent; *indusium* lateral, oblong, inflated, cucullate, attached beneath the sorus across the venule by its broad base, the free margin dentate or fimbriate.

61. *LASTREA*, *Presl*.—*Veins* forked or pinnately costæform; *venules* direct. *Sori* round, uniserial, medial, or terminal; *indusium* lateral, reniform, rarely orbicular, glabrous or pilose, sometimes cochleate.

62. *PYCNOPTERIS*, *T. Moore*.—*Veins* forked; *venules* elongate, parallel, direct, mostly terminating in club-shaped apices near the margin, the lowest anterior and posterior ones (sometimes more) in each fascicle soriferous. *Sori* large, roundish-reniform, medial, near the costa, irregularly bi-triserial; *receptacle* elevated; *indusium* reniform.

63. *POLYSTICHUM*, *Schott*.—*Veins* forked or pinnately-forked; *venules* direct, the lower anterior one more fertile. *Sori* round, medial, rarely terminal, uniserial; *indusium* orbicular, peltate, rarely excentric and reniform.

64. *CYCLOPLETIS*, *J. Smith*.—*Veins* thrice dichotomously branched; *venules* direct, the lower anterior and posterior ones of each fascicle fertile. *Sori* round, medial or terminal, biserial; *indusium* orbicular, peltate.—*Pinnæ articulate*.

65. *DIDYMOCHLÆNA*, *Desvaux*.—*Veins* forked, radiating; *venules* direct, the apices of the sterile ones clavate, the anterior one fertile. *Sori* elliptical, terminal, uniserial; *indusium* oblong, longitudinally attached by its centre.—*Pinnules articulate*.

66. *NEPHROLEPIS*, *Schott*.—*Veins* forked; *venules* direct, the anterior one soriferous. *Sori* round, terminal, uniserial; *indusium* reniform, sometimes almost orbicular.—*Pinnæ articulate*.

67. *OLEANDRA*, *Cavanilles*.—*Veins* simple or forked; *venules* parallel, direct, their apices curved, forming a slightly thickened margin. *Sori* round, costal or irregular, uniserial; *indusium* reniform, rarely orbicular.

*Tribe VI. DICKSONIÆ*, *J. Smith*.—*Sori* marginal, round, globose, vertically-oblong or transversely-elongate, with a special interior-attached lateral indusium, conniving more or less with the changed indusiiform margin of the frond, forming urceolate calyciform or two-lipped cysts, or marginal grooves containing the spore-cases.

Section I. *Lindsæa*, *J. Smith*.—Spore-cases pedicellate, from an elongated transversely anastomosing, rarely simple, terminal receptacle; indusia plane two-lipped.

68. *DICTYOXIPHUM*, *Hooker*.—*Fronds* dissimilar, the fertile contracted with revolute margins, soriferous on the upper half. *Costa* central, prominent; *veins* internal, nearly uniform, compoundly-anastomosing with variously directed free *veinlets* terminating in the areoles. *Sori* linear, continuous, occupying both margins; *indusium* linear, attached to the receptacle, opening from the upper surface of the frond, and becoming rolled back.

69. *LINDSÆA*, *Dryander*.—*Costa* excentric or wanting; *veins* forked radiating; *venules* (sterile fronds) direct free; or (fertile fronds) combined at their apices by the transverse receptacle. *Sori* linear, continuous rarely interrupted; *special indusium* linear, continuous, usually shorter than the indusiiform margin of the frond.

Section II. *Davalliæ*, *J. Smith*.—Spore-cases pedicellate from a simple terminal receptacle; indusium more or less attached by its base and sides, rarely by its base only, equalling the margin of frond and forming an urceolate two-lipped or tubular vertical cyst.

70. *LEUCOSTEGIA*, *Presl*.—*Veins* forked; *venules* direct, free. *Sori* round, terminal, often solitary on each segment, seated in the sinus; *indusium* scarious, orbicular or oblong, its sides free.



71. MICROLEPIA, *Presl*.—*Veins* forked or pinnate; *venules* direct, free. *Sori* round or oblong, vertical, superficial, intramarginal; *receptacle* elevated; *spore-cases* spreading, rarely immersed in a cystiform cavity; *indusium* attached by its base and sides widening upwards, the free margin rounded or truncate.

72. DEPARIA, *Hooker*.—*Veins* pinnate; *venules* simple, direct, their apices free and sporangiferous. *Sori* globose, extra-marginal; *spore-cases* pedicellate, vertical; the *indusia* forming with the indusiiform teeth, calyciform exserted cysts.

73. DAVALLIA, *Smith*.—*Veins* forked; *venules* direct, free, with their apices soriferous. *Sori* vertically oblong, intramarginal; *spore-cases* pedicellate, exserted beyond the free margin of the indusium; *indusium* inflated, forming with the changed margin of frond, a vertical two-lipped or tubular cyst with the apex usually constricted.

Section III. *Trichomanes*, J. Smith.—*Spore-cases* sessile, seated compactly around a columnar receptacle, included within a bilabiate or urceolate usually vertical cyst, formed by the connivance of the indusium with the margin of the frond.

74. TRICHOMANES, *Linnaeus*.—*Veins* simple or forked, direct. *Sori* vertically oblong, terminal; *spore-cases* sessile; *receptacle* filiform exserted; *indusium* urceolate or calyciform.

75. HYMENOPHYLLUM, *Smith*.—*Veins* direct, free. *Sori* globose or vertically oblong; *spore-cases* sessile; *receptacle* columnar included; *indusium* urceolately two-lipped.

Section IV. *Dicksonia*, J. Smith.—*Spore-cases* pedicellate from a round terminal receptacle, included within a concave two-lipped or calyciform reflexed cyst, formed by the connivance of the special indusium with the indusiiform crenules of the frond.

76. SITOBOLIUM, *Desvaux*.—*Veins* pinnate; *venules* simple or forked, direct, their apices free and sporangiferous. *Sori* globose, exserted; *receptacle* elevated, globose; *special* and *accessory indusia* nearly equal, forming a reflexed entire or two-lipped calyciform cyst.

77. BALANTIUM, *Kaulfuss*.—*Veins* pinnate; *venules* simple or forked, direct, free. *Sori* large, nearly globose, exserted, solitary on each segment; *receptacle* elevated, oblong; *special* and *accessory indusia* coriaceous, nearly equal, forming slightly reflexed oblong transversely two-lipped cysts.

78. DICKSONIA, *L'Heritier*.—*Veins* pinnate; *venules* simple, direct, free, soriferous at the apex. *Sori* large, globose; *receptacle* elevated, globose; *indusia* coriaceous, the *accessory* cucullate, larger than the *special*, forming with it a reflexed unequal two-lipped cyst.

79. CIBOTIUM, *Kaulfuss*.—*Veins* forked or pinnate; *venules* direct, free, soriferous at the apex. *Sori* somewhat globose, superficial, seated on the interior edge of the margin or sinus; *receptacle* small; *indusium* coriaceous, of two unequal valves, forming a reflexed adnate two-lipped cucullate cyst.

Tribe VII. CYATHEÆ, J. Smith.—*Sori* round, globose, intramarginal, medial or axillary, furnished (generally) with a calyciform or lateral interior-attached special indusium, or naked, or furnished with articulate hairs involving the spore-cases. *Receptacle* elevated, globose, or columnar. *Spore-cases* usually sessile and compressed.

80. CYATHEA, *Smith*.—*Veins* pinnately-costæform; *venules* forked, direct, free. *Sori* medial or costal, uniserial, usually axillary in the forks of the veins; *spore-cases* compressed, seated on a globose receptacle; *indusium* inferior, with an operculiform apex, becoming calyciform, entire or unequally lacerated.

81. HEMITELIA, *R. Brown*.—*Veins* simply or pinnately-forked; *venules* free, or the inferior ones angularly anastomosing, forming a costal arch and other areoles between the sinus and midrib of the segments. *Sori* medial, uniserial, submarginal, or irregular; *receptacle* globose; *indusium* semi-calyciform, interiorly attached.

82. ALSOPHILA, *R. Brown*.—*Veins* pinnately costæform; *venules* simple or forked, direct, free. *Sori* round or sub-globose, sometimes becoming confluent, medial or axillary, naked or furnished with a lateral interior *indusium*, which is sometimes very small or hair-like.



GLEICHENIACEÆ, R. Brown.—*Spore-cases sessile, globose or pyriform, opening vertically, with a complete transverse ring. Sori round, superficial or immersed.*

83. GLEICHENIA, *Smith.*—*Veins* pinnate or pinnately forked; *venules* free, the lower anterior one fertile. *Sori* round, terminal, naked and superficial, or immersed in a concave cyst; *spore-cases* 2—4.

84. MERTENSIA, *Willdenow.*—*Veins* simply or pinnately forked; *venules* direct free, the anterior one fertile. *Sori* round or globose, medial, naked or intermixed with hairs, superficial; *spore-cases* 3—8.

SCHIZÆACEÆ, Martius.—*Spore-cases sessile, oval oblong, rarely globose, striate or rayed at the apex, opening lengthways (vertically) on the exterior side, produced on contracted marginal lobules or special appendices to the fronds.*

85. LYGODIUM, *Swartz.*—*Veins* (sterile) forked, free, or (fertile) pinnate; *venules* arcuate, bearing the spore-cases on their superior sides. *Sori* on marginal appendices, forming linear spikelets, composed of two series of indusiate imbricating cysts, each of which contains an oval resupinate spore-case attached by its interior side.

86. LYGODICTYON, *J. Smith.*—*Veins* (sterile) pinnate; *venules* anastomosing, forming unequal oblong areoles. *Sori* on marginal appendices, forming linear spikelets, composed of two rows of indusiate imbricating cysts, each of which contains an oval resupinate spore-case attached by its interior side.

87. SCHIZÆA, *Swartz.*—*Fertile appendices* terminal, forming a reflexed pinnate crest of linear segments, which have an inflexed indusiiform margin. *Spore-cases* oval, vertical, arranged in a compact row on each side the midrib of the linear unilateral conniving segments.

88. ANEIMIA, *Swartz.*—*Veins* forked; *venules* direct, free. *Fertile fronds* tripartite, the two opposite branches contracted erect. *Sori* unilateral on linear segments, forming dense compound panicles; *spore-cases* oval, vertical, naked.

89. ANEIMIDICTYON, *J. Smith.*—*Veins* forked; *venules* reticulated, forming unequal oblong areoles; otherwise as *Aneimia*.

90. MOHRIA, *Swartz.*—*Fronds* dissimilar, the fertile erect, uniformly contracted, constituting a rachiform unilateral sporangiferous panicle, with the margin of the segments inflexed. *Veins* forked; *venules* direct, free. *Sori* marginal, on or near the apices of the venules; *spore-cases* ovate, globose, naked.

OSMUNDACEÆ, Martius.—*Spore-cases pedicellate, globose, reticulated, opening by a vertical slit (bivalved), the apex oblique, gibbous, pellucid, destitute of a ring.*

91. OSMUNDA, *Linnaeus.*—*Veins* forked; *venules* direct, free. *Sori* naked and densely clustered on contracted fronds, or on some portion of the segments, which are contracted, rachiform, simple or paniculate; *spore-cases* large, subglobose.

92. TODEA, *Willdenow.*—*Veins* simple or forked; *venules* direct, free. *Sori* oblong, simple, or forked, and subsequently confluent; *spore-cases* naked, subglobose, bivalved, produced on evident venules, few to each sorus.

MARATTIACEÆ, Kaulfuss.—*Spore-cases sessile (rarely pedicellate), horny, opaque, distinct, and unilocular, or laterally and oppositely connate, forming a multilocular round, oblong, or linear biserial or bivalved compound spore-case, opening by pores or vertical slits on the interior side.*

93. MARATTIA, *Smith.*—*Veins* forked; *venules* direct, free. *Sori* linear, submarginal, consisting of a transverse row of large oblong opaque multilocular spore-cases, one on each vein; *spore-cases* sessile,



distinct, subterminal, longitudinally two-valved, the valves laterally connate, containing 6-12 cells, opening by a vertical internal slit; *receptacle* subterminal.

94. *EUPODIUM*, *J. Smith*.—*Veins* simple or forked, *venules* direct, free. *Spore-cases* large, oblong, multilocular, seated on slender stalks, longitudinally two-valved, the valves laterally connate, containing 5-8 cells opening by a vertical slit inside; *receptacle* medial.

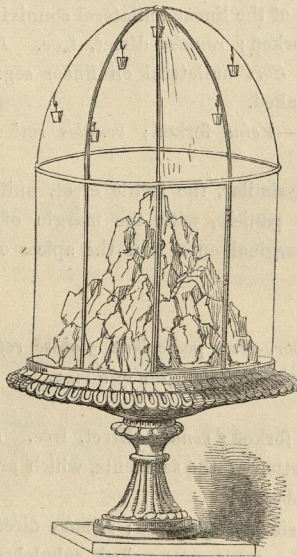
95. *ANGIOPTERIS*, *Hoffman*.—*Veins* simple or forked; *venules* direct, free. *Sori* linear, continuous, compound; *spore-cases* obovate, emarginate, sessile, laterally confluent, arranged in opposite series of 5-7 cells, the cells opening by a vertical internal slit; *receptacle* medial.

96. *DANÆA*, *Smith*.—*Veins* forked; *venules* direct, parallel, arcuate on their apices, anastomosing with the cartilaginous margin. *Spore-cases* linear, biserial, multilocular, each cell opening by a circular pore; *receptacle* occupying the whole length of the venules.—Fertile fronds usually contracted.

*OPHIOGLOSSACEÆ*, *Presl*.—*Spore-cases* sessile, roundish or subglobose, opening by a transverse fissure (bivalved), opaque, without a ring or reticulation.

97. *BOTRYCHIUM*, *Swartz*.—Fronds two-branched, the fertile branch erect, contracted, constituting a compound sporangiferous unilateral panicle. *Veins* simple or forked, radiating; *venules* direct, free. *Spore-cases* globose, distinct.

98. *OPHIOGLOSSUM*, *Linnaeus*.—Fronds two-branched, the sterile portion spreading, usually shorter than the erect fertile spike. *Veins* (sterile) uniform, reticulated, forming elongated areoles. *Spore-cases* roundish, connate in two parallel rows into a simple compact spike.



FERN CASE.



# THE GENERA AND SPECIES OF CULTIVATED FERNS.

## Order, POLYPODIACEÆ, R. BROWN.

Tribe, POLYPODIÆ, J. Smith—Sori of definite form, naked, *i. e.* without an indusium.

Sect. ORTHOPHLEBIÆ, J. Smith (from *orthos*, straight, and *phleps*, a vein).—Veins simple or forked, free, that is, not united so as to form a network.

### I. GRAMMITIS, Swartz.

Sori oval, oblong, oblique; *spore-cases* lateral. *Veins* simple or forked, internal, the soriferous *venule* sometimes very short. *Fronde* simple, linear, with entire or serrulate margins, plane or convex at the apex.—Name derived from *gramme*, a line; alluding to the lines of sori.

This genus has considerable affinity with the § *Leptogramma* of *Gymnogramma*, in consequence of its linear-oblique sori; but it is distinguished by its dwarf habit, simple fronds, and more simple venation. There are several species known; but one only has hitherto been introduced in a living state. Fig. 1 represents the upper portion of a frond of *Grammitis Billardieri* (nat. size).

1. G. BILLARDIERI, Willdenow (G. AUSTRALIS, R. Brown).—An interesting evergreen greenhouse species, from New Holland. Fronds simple linear-lanceolate acuminate, from four to six inches long, light green, attenuated at the base. Sori linear-oblique, confined to the upper portion of the frond, occupying the whole of the venules. Stipes hairy; terminal, adherent to a tufted rhizome.



Fig. 1

### II. POLYPODIUM, Linnæus.

Sori circular, rarely oval or oblong, naked, transverse, uniserial, solitary or irregular; *spore-cases* terminal or lateral, sometimes seated in a deep cyst or cavity forming elevated protuberances on the upper surface of fronds.

*Veins* simple, forked or pinnate, free. *Fronde* varying from a few inches to four or five feet high, and from simple to decompose; coriaceous, membranous, glabrous, villose or glandulose.—Name derived from *polys*, many, and *pous*, a foot; the creeping rhizome having many foot-like divisions or tubercles.

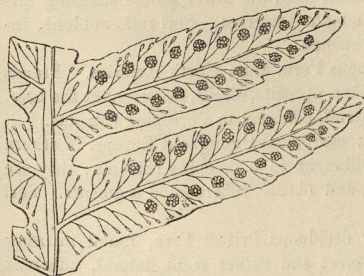


Fig. 2.

This genus, before it was divested of those possessing a reticulated venation, included between 200 and 300 species, presenting wide differences in habit and texture and in the circumscription of their fronds, which are now distributed among nine genera. The true *Polypodiums* have naked circular (rarely oblong) sori, with simple forked or pinnate free veins. Fig. 2 represents a portion of *Polypodium vulgare* (nat. size).



‡ CTEONPTERIS, *Blume*.—Fronds articulated with the creeping rhizome.

1. *P. VULGARE*, *Linnaeus*.—A hardy ornamental evergreen, indigenous Fern,\* common in Europe, Asia, and North America. Fronds glabrous pinnatifid, one foot high, dark green; segments lanceolate, approximate, obtuse at the apex, with a crenulate or serrulate margin. Sori confined to the upper portion of the frond, arranged in a single row on each side of the midrib of the lobes (uniseriate); spore-cases attached to the apex of an excurrent venule (terminal); apices of veins club-shaped. Stipes lateral, articulated with a creeping scaly rhizome.

Several forms of the common Polypody are found with the segments more or less pinnatifid, lobed, crenate, serrate, or bifid at the apex; but two or more of these may often be detected growing on the same plant. The only form that appears to maintain a markedly distinct character is *P. cambricum*, *Linnaeus*, the segments of which are deeply and interruptedly pinnatifid. It is very elegant, but usually without fructification.

2. *P. MACROCARPUM*, *Presl*. (*GONIOPHLEBIUM*, *J. Smith*; *PLEOPELTIS PINNATIFIDA*, *Hooker and Greville*).—A dwarf evergreen stove Fern, native of South America. Fronds four to eight inches high, ovate, dark green above, and covered over beneath with distinct ovate caudate scales, which are black in the centre, brown, and deeply fringed on the margin. The fronds are pinnatifid, with oblong obtuse segments, and they are articulated on a scaly creeping rhizome. Sori large, uniseriate. We have only seen sterile fronds of the cultivated plant, but it appears to be identical with the species to which we have referred it, and from which our description of its size and fructification are drawn. It is a true *Polypodium*, the venation being free.

3. *P. INCANUM*, *Suartz* (*GONIOPHLEBIUM*, *J. Smith*; *P. VELATUM*, *Schkuhr*).—A dwarf evergreen stove fern, native of the West Indies, various parts of South America, and Natal. Fronds pinnatifid, six to twelve inches long, lanceolate; segments oblong-obtuse, coriaceous, the upper surface dull green, densely covered beneath with roundish fimbriate peltate brown scales; they are lateral, articulated on a scaly creeping rhizome. Sori immersed, sub-marginal, uniseriate. Veins internal and indistinctly seen, but they are free, and it is consequently a true *Polypodium*.

4. *P. PLUMULA*, *Humboldt*.—An exceedingly beautiful evergreen stove species, from the West Indies and South America. Fronds lanceolate, sub-pinnate, from six inches to a foot or more long, grass green, with numerous linear, parallel, horizontal segments, thinly scattered over the under side with very small scales. Sori uniseriate on the upper portion of the frond. Rachis and stipes ebeneous, scaly beneath; lateral, articulated, with a small creeping rhizome.

5. *P. OTITES*, *Linnaeus* (*P. PECTINATUM*, of gardens—fide *Kunze*).—A very beautiful evergreen stove Fern, native of the West Indies. Fronds slender, sub-pinnate, from one to one and a half foot long, pubescent; the pinnae linear, parallel, horizontal. Stipes and rachis black. Sori uniseriate, of a bright yellowish-brown, distributed over the whole under surface. Fronds lateral, articulated on a creeping rhizome.

6. *P. PARADISEÆ*, *Langsdorf and Fischer* (*P. OTITES* of gardens).—A very handsome evergreen stove species, from Brazil and the West Indies. Fronds pubescent, from two to five feet long, very slender, lanceolate-elongate, narrowing to the base, sub-pinnate, the segments linear, nearly horizontal; the stipes and rachis blackish-brown. Sori uniseriate, occurring over nearly the whole frond. Stipes very short; lateral, articulated on a creeping rhizome.

7. *P. FRATERNUM*, *Schlechtendal* (*P. HENCHMANNI*, *J. Smith MS*).—A glabrous evergreen stove Fern, from Mexico. Fronds oblong, acuminate, two feet long, quite smooth, pinnate, with long, linear-lanceolate, narrow pinnae, decurrent at the base, very dark green; lateral, articulated, on a scaly creeping rhizome. Sori large, uniseriate, bright brown.

‡ PHEGopteris, *Presl*.—Fronds adherent to the rhizome.

8. *P. PHEGopteris*, *Linnaeus*.—A deciduous hardy indigenous species, found in most European countries, as far north as Lapland. Fronds pinnato-pinnatifid, from six to twelve inches long, the lower pinnae standing forward, deflexed, with linear-lanceolate, entire segments, the upper ones adnate-decurrent. Sori rather oblong, intramarginal. Fronds lateral, adherent on a somewhat scaly creeping rhizome.

9. *P. HEXAGONOPTERUM*, *Michaux*.—A very handsome hardy deciduous Fern, from North America. Fronds triangular, about one and a half foot long, rather hairy, bipinnatifid; pinnae opposite, sessile, decurrent at the base, with oblong-obtuse crenulate segments. Sori sub-marginal. Stipes lateral, adherent to a creeping rhizome.

10. *P. DRYOPTERIS*, *Linnaeus*.—A deciduous hardy British species; also found throughout Europe, Northern Asia, and North America. Fronds six to ten inches high, lateral, adherent to a creeping rhizome; they are ternate, deltoid, smooth, bipinnate, with deflexed spreading divisions, and obtuse, subcrenate segments. Sori rather oblong, intramarginal.

11. *P. ROBERTIANUM*, *Hoffman* (*P. CALCAREUM*, *Smith*).—A hardy deciduous British Fern, found in other parts of central Europe. Fronds from six to twelve inches high, erect and rather rigid, lateral, adherent to a rough scaly creeping rhizome; triangular, elongate, three-branched, the branches doubly pinnate, with somewhat crenate obtuse segments. Sori round, intramarginal. Veins simple, occasionally forked.

\* For more ample descriptions and figures of the British species, see *Handbook of British Ferns*. London: Groombridge.



12. *P. ALPESTRE*, *Sprengel* (ASPIDIUM, *Hoppe: Schkuhr*; *A. RHÆTICUM*, *Swartz*; *P. RHÆTICUM*, *De Candolle*).—An ornamental, hardy, deciduous Fern; native of Switzerland, and of the Highlands of Scotland. Fronds glabrous, lanceolate, one to three feet long, bipinnate, with lanceolate-acuminate pinnae; the pinnules distinct, pinnatifid, oblong. Sori medial, round and uniserial. Stipes short, terminal, adherent to a short decumbent rhizome.

13. *P. DREPANUM*, *Lowe* (ASPIDIUM, *Swartz*; POLYSTICHUM, *Presl*).—An ornamental evergreen warm greenhouse species, from Madeira. Fronds ovate acuminate, one and a half to two feet long, bipinnate, dark green; pinnae four to six inches long; pinnules lanceolate, falcate, auriculate, pinnatifid, inferior ones distant, cuneate at the base, superior basal ones longest, uppermost ones confluent, the segments all acutely toothed. Rachis and stipes paleaceous; terminal, adherent to a fasciculate erect rhizome. This plant has been placed in *Aspidieae* by most authors; and we had adopted this view in the *Gardener's Magazine of Botany* (iii. 320); but having since had an opportunity of examining the sori in its earliest stages, we have now no hesitation in referring it back to *Polypodium*, it being entirely destitute of an indusium.

14. *P. EFFUSUM*, *Swartz*.—An evergreen stove Fern, from Jamaica. Fronds deltoid, membranous, three to five feet long, glabrous, pale green; four times pinnate, with lanceolate pinnae; the pinnules linear-lanceolate, with pinnatifid segments, the lower one distant. Sori round, medial; veins pinnately forked. Stipes scaly, especially near the base, adherent to a short creeping rhizome.

15. *P. AMPLUM*, *Humboldt* (*P. LACHNOPodium*, *J. Smith*—*fide Klotzsch*).—A very ornamental stove species, from Jamaica. Fronds deltoid, of a soft delicate texture, from two to four feet long, bi-tripinnatifid, with lanceolate-acuminate pinnules, and oblong-linear, obtuse, hairy segments. Sori round, medial. Stipes and rachis densely covered with narrow brown scales. The fronds are terminal, adherent around an erect (caudiciform) rhizome.

16. *P. RUGULOSUM*, *Labillardière* (HYPOLEPIS RUGULOSA, *J. Smith*; *H. AMAURORACHIS*, *Hooker*; CHEILANTHES AMAURORACHIS, *Kunze*).—A rambling-growing evergreen greenhouse species, native of New Holland, New Zealand, and the Island of Tristan d'Acunha. Fronds triangular elongate, from two to four feet high, tripinnate, pinnae lanceolate, with lanceolate-acuminate pinnules, and oblong, rather obtuse segments, the lower ones distant and pinnatifid, margin slightly crenulated. Sori round, sub-marginal. Fronds covered with glandulous hairs, lateral, adherent to a very peculiar, elongated, rough, creeping rhizome. Rachis and stipes purplish.

### III. STRUTHIOPTERIS, Willdenow.

*Sori* round, confluent, wholly occupying the under surface of the segments; *spore-cases* lateral; base of the pedicels concrete, forming an elevated, thickened receptacle. *Veins* pinnate, free. *Fronds* of two kinds—fertile, with contracted, revolute margins, forming a spurious universal indusium; the *pinnae* linear, revolute, moniliform, each segment producing five soriferous veins, the margin becoming replicate and lacerated, and wholly occupied by round confluent *sori*.—Name derived from *struthios*, an ostrich, and *pterus*, a fern; in allusion to the resemblance of the fronds to ostrich-feathers.

The habit of this genus, more than any technical character, separates it from *Polypodium*. Fig. 3 represents a pinnule of the sterile, and a portion of the fertile frond of *Struthiopteris pennsylvanica* (nat. size.)

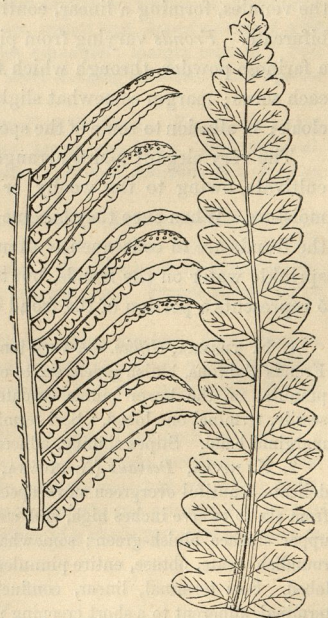


Fig. 3.

1. *S. GERMANICA*, *Willdenow* (OSMUNDA STRUTHIOPTERIS, *Linnaeus*).—A hardy deciduous ornamental Fern, from the south of Europe. Sterile fronds arranged in an exterior circle, reclining, from two to three feet long, lanceolate, pinnate, with pinnatifid-acuminate pinnae. Fertile fronds few, occupying the centre, erect, about a foot long, dark brown, and resembling a bunch of feathers; they are contracted, pinnate, the pinnae crowded, linear, revolute, and moniliform. Sori round, confluent. Fronds terminal, adherent to an erect (caudiciform) rhizome.

2. *S. PENNSYLVANICA*, *Willdenow* (ONOCLEA NODULOSA, *Schkuhr*).—A hardy deciduous ornamental species, from North America. The sterile fronds commonly attain the height of two feet, and are lanceolate, pinnate, the pinnae acuminate, pinnatifid, with rounded blunt segments. The fertile ones are about a foot long, contracted, pinnate, with linear, crowded pinnae, which are revolute and moniliform. Sori round, confluent. Rhizome erect; fronds adherent.



IV. ALLOSORUS, *Bernhardi*.

*Sori* round or oblong, becoming confluent, and ultimately occupying the whole under-surface of the segments; *spore-cases* attached on or near the apex of the veins, forming broad, intramarginal, compound, transverse sori, concealed by the revolute margin of the pinnules. *Veins* forked, free, elevated,

terminating within the indusiiform margin. *Fronds* of two kinds—sterile, bi-tripinnate, generally smooth, with the pinnules dentate, crenate, or lacinate; fertile, contracted, segments oval or oblong, elliptical, revolute, and plaited.—Name derived from *allos*, various, and *soros*, a heap; in allusion to the altered appearances presented by the sori during the different stages of their development.

Fig. 4 represents the upper portion of a sterile, and upper portion of a fertile frond (nat. size); and a segment of fertile frond (magn.), showing the veins and sori of *Allosorus crispus*.

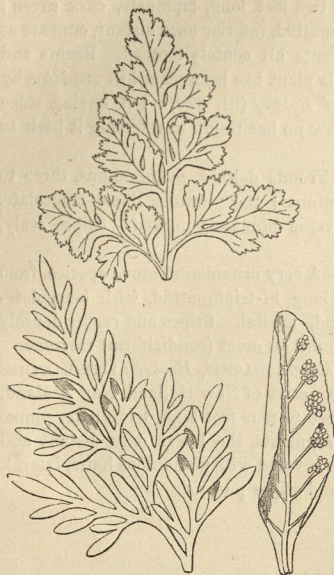


Fig. 4.

1. *A. CRISPUS*, *Bernhardi* (*OSMUNDA*, *Linnaeus*; *PHOROBOLUS*, *Desvaux*; *PTERIS*, *Linnaeus*; *CRYPTOGRAMMA*, *R. Brown*).—A very elegant dwarf hardy Fern, native of Britain, and the Alps of Europe. Sterile fronds bipinnate; pinnules bi-tripinnatifid, segments oblong, often bi-dentate. Fertile fronds contracted, bipinnate, tripinnate below; pinnules linear-oblong, rather obtuse, revolute, entire, narrow at the base. Sori round, intramarginal, subsequently confluent, concealed by the revolute margin of the frond. Veins simple, forked where they are soriferous. Fronds triangular, from three to six inches high, adherent to a decumbent tufted rhizome. There are two or three distinct-looking forms of this plant occasionally met with; but they are not sufficiently constant to be considered as permanent varieties. Several species of *Platyloma* are referred to this genus by some authors.

V. NOTHOCHLÆNA, *R. Brown*.

*Sori* round, solitary, subsequently confluent; *spore-cases* terminal, attached on or near the apex of the venules, forming a linear, continuous or interrupted marginal line. *Veins* forked, free, pinnate or bifurcate. *Fronds* varying from pinnate to bi-tripinnate, hairy, densely scaly, woolly, or covered with a farinose powder, through which the *spore-cases* protrude; of the latter there are usually but few to each sorus; margin somewhat slightly reflexed.—Name derived from *nothos*, spurious, and *chlaina*, a cloak; in allusion to some of the species appearing to have an involucre. Sometimes written *Notholæna*.

The very elegant plants arranged under this genus are of dwarf habit, and generally difficult to cultivate, owing to the woolly or scaly surface of the fronds, which retains moisture. When once they become wet the water does not readily pass off, and the fronds are in consequence often destroyed. It is therefore not advisable to sprinkle water on the fronds, but to keep them quite dry during winter. Fig. 5 represents a portion of the frond of *Nothochlæna trichomanoides*.

1. *N. TENERA*, *Gillies*.—A very tender delicate evergreen stove Fern, from Chili. Fronds glabrous, bluish green, six to eight inches high, somewhat lanceolate, bipinnate; pinnules on the lower pinnae cordate-ovate, oblong-obtuse, superior ones becoming sessile, terminal one lobed. Sori terminal, linear, continuous, confluent, forming a broad marginal band. Stipes shining, adherent to a short creeping rhizome.

2. *N. NIVEA*, *Desvaux* (*N. INCANA*, *Presl*; *PTERIS NIVEA*, *Poiret*).—A very tender delicate beautiful evergreen stove species, native of Mexico, Peru, and Chili. Fronds from six to twelve inches high, and covered beneath with white farinose powder, the upper surface bluish-green; somewhat lanceolate, with a broad base; bipinnate, with roundish ovate, obtuse, entire pinnules, which are cordate at the base, the terminal one lobed. Sori terminal, linear, confluent, forming a broad marginal band. Fronds terminal, adherent to a short creeping rhizome.

3. *N. ARGENTEA*, *J. H.*—This, one of the handsomest of the genus, is an evergreen stove species, native of South America. Fronds triangularly ovate, about six inches long, and covered throughout with white farinose powder; sub-tripinnate, with oblong obtuse crenate pinnules,



Fig. 5.



the lower ones distant. Stipes, rachis, and midrib of pinnæ shining black. Sori linear, terminal, consisting of a single row of spore-cases, near the margin of each segment. Stipes scaly near the base. Fronds adherent to a somewhat creeping rhizome.

4. *N. TRICHOMANOIDES*, *R. Brown* (PTERIS, *Linnaeus*).—A very handsome evergreen stove Fern, from Jamaica. Fronds slender, pendulous, one foot long, linear, pinnate, covered especially beneath, with a white farinose powder, and brown stellate pubescence; pinnæ oblong, obtuse, bluntly lobed or crenate, cordate and auriculate at the base. Sori terminal, confluent, forming a linear continuous marginal band. Fronds terminal.

5. *N. LEVIS*, *Martens and Galeotti*.—A beautiful evergreen warm greenhouse Fern, native of Mexico. Fronds linear-lanceolate, pinnate, a foot long, deep green on the upper surface, and densely covered beneath with imbricated fringed white scales, which ultimately become of a rich brown; upper surface scattered over with a stellate scaly pubescence; pinnæ stalked, cordato-oblong, round at the apex, inferior ones hastate, and sinuate, superior ones entire. Sori linear, continuous, sub-marginal, protruding through the scales, forming a broad black band. Fronds lateral or subterminal, adherent to a whitish, scaly, shortly-creeping rhizome. This plant has the venation and broad sori of a *Platyloma*, but is destitute of an indusium, the margin of the frond being quite flat.

6. *N. RUFA*, *Presl* (CHEILANTHES FERRUGINEA, *Willdenow*).—A slender and rather straggling growing stove species, native of the West Indies and South America. Fronds narrow, linear, from twelve to eighteen inches long, woolly, pinnate; pinnæ ovate, oblong-obtuse, pinnatifid, with the stipes and rachis light brown. Sori terminal; marginal, forming a linear continuous row of little more than single spore-cases. Fronds adherent to a creeping rhizome.

7. *N. SINUATA*, *Kaulfuss* (ACROSTICHUM, *Swartz*).—A very elegant evergreen stove Fern; native of Peru, Mexico, &c. Fronds one to two feet long, reclining, linear, pinnate; pinnæ cordate-ovate, obtuse, pinnatifid, white on the under surface, and densely covered with imbricated fringed scales; upper surface bright green, scattered over with stellate pubescence. Stipes, rachis, and rhizome scaly. Sori terminal; marginal, consisting of a few spore-cases, situated in the sinuses of the segments, protruding through the scales.

8. *N. SQUAMATA*, *J. H.*—A dwarf evergreen stove Fern; from Mexico and Peru. Fronds pinnate, about six inches long, rather ovate-lanceolate, scaly beneath, with oblong-obtuse, pinnatifid pinnæ, which are dark green above and whitish beneath. Sori terminal, continued round each segment of the pinnæ. This species is but little known in cultivation, although introduced about 1842.

9. *N. LANUGINOSA*, *Desvaux* (ACROSTICHUM VELLEUM, *Aiton*; *N. VELLEA*, *Desvaux*).—A very tender delicate evergreen greenhouse Fern; native of the South of Europe, Madeira, &c. Fronds four to six inches high, very woolly and brownish on the under surface; linear-lanceolate, bipinnate, with roundish ovate pinnules, the terminal one lobed. Sori round, terminal, subsequently confluent. Rhizome short, somewhat creeping.

10. *N. VESTITA*, *Desvaux* (CHEILANTHES, *Swartz*). [Plate I.]—A slender evergreen frame, or greenhouse species; native of various parts of North America. Fronds from five to ten inches long, densely covered with hairs; linear-lanceolate, bipinnate, with roundish ovate pinnæ, the pinnules pinnatifid; margin crenate. Sori round, terminal, marginal, subsequently confluent. Fronds adherent to a short creeping rhizome. This species is often sold for *Woodsia ilvensis*.

11. *N. DISTANS*, *R. Brown*.—A small evergreen greenhouse Fern; from New Holland. Fronds six to ten inches long; linear-lanceolate, bipinnate, pinnules oblong obtuse, opposite, sessile and hairy. Sori terminal, marginal, confluent. Stipes, rachis, and midrib of pinnæ, covered with scales. Fronds adherent to a creeping rhizome.

12. *N. MARANTÆ*, *R. Brown* (ACROSTICHUM, *Linnaeus*; CETERACH, *De Candolle*).—A rather handsome evergreen Fern; found in the South of Europe and Madeira. Fronds from six to ten inches high, rather stiff, densely covered with scales on the under surface; ovate-lanceolate, bipinnate, with oblong obtuse pinnules, the lower one stalked, superior ones sessile, entire at the apex. Sori terminal, and marginal. Fronds adherent to a thick, short, creeping rhizome.

13. *N. TOMENTOSA*, *Desvaux* (CHEILANTHES, *Link*).—A woolly evergreen stove species; from Mexico. Fronds very handsome, about a foot long, tripinnate, with oblong-linear pinnules, and very small segments, which are roundish ovate distant and concave, the terminal one larger. Sori consisting of a few spore-cases on each segment. Rhizome short, creeping.

14. *N. ECKLONIANA*, *Kunze*.—This evergreen Fern, the most beautiful species of the scaly section, is a native of the Cape of Good Hope, and is best cultivated in a warm greenhouse. Fronds nearly a foot long, covered on all parts with narrow white scales which give them a woolly appearance; they are rather ovate, tripinnate, with oblong-obtuse pinnules, and small roundish ovate segments, crenate and concave, the margin revolute; lower ones distant, superior ones sessile. Sori terminal, consisting of a single row of spore-cases on each segment, partly concealed by the revolute margin. Rhizome creeping.

## VI. GYMNOGRAMMA, *Desvaux*.

*Sori* linear, simple, or often forked, oblique, at length confluent; *spore-cases* medial, superficial, occupying nearly the whole length of the venules, and sometimes echinate. *Veins* forked, or pinnate;



venules simple. Fronds varying from a few inches to three or four feet long; simple pinnate bipinnate or decompound; smooth hairy or covered beneath with a rich-coloured farinose\* powder.—Name derived from *gymnos*, naked, and *gramme*, a line; in allusion to the linear sori being destitute of a cover.

In the *Gardeners' Magazine of Botany* we have adopted the genus *Leptogramma*, distinguishing it from *Gymnogramma* by the simple venules and simple sori, which characterized the original; but several additional species have now been introduced to cultivation, which while they agree in having simple sori with the characters assigned to *Leptogramma*, yet do not accord in the venation. Hence it becomes necessary to cancel *Leptogramma* as a genus; but it may be usefully retained as a sectional group, to include those species which are distinguished from true *Gymnogramma* by oblong-linear simple sori.

Fig. 6 represents a pinna of *Gymnogramma tomentosa* (med. size).



Fig. 6.

‡ *GYMNOGRAMMA VERA*.—Sori linear, forked.

1. *G. RUFA*, *Desvaux* (HEMIONITIS, *Swartz*; *NEUROGRAMMA*, *Link*).—An ornamental evergreen stove species; native of tropical America. Fronds from one to two feet long, hairy, linear, pinnate with oblong, obtuse pinnæ, stalked, and cordate at the base. Stipes and rachis reddish brown; terminal, adherent to a fasciculate erect rhizome. Sori linear medial, forked, oblique, subsequently confluent, produced on every pinnæ throughout the frond.

2. *G. TOMENTOSA*, *Desvaux* (HEMIONITIS, *Raddi*; *NEUROGRAMMA*, *Link*; *CETERACH LOBATUM*, *Prest*).—A tender delicate and beautiful stove Fern; native of Brazil and the West Indies. Fronds somewhat lanceolate, bipinnate, hairy, and membranous, from one to two feet long, with oblong-obtuse pinnules, the lower ones cordate at the base, terminal one lobed, acuminate. Sori linear, medial, forked, oblique. Stipes and rachis black, terminal, adherent to a fasciculate erect rhizome.

3. *G. JAVANICA*, *Blume*.—A very handsome evergreen stove Fern; from Java. Fronds glabrous, pinnate, two to three feet high, bright green; pinnæ petiolate oblong-lanceolate, six to ten inches long, acuminate, or subcaudate at the apex, and cuneate at the base. This species is rare in English gardens, though it has been in cultivation on the Continent for several years.

4. *G. TRIFOLIATA*, *Desvaux* (*ACROSTICHUM*, *Linnaeus*).—A rather erect growing evergreen stove Fern; from the West Indies. Fronds oblong-lanceolate, broadest at the base, bipinnate, one to one-and-a-half foot long, light green; pinnæ petiolate, trifoliate, with linear-lanceolate segments, slightly crenate at the margin, and covered beneath with a yellowish farinose powder. Stipes scaly at the base, terminal, adherent to a fasciculate erect rhizome. This species, which is scarce in cultivation, has often been brought to the country, but is difficult to establish; it has recently been introduced to the Royal Botanic Garden, Kew.

5. *G. CALOMELANOS*, *Kaulfuss* (*ACROSTICHUM*, *Linnaeus*; *CEROPTERIS*, *Link*).—An ornamental evergreen stove Fern; from Jamaica. Fronds from two to three feet long, ovate-lanceolate, bi-subtri-pinnate, the upper side dull green, and covered beneath with a white farinose powder; pinnules lanceolate-acuminate, with elongated acuminate lobed segments. Sori forked, medial, oblique, confluent, and nearly covering each segment. Stipes, rachis, and midrib of pinnæ black; terminal, adherent to a fasciculate erect rhizome. This plant frequently goes under the name of *G. peruviana*, in gardens.

6. *G. TARTAREA*, *Desvaux* (*ACROSTICHUM*, *Swartz*; *CEROPTERIS*, *Link*; *G. DEALBATA*, *Link*).—An ornamental evergreen stove species; from the warm parts of America. Fronds two to three feet long, ovate-lanceolate, bi-subtri-pinnate; the upper surface dull green, and covered beneath with a white farinose powder; pinnules lanceolate-acuminate, with roundish ovate or oblong segments, which are distant, the lower one lobed. Sori linear, medial, forked, oblique, becoming confluent. Stipes, rachis, and midrib of pinnæ black; terminal, adherent to a fasciculate erect rhizome.

7. *G. OCHRACEA*, *Prest?*—An evergreen stove Fern; from Peru. Fronds from one to one-and-a-half foot long, ovate-lanceolate, pale yellow beneath, the upper surface bright green; bipinnate, with lanceolate-acuminate pinnæ, and narrow oblong-linear dentate pinnules. Sori medial, somewhat scattered on the veins. This, which has the most compact frond of the yellow farinose species, is in cultivation under the name of *G. Massoni*.

\* The farinose powder, which is found on the fronds of many species of *Gymnogramma* and other genera of Ferns, is not always of the same colour throughout the frond. We have received from Mr. W. H. Baxter, of the Botanic Garden, Oxford, a frond of *Gymnogramma tartarea*, which has both the white powder proper to the species, and the bright yellow proper to *G. chrysophylla*, on distinct portions of the same frond.



8. *G. CHRYSOPHYLLA*, *Kaulfuss* (*CEROPTERIS*, *Link*).—One of the most beautiful of exotic Ferns in cultivation. It is an evergreen stove species; from the West Indies and South America. Fronds from one to two feet long, covered beneath with a farinose powder of the richest golden yellow, the upper surface yellowish green; bipinnate having lanceolate acuminate pinnae, and roundish ovate or oblong pinnules, slightly dentate, distant, pinnatifid, with medial sori scattered on the veins; terminal, adherent to a fasciculate erect rhizome. This Fern, like most others, varies in cultivation according to the treatment it receives; if subjected to a low temperature, and a rather dry atmosphere, the fronds do not exceed ten inches high, are nearly triangular and of the most intense golden yellow; but if in a temperature of 85-90° Fahrenheit, with proportionate moisture, it then becomes more compound, two feet high or more, the segments of the pinnules more serrated, and of an exceedingly bright yellow.

9. *G. MARTENSII*, *Bory* (*G. MERTENSII*, *of gardens*).—An elegant evergreen stove Fern; from South America. Fronds delicate, very fragile, one and a-half foot long, covered beneath with a rich yellow farinose powder, the upper surface yellowish green; ovate-lanceolate, bipinnate with lanceolate pinnae, and roundish or elongated pinnatifid pinnules, with dentate segments. Sori medial, confluent, covering nearly every segment of the frond. Rhizome tufted.

10. *G. SULPHUREA*, *Desvauz*.—A very elegant dwarf evergreen species; from Jamaica. Fronds from six to ten inches long, fragile, and very delicate, the under surface covered with a farinose powder of a bright sulphur yellow, upper surface pale green; bipinnate with lanceolate-acuminate pinnae, and oblong-obtuse pinnatifid pinnules, cuneate at the base, the margins dentate. Sori linear, forked, oblique, confluent, nearly covering each segment of the pinnules. Fronds terminal, adherent to a fasciculate erect rhizome.

11. *G. CHÆROPHYLLA*, *Desvauz* (*ANOGRAMMA*, *Link*).—A tender delicate fragile annual stove Fern; native of the West Indies and various places in South America. Fronds decompound, triangular, bright green, from six inches to a foot high, with roundish ovate pinnatifid pinnules, deeply dentate, and cuneate at the base. The fertile fronds are erect, and the pinnules very much contracted.

12. *G. LEPTOPHYLLA*, *Desvauz* (*ANOGRAMMA*, *Link*; *GRAMMITIS*, *Swartz*; *POLYPODIUM*, *Linnaeus*).—An extremely delicate annual stove species; from the South of Europe, Madeira, &c. This little Fern attains the height of but a few inches. Its fronds are smooth, somewhat deltoid, bipinnate, with roundish cuneate, two or three lobed pinnules, and each lobe bluntly dentate. Sori forked, confluent. Fertile fronds not contracted, and nearly all are fertile.

13. *G. GRACILE*, *T. M.*—A delicate fragile stove Fern; supposed to be a native of South America. Fronds about a foot high, pale green, sparingly covered beneath with white farinose powder; ovate-triangular, acuminate, bipinnate; pinnules inciso-pinnatifid, decurrent at the base, the segments cuneate-bifid or emarginate, the divisions entire and retuse. Stipes long, and as well as the rachis and costa purplish. Rhizome short caespitose. Our specimens are imperfect, but they appear distinct. It was introduced to the nursery of Messrs. Henderson of St. John's Wood last year, and was obtained from Mr. Linden. It seems closely allied to *G. conspersa*, Kunze, from Natal.

♂ LEPTOGRAMMA.—Sori simple, linear-oblong.

14. *G. VILLOSA*, *Link* (*LEPTOGRAMMA*, *J. Smith*).—A beautiful evergreen stove Fern; from Brazil. Fronds hairy, somewhat lanceolate, bipinnatifid, about two feet long, reclining, with linear-lanceolate acuminate pinnae, and rather ovate, bluntly acuminate segments. Sori oblong, submedial, oblique. Fronds lateral or terminal, adherent to a caespitose creeping rhizome. Fig. 7 represents the upper part of a pinna of *G. villosa*, of medium size.

15. *G. GRACILE*, *Heward* (*LEPTOGRAMMA*, *J. Smith*).—A rather erect growing evergreen stove Fern; from Jamaica. Fronds lanceolate-elongate, pinnate, one and a-half to two feet long, pale green, pubescent throughout; pinnae sessile, oblong-acuminate; middle ones four to five inches long, gradually decreasing to the base, where they are only a quarter of an inch long; all deeply pinnatifid, with oblong-linear repand segments, round at the apex, and crenate at the margin. Stipes about an inch long, with a few scales at the base. Fronds nearly all fertile throughout; terminal, adherent to an erect rhizome. This species was introduced to English collections in 1851.

16. *G. TOTTA*, *Schlechtendal* (*G. LOVEI*, *Hooker et Greville*).—An ornamental evergreen warm greenhouse Fern; a native of Madeira and the Cape of Good Hope. Fronds very hairy, lanceolate, pinnate, one to one-and-a-half foot long, palish green; pinnae sessile, oblong, obtuse at the apex, pinnatifid, upper ones adnate-decurrent, with blunt lobes. Veins forked or pinnate, the inferior pair of venules occasionally anastomosing. Stipes scaly; terminal, adherent to a decumbent, scaly creeping rhizome.

17. *G. REPENS*, *M. and H.*—An ornamental deciduous stove Fern; a native of the East Indies. Fronds slender, broadly lanceolate, one to two feet long, light green, pinnate; pinnae remote, oblong-acuminate, four to five inches long, rather membranous, the inferior pair or more petiolate, the superior adnate, pinnatifid, with oblong rather obtuse segments, crenate or bluntly lobed and hairy on the margin; the pair next the rachis much larger than the others, and deeply pinnatifid with round lobes. Rachis and stipes terete, with a few scales at the base; lateral, adherent to a creeping rhizome, about the size of a goose quill. This Fern has been in cultivation for ten or twelve years.



Fig. 7.



SECT. SYMPLOPHLEBIEÆ, J. Smith (from *symploke*, connection, and *phleps*, a vein).—Veins anastomosing, so as to form a network.

## VII. MENISCIUM, Schreber.

*Sori* linear, medial, somewhat transverse, arcuate or crescent-shaped, continued across the junction of two anastomosing venules, and subsequently becoming confluent. *Veins* pinnate, curved, somewhat parallel; *venules* arcuate, or angularly anastomosing, producing from their junction an excurrent veinlet, free, or uniting with the anastomosing venules above, dividing the surface of the frond throughout into numerous rectilinear parallelograms. *Fronde* from one to five feet long, smooth or hairy, simple pinnate or ternate; *pinnæ* entire, crenulate, or serrulate.—Name derived from *meniskos*, a crescent; the fructification forming short curved lines.

The venation in some of the species of this genus is not distinguishable from that of some *Nephrodiums*. The only technical character by which *Meniscium* can be distinguished is the arched or arcuate sori, by which, however, it is readily known. Fig. 8 represents a portion of the base of a pinna of *Meniscium palustre* (nat. size).

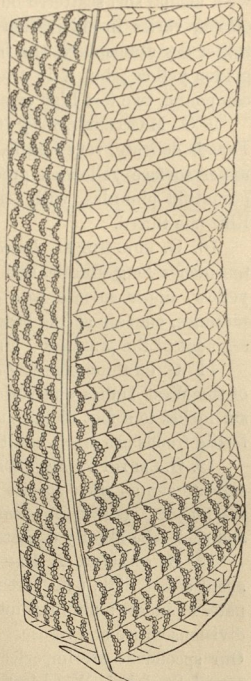


Fig. 8.

1. *M. SIMPLEX*, Hooker.—A dwarf evergreen stove Fern, from China. Fronds simple, pubescent, somewhat elliptical or oblong-acuminate, dentato-serrate, from six to twelve inches long, dull green, cordate at the base, and sub-hastate; lateral, adherent to a slender scaly creeping rhizome. *Sori* medial. This species is of recent importation, having been introduced to Kew from Hong Kong in the latter part of 1850.

2. *M. PALUSTRE*, Raddi (*M. DENTATUM*, Presl—fide Kunze).—A tall robust evergreen stove species, from South America. Fronds glabrous, rather erect, somewhat ovate-lanceolate, pinnate, from three to five feet long; *pinnæ* entire, lanceolate, acuminate, coriaceous, from six to ten inches long, lively green, slightly undulated, and roundish or cuneate at the base; the lower pairs of *pinnæ* often proliferous at their base. Stipes dark-coloured near the base; lateral, adherent to a thick creeping rhizome. *Sori* medial, subsequently confluent.

3. *M. RETICULATUM*, Swartz (*POLYPODIUM*, Linnaeus).—A tall robust evergreen stove Fern, native of the West Indies. Fronds four to six feet high, lanceolate, pinnate; *pinnæ* lanceolate, acuminate, six or seven inches long, membranous, obliquely cuneate at the upper base, rounded below, repand, serrate; viviparous in the axils. We have not seen fertile fronds of the cultivated plant, which, however, we refer with little hesitation to the species of Swartz above quoted.

## VIII. GONIOPTERIS, Presl.

*Sori* round, medial, or costal. *Spore-cases* sometimes echinate. *Veins* pinnate; *venules* angularly anastomosing, producing from their junction an excurrent free or anastomosing sterile veinlet. *Fronde* from one to two feet high, pinnate; *pinnæ* entire, serrate, crenate, or pinnatifid; when deeply pinnatifid, the inferior pair of venules only anastomose, the superior ones being all free.—Name derived from *gonia*, an angle, and *pterus*, a fern; in allusion to the angular anastomosing of the venules.

The species of *Goniopteris* are easily cultivated, and have usually a neat appearance, being of nearly uniform size. The primary character of the genus lies in the round and naked sori, which are moreover medial, costal, sub-marginal, or basal; the venation affords no trustworthy distinguishing character, for the veins are arranged exactly as in some species of *Meniscium* and of *Nephrodium*. Fig. 9 represents a pinna of *Goniopteris crenata* (med. size).

1. *G. REPTANS*, Presl (*POLYPODIUM*, Swartz; *P. RADICANS*, Lamarck).—A prostrate-growing, evergreen hot-house Fern, from Jamaica. Fronds lax, slender, elongate, pubescent, pinnate, a foot or more long, light green, and rooting at the apex; *pinnæ* petiolulate, inferior ones oblong-ovate, cordate at the base, and round at the apex; superior ones auriculate, and semiobicular, truncate at the base, crenate at the margin. Fronds terminal, adherent to a somewhat tufted rhizome. *Sori* uniserial. Introduced to Kew in 1852.

2. *G. GRACILIS*, M. and H.—An interesting evergreen stove Fern, from Jamaica. Fronds slender, narrow, lanceolate, pinnate, minutely pubescent, one to one and a half foot long, deep green, and proliferous near the apex; lower *pinnæ* small, distant, petiolulate, cordate-oblong, obtuse at the apex, pinnatifid, with round lobes;



middle ones sessile, falcate, adnate, oblong-hastate; upper ones small, semi-orbicular, distinct or confluent at the base, entire on the margin. Sori uniserial or biserial, with a tuft of forked or stellate hairs in each sorus. Fronds terminal, adherent to a rather erect-growing rhizome. The plant is covered throughout, especially beneath, with small forked or stellate pubescence. The sterile fronds have a great similarity to *G. asplenioides*. It was introduced to Kew in 1852.

3. *G. ASPLENIODES*, Presl (POLYPODIUM, Swartz; *P. COMPOSITUM*, Link). [Plate II].—An ornamental, evergreen stove Fern, from Jamaica. Fronds lanceolate, pinnate, rugose, pubescent, about one foot long, dullish green, with oblong obtuse pinnatifid pinnae, somewhat cordate at the base; terminal, adherent to a short creeping rhizome. Sori medial, or subterminal, subsequently confluent.

4. *G. FRAXINIFOLIA*, Presl (POLYPODIUM, Jacquin; *P. PROLIFERUM*, Kaulfuss; *P. FREYREISSII*, Sprengel).—An elegant evergreen stove species, from Brazil. Fronds lanceolate, pinnate, two feet long, with entire lanceolate-acuminate smooth shining pinnae, which are dark green, truncate, or occasionally auriculate at the upper base, and proliferous throughout. Sori medial, triserial, and subsequently confluent. Fronds terminal, adherent to an erect fasciculate rhizome.

5. *G. CRENATA*, Presl (POLYPODIUM, Swartz).—A very handsome evergreen stove Fern, native of the West Indies. Fronds ovate-lanceolate, one and a half to two feet long, pinnate, with entire oblong ovate-acuminate membranous crenate pubescent pinnae, pale green, roundish or obliquely truncate at the base, with very short petioles. Sori medial, in four to eight series. Rachis and stipes green; lateral, adherent to a short creeping rhizome.

6. *G. AFFINIS*, M. and H.—An ornamental evergreen stove Fern, from Jamaica. Fronds somewhat lanceolate, pinnate, one to two feet long, palish green; pinnae glabrous, lanceolate, four to seven inches long, and about one inch wide, lower ones petiolulate, upper sessile, pinnatifid, obtusely lobed, acute at the apex, unequal or slightly cordate at the base. Stipes with a few scales at the base; terminal, adherent to a decumbent somewhat creeping rhizome.

7. *G. MEGALODES*, Presl (POLYPODIUM, Schkuhr).—An ornamental evergreen stove Fern, from the West Indies. Fronds oblong-acuminate, broad at the base, pinnate, pubescent, pale green, from two to three feet long, with linear-lanceolate, acuminate, pinnatifid, rather membranous pinnae. Sori medial. Stipes and rachis green; lateral, adherent to a short creeping rhizome.

8. *G. FORSTERII*, M. and H.—A rather rugose-looking evergreen warm greenhouse Fern, from New Zealand. Fronds lanceolate, pinnate, one to two feet long, dull green; pinnae sessile, lanceolate, cordate at the base, lower ones short, pinnatifid, with roundish obtuse segments, ciliated and crenulate at the margin. Rachis and stipes tetragonal, with a few scales at the base. Sori medial, or produced near the junction of the venules and confluent. Fronds terminal, adherent to a rather erect-growing rhizome.

This plant, which is scarce in cultivation, although grown in Britain nearly thirty years ago, has recently been re-introduced to Kew. It is doubtless the *Polypodium pennigerum* of Forster; but as that specific name is preoccupied in this genus, owing to a confusion which has arisen between the present and following species, and a supposed "*Aspidium*" which resembles them, it seems to us better to cancel the name *pennigerum*, and distinguish Forster's plant by a new name.

9. *G. TETRAGONA*, Presl (POLYPODIUM, Swartz; *P. SMITHIANUM*, Heward).—An ornamental evergreen stove Fern, from the West Indies. Fronds somewhat lanceolate, pinnate, minutely pubescent, from one to two feet high; pinnae sessile, lanceolate-acuminate, bright green; lower ones petiolulate, standing forward and tapering to the base, upper ones truncate or slightly cordate at the base, pinnatifid, with repand or slightly falcate, acute (in the fertile often rounded or obtuse) segments. Fertile fronds erect, usually more or less contracted; pinnae indistinctly articulated with the rachis, which is flattened above, and of a pale green. Sterile fronds shorter than the fertile, and more dilated. Sori medial, uniserial, the lower ones subsequently confluent. Fronds terminal, adherent to a short creeping rhizome.

10. *G. PROLIFERA*, Presl (MENISCIUM, Swartz).—A straggling-growing evergreen stove Fern, from the East Indies. Fronds pale green, slender, usually linear-lanceolate pinnate, two to three feet long, with oblong-acuminate, membranous, pubescent pinnae, slightly cordate at the base, and crenato-dentate at the margin. This Fern grows freely, and is very proliferous, but without fructification, sometimes growing to a great length, but very narrow. Fronds lateral, adherent to a creeping rhizome.

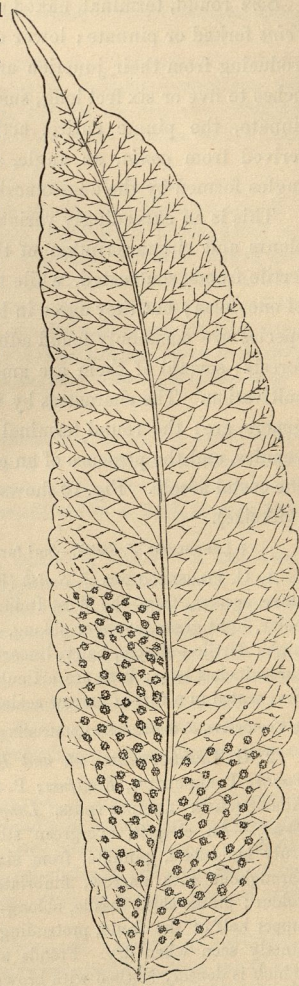


Fig. 9.



## IX. GONIOPHLEBIUM, Presl.

*Sori* round, terminal, naked or squamiferous, arranged in one or more transverse parallel rows. *Veins* forked or pinnate; lower exterior *venule* free and fertile, the others angularly anastomosing, producing from their junction an excurrent, free, and generally fertile veinlet. *Fronds* from a few inches to five or six feet long, smooth hairy or scaly, simple pinnatifid or pinnate, the pinnæ entire, articulate, serrulate or undulate.—Name derived from *gonia*, an angle, and *phleps*, a vein; in allusion to the angles formed by the anastomosing of the venules.

This is an exceedingly variable genus, with regard to the size of the plants and circumscription of their fronds. The dwarf kinds have the fertile fronds contracted, while the larger species have their fronds all of one form; but they agree in having a scaly, creeping rhizome. The species are commonly found adhering to the trunks of trees in tropical forests; several of them are amongst the most elegant of the Ferns in cultivation. The characters by which they are determined from all congeners, are: the round terminal sori, the angular anastomosing of the venules, and the presence of an excurrent generally soriferous veinlet in the costal areole. Fig. 10 shows a pinna of *Goniophlebium meniscifolium* (full size).

‡ LOPHOLEPIS, J. Smith.—Sori furnished with a dense tuft of elongate scales.

1. *G. PILOSELLOIDES*, J. Smith (POLYPODIUM, Linnaeus).—A dwarf, evergreen stove species, from the West Indies. Fronds of two kinds: sterile—simple, hairy, light green, ovate or oblong, decurrent at the base, from one to two inches high: fertile—simple, hairy, linear-oblong, decurrent at the base, from two to three inches long; both are articulated on a very slender, creeping rhizome. Sori seated in a tuft of narrow scales, uniserial.

‡ LEPICYSTIS, J. Smith.—Sori protruding through the densely-scaly under surface of frond.

2. *G. LEPIDOPTERIS*, M. and H. (POLYPODIUM, Kunze; *G. SEPULTUM*, J. Smith; *P. SEPULTUM*, Kaulfuss; *P. RUFULUM*, Presl; *P. HIRSUTISSIMUM*, Raddi; *ACROSTICHUM LEPIDOPTERIS*, Langsdorf and Fischer; *MARGINARIA RUFULA*, Presl).—An elegant, evergreen stove species, from South America. Fronds truly lanceolate, pinnate, from six inches to a foot long, densely covered throughout with narrow, fimbriated scales, which give them a pale tawny colour; pinnæ close, sessile, oblong-linear, rather obtuse. Sori uniserial on the upper half of the frond, protruding through the scales. Veins internal, indistinctly seen when dry. Fronds articulated on a whitish creeping rhizome, which is densely clothed with brown chaffy scales.

3. *G. ALBICANS*, M. and H.—A very scaly evergreen stove Fern, from Mexico. Frond somewhat lanceolate, broad at the base, pinnate, one to two feet long, dark green above and densely covered throughout, especially beneath, with elongated peltate-stellate scales, which produce a whitish appearance; pinnæ adnate linear-lanceolate, one to three inches long, approximate, auricled on the upper base, inferior pair or more sub-petiolate, rather obtuse at the apex, entire at the margin. Sori uniserial, protruding through the scales on the upper half of the fronds. Fronds lateral, articulated with a creeping rhizome, which is about the size of a goose-quill, densely clothed with small appressed scales. This Fern is in cultivation under the name of *G. sepultum*; but it is very distinct from that species—the fronds being much larger, of a different outline, and the rhizome clothed with a very different kind of scale. It has been in cultivation about ten years, and was originally introduced among some orchids.

‡ SCHELLOLEPIS, J. Smith.—Sori sunk in a cavity, forming a protuberance on the upper surface of the frond.

4. *G. ARGUTUM*, J. Smith (POLYPODIUM, Wallich).—A beautiful evergreen stove Fern, from Nepal. Fronds glabrous, slender, from two to three feet long, the rachis and stipes pale brown, shining, and articulated on a scaly, creeping rhizome. Fronds pinnate,

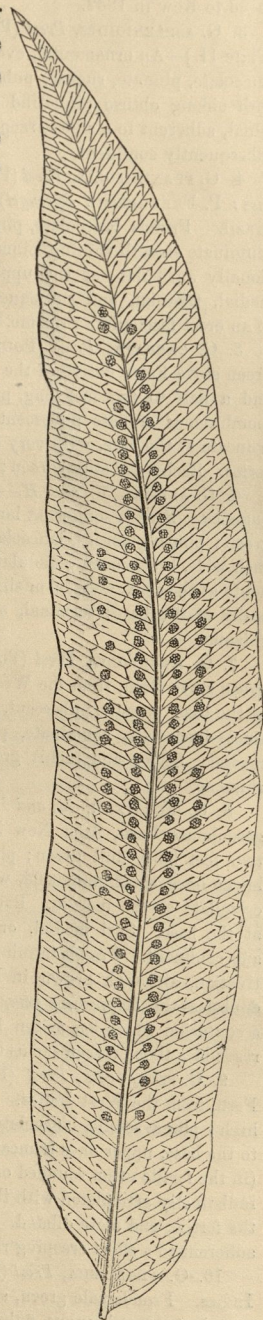


Fig. 10.



lanceolate, with lanceolate-acuminate, rather membranous, bright green pinnæ, which are articulated with the rachis, serrated, and decurrent at the base. Sori large, uniserial, yellowish brown, each furnished with numerous lacinated scales, which are soon obliterated by the spore-cases; they are immersed, forming elevated protuberances on the upper surface of the frond.

5. *G. VERRUCOSUM*, *J. Smith*.—An ornamental evergreen stove species, from the Philippine Islands and Singapore. Fronds slender, slightly pubescent, four to five feet long, pendulous, lanceolate-acuminate, with oblong-acuminate, undulated, bright green pinnæ, which are slightly serrated, round at the base, and articulated with the rachis. Sori uniserial, immersed, forming elevated protuberances on the upper surface of the frond. Rachis and stipes scaly, and articulated with a creeping rhizome.

6. *G. SUBAURICULATUM*, *Presl* (*POLYPODIUM*, *Blume*; *G. REINWARDTII*, *De Vriese*; *P. REINWARDTII*, *Kunze*).—A very elegant evergreen stove species, from Java and Luzon. Fronds slender, lanceolate, pinnate, from four to six feet long, with long, narrow, lanceolate-acuminate, membranous bright green pinnæ, which are serrate, subauriculate at the base, and articulated with the rachis. Sori uniserial, yellowish brown, each furnished with numerous lacinated scales, which are soon lost by the swelling of the spore-cases; they are immersed, forming elevated protuberances on the upper surface. Rachis and stipes brown, pubescent, articulated with a scaly creeping rhizome. This species is one of the most beautiful of the *Polypodiæ*, and the most ornamental of all herbaceous species yet in cultivation; the fronds being long, very slender and pendulous, measuring sometimes eight feet long, and having fifty-eight pairs of pinnæ, with a stipes not more than eight inches long.

§ GONIOPHLEBIA VERA, *J. Smith*.

7. *G. VACCINIFOLIUM*, *J. Smith* (*POLYPODIUM*, *Langsdorf and Fischer*; *CRASPEDIA*, *Link*).—A dwarf, creeping, evergreen, stove species, from the West Indies and South America. Fronds of two kinds: sterile—simple glabrous, sub-rotund or oblong, decurrent at the base, dark green, about half an inch high: fertile—linear, simple glabrous, two inches long, decurrent at the base. Both kinds are lateral, articulated on a thick, brown, scaly creeping rhizome. Sori terminal, uniserial.

8. *G. CATHARINÆ*, *J. Smith* (*POLYPODIUM*, *Langsdorf and Fischer*; *P. GLAUCUM*, *Raddi*).—A handsome, stiff-growing, stove Fern, from Brazil. Fronds one foot to a foot and a-half high, somewhat lanceolate, broad at the base, with an elongated bluntish point, dark green, paler beneath, quite smooth; subpinnate below, deeply pinnatifid above; pinnæ approximate, elongate-oblong, undulated, entire, narrowed near the base, and very blunt at the apex, the lowest shorter, standing forward, and decurrent at the base. Sori uniserial near the costa, extending from the base to the apex of the frond, and from the base nearly to the apex of the segments. Stipes smooth, a little margined upwards. Fronds articulated with a thick, green, creeping, caespitose rhizome, which is covered with imbricating, ovate-acuminate peltate, dark-coloured scales. New-hay-scented when dry. We are indebted to Mr. Henderson, of Wentworth, for this species, which is undoubtedly the *Polypodium glaucum* of Raddi, and distinct from *G. Catharinæ*, of gardens.

9. *G. LATIPES*, *J. Smith* (*POLYPODIUM*, *Langsdorf and Fischer*; *G. CATHARINÆ*, of gardens).—An evergreen ornamental stove Fern, from Brazil. Fronds glabrous, oblong-elongate or broadly-lanceolate, deeply-pinnatifid or sub-pinnate, broad at the base, from one to two feet long, dull green; segments lanceolate, three to six inches long, acutish or obtuse at the apex; lower ones undulated, standing forward, sub-deflexed, and crenulate on the margin. Sori uniserial. Fronds lateral, articulated on a creeping rhizome, which is densely covered with imbricate, peltate, acuminate, brown scales.

10. *G. LORICEUM*, *M. and H.* (*POLYPODIUM*, *Linnaeus*; *P. RAMOSUM*, *Loddiges*; *G. LATIPES*, of gardens).—Fronds glabrous, lanceolate, deeply pinnatifid or subpinnate, slender, and somewhat pendulous, from one to two feet long, dull green, segments linear-oblong, rather membranous, acute or acuminate at the apex, undulated, slightly falcate, and crenulate at the margin. Sori small, uniserial or biserial. Fronds lateral, articulated on a green creeping rhizome as large as a swan's quill, which is covered with peltate, fimbriate scales.

11. *G. HARPEODES*, *J. Smith* (*POLYPODIUM*, *Link*).—A tall-growing evergreen stove species, from Brazil. Fronds glabrous, broadly-lanceolate, three to four feet long, dull green, erect, the stipes nearly half the length of the fronds; they are articulated on a short, thick, scaly, creeping rhizome. Frond deeply pinnatifid or subpinnate, with lanceolate-acuminate, nearly entire, scimitar-shaped pinnæ, the lower ones standing forward. Sori large, yellowish brown, uniserial.

12. *G. VACILLANS*, *M. and H.* (*POLYPODIUM*, *Vacillans*, *Link*; *P. REPANDULUM*, *Kaulfuss*).—An evergreen stove Fern, from Brazil. Fronds pubescent, lanceolate, two to three feet long, pinnate; pinnæ without a footstalk, four to six inches long, linear, attenuated at the apex, and irregularly crenato-serrate. Sori uniserial; nearly all the entire at the margin. Sori uniserial. Fronds lateral, articulated on a creeping rhizome. This Fern is in the collection of G. Norman, Esq., of Hull.

13. *G. SUBPETIOLATUM*, *M. and H.* (*POLYPODIUM*, *Hooker*).—A large evergreen greenhouse Fern, from Mexico and Guatemala. Fronds pubescent, lanceolate, two to three feet long, pinnate; pinnæ without a footstalk, four to six inches long, linear, attenuated at the apex, and irregularly crenato-serrate. Sori uniserial; nearly all the fronds soriferous throughout. Fronds lateral, articulated on a scaly creeping rhizome. Specimens of this Fern, recently communicated from Wentworth, prove it to be, when fully developed, a species of *Goniophlebium*; though when in a less vigorous condition the veins are free.



14. *G. DISSIMILE*, *J. Smith* (POLYPODIUM, *Linneus*).—A handsome evergreen stove Fern, from the West Indies. Fronds slender, pendulous, two to three feet long, pubescent, pale green, lanceolate, pinnate, the pinnæ distant, sessile, sub-falcate, lanceolate-acuminate, membranous, undulated, and somewhat deflexed, the lower ones standing forward. Sori biserial. Fronds articulated on a scaly, creeping rhizome.

15. *G. ALBO-PUNCTATUM*, *J. Smith* (POLYPODIUM, *Raddi*).—A very ornamental evergreen stove species, from Brazil. Fronds broadly lanceolate, pubescent, pale green, from two to three feet long, the upper surface scattered over with small white scales; they are lateral, articulated on a short, scaly, creeping rhizome. Fronds pinnate, with lanceolate-acuminate, nearly entire, membranous, undulated pinnæ, having the inferior base truncate, and the superior adnate; the upper ones are sessile. Sori uniserial.

16. *G. MENISCFOLIUM*, *J. Smith* (POLYPODIUM, *Langsdorf and Fischer*; *P. LONGIFOLIUM*, *Presl*; *P. PRESLIANUM*, *Sprengel*—*fide Kunze*).—A tall, glabrous, evergreen, stove species, from Brazil. Fronds lanceolate, three to four feet long, pinnate, with lanceolate-acuminate, undulated, shining, bright green pinnæ, from six to eight inches long, having their inferior base roundish, and the upper one adnate. Sori large, yellowish brown, generally biserial. Stipes and rachis green, lateral, articulated on a thick, scaly, creeping rhizome.

17. *G. DISTANS*, *M. and H.* (POLYPODIUM, *Raddi*; *MARGINARIA DISTANS*, *Presl*; *G. DEFLEXUM*, *of gardens*).—An ornamental, evergreen, stove Fern, from Brazil. Fronds glabrous, two feet long, pinnate, with lanceolate-acuminate, coriaceous, undulated, deflexed pinnæ, of a dull green, roundish at the base, and articulated with the rachis; the lower pinnæ are sometimes divided. Sori triserial. Stipes and rachis blackish green, lateral, articulated on a moderately thick, scaly, creeping rhizome.

#### X. CYRTOPHLEBIUM, *R. Brown.*

*Sori* round, naked, lateral or terminal, arranged in two rows between and parallel with the primary veins, or irregular. *Veins* pinnate or forked; lower exterior *venule* free and fertile, the others arcuately or angularly anastomosing, producing from their exterior side two or more excurrent, free, fertile *veinlets*, which are sometimes very short, often uniting with the next superior venules, forming two rows of areoles between each two primary veins. *Fronds* simple or pinnate, from one to three feet long, glabrous, coriaceous or somewhat membranous. *Rhizome* creeping.—Name derived from *kyrtos*, curved, and *phleps*, a vein; alluding to the convex or curved form of the venules.

There are various technical characters by which to distinguish this genus from the preceding ones, some of them of minor importance, and perplexing unless to a practised eye; the most essential, however, and those by means of which it is easily recognised, are the arcuate venules, combined with two series of sori, between each two of the primary veins. Fig. 11 represents the upper portion of a frond of *Cyrtophlebium repens* (nat. size).

1. *C. ANGUSTIFOLIUM*, *J. Smith* (POLYPODIUM, *Swartz*; *P. DIMORPHUM*, *Link*; *MARGINARIA DIMORPHA*, *Link*; *M. ANGUSTIFOLIA*, *Presl*).—A slender evergreen stove Fern, native of the West Indies and South America. Fronds glabrous, simple, linear, attenuate, very narrow, reclining, with a somewhat revolute margin, coriaceous, from a foot to a foot and a-half long, dull green, decurrent at the base; lateral, articulated on a short, creeping, scaly rhizome. Sori medial; veins immersed. There are two forms of this plant.

2. *C. REPENS*, *J. Smith* (POLYPODIUM, *Swartz*; *CAMPYLONEURUM*, *Presl*).—A creeping evergreen stove species, from the West Indies. Fronds simple, reclining, lanceolate-acuminate, from one to one and a-half foot long, glabrous, undulated, rather membranous, deep green, decurrent at the base. The upper surface of the fronds is scattered over with white scales, attached opposite the apex of each veinlet. Sori round, terminal. Fronds lateral, articulated on a scaly, slender, creeping rhizome.

3. *C. NITIDUM*, *J. Smith* (POLYPODIUM, *Kaulfuss*; *CAMPYLONEURUM*, *Presl*).—A rigid and rather erect-growing stove Fern, native of the West Indies. Fronds glabrous, from one to two feet long, coriaceous, undulated, deep green and shining, lanceolate-

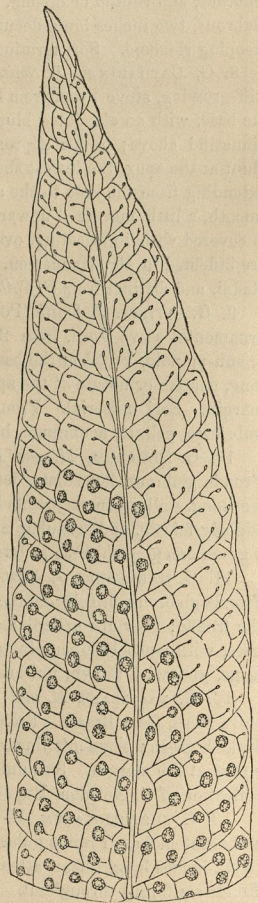


Fig. 11.



acuminate, decurrent at the base; lateral, articulated on a short, scaly, creeping rhizome. Sori medial or terminal; veins indistinct.

4. *C. PHYLLITIDIS*, *J. Smith* (POLYPODIUM, *Linnaeus*; CAMPYLONEURUM, *Prest.*).—A rigid and rather erect-growing stove Fern, from the West Indies. Fronds simple, glabrous, from one to two and a-half feet long, rather narrow, slightly undulated, pale green, lanceolate-acuminate, coriaceous, decurrent at the base; articulated on a scaly, short, creeping rhizome. Sori medial.

5. *C. DECURRENS*, *J. Smith* (POLYPODIUM, *Raddi*; CAMPYLONEURUM, *Prest.*).—An ornamental evergreen stove species, from Brazil. Fronds glabrous, nearly ovate, pinnate, from two to three feet high, rather erect, with lanceolate-acuminate, narrow, membranous, pale green pinnæ, which are six to ten inches long, decurrent at the base, and running down the rachis; they are articulated with a scaly, creeping rhizome. Sori terminal.

## XI. NIPHOBOLUS, *Kaulfuss*.

*Sori* round, terminal, sometimes irregular and then usually confluent, protruding through dense stellate pubescence. *Veins* pinnate, internal, indistinct; *venules* parallel, transversely anastomosing, producing from their exterior side from two to five free or irregularly anastomosing *veinlets*, which are soriferous at their apices. *Fronds* simple, from one to one and a-half foot long, thick and fleshy, or coriaceous; the fertile generally contracted. Rhizome creeping.—Name derived from *niphobolos*, covered with snow; the fronds being covered with a white starry pubescence.

This genus has the most obvious characters of any in this section of *Polypodiæ*; for, in the absence of fructification, it is at once known by its stellate pubescence and simple fronds. The venation being internal and obscure, cannot be well seen, unless the cellular tissue of the frond is destroyed; it is one of the most exquisitely beautiful of all the forms of venation developed throughout the whole family of Ferns. Fig. 12 represents a fertile and a sterile frond of *Niphobolus Lingua* (nat. size).

1. *N. NUMMULARIFOLIUS*, *J. Smith* (ACROSTICHUM, *Swartz*; GYMNOPTERIS, *Prest.*).—A very elegant little evergreen stove species, native of the East Indies and the Philippine Islands. Sterile fronds subrotund, half an inch in diameter, light green, very fleshy. Fertile fronds linear, two inches long, decurrent at the base. Both the sterile and fertile are articulated on a scaly filiform creeping rhizome. Sori round, subsequently confluent, covering the whole under surface; veins and costa immersed in the substance of the frond.

2. *N. RUPESTRIS*, *Sprengel* (POLYPODIUM, *Forster*; CRASPEDARIA, *Link*; *N. SERPENS*, *Endlicher*).—A dwarf evergreen greenhouse species, from New Holland. Sterile fronds roundish or oblong-ovate, one to two inches long, decurrent at the base. Fertile fronds linear, three to four inches long, obtuse at the apex, and decurrent at the base. Both kinds are dull green, and articulated on a small scaly creeping rhizome, about the thickness of a crow's quill. Sori round, confined to the upper half of the frond; veins and costa immersed.

3. *N. PERTUSUS*, *Sprengel* (POLYPODIUM, *Roxburgh*; CRASPEDARIA, *Link*).—A very fleshy evergreen stove Fern, a native of the East Indies, China, and New Holland. Sterile fronds oblong-ovate, obtuse, decurrent at the base, three to four inches long. Fertile fronds linear, four

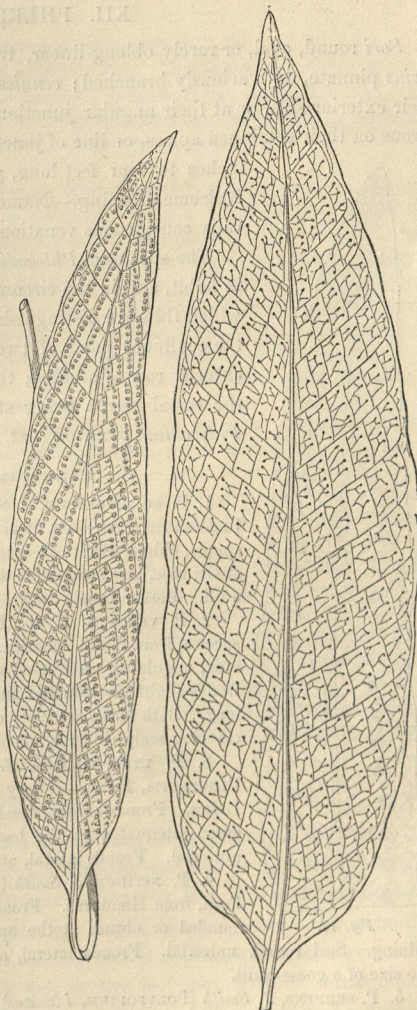


Fig. 12.



to eight inches long, decurrent at the base. Both are of a light shining green, and are articulated on a small scaly creeping rhizome, of the size of a crow's quill. Sori confluent on the upper half of the frond; veins and costa immersed.

4. *N. varius*, *Kaulfuss*.—An ornamental evergreen stove Fern, from the Malay Islands and Singapore. Sterile fronds lanceolate-acuminate, from six to twelve inches long, decurrent at the base. Fertile fronds linear-lanceolate, acuminate, decurrent at the base, one foot long. Both kinds are densely covered throughout with stellate pubescence, and are articulated on a slender scaly creeping rhizome. Sori on the upper part of the frond, confluent in oblong masses; costa nearly immersed.

5. *N. lingua*, *Sprengel* (*ACROSTICHUM*, *Thunberg*; *POLYPODIUM*, *Swartz*; *CRASPEDARIA CHINENSIS*, *Link*).—A very pretty evergreen warm greenhouse species, from China and Japan. Sterile fronds lanceolate-acuminate, six to ten inches long, decurrent at the base, dull green on the upper surface, and whitish beneath. Fertile fronds contracted, but nearly of the same form as the sterile, and of equal length. Both are articulated on a slender scaly creeping rhizome. Sori arranged in transverse parallel rows, between the primary veins, throughout the whole under surface of the frond, brownish red; costa elevated; veins immersed.

## XII. PHLEBODIUM, *R. Brown*.

*Sori* round, oval, or rarely oblong-linear, transversely uniserial or biserial, sometimes irregular. *Veins* pinnate, or variously branched; *venules* arcuately or angularly anastomosing, producing on their exterior side, or at their angular junction, two or more conniving *veinlets*, which are sporangiferous on their combined apices, or line of junction. *Fronds* simple, pinnatifid or pinnate, from a few inches to four feet long, glabrous or squamiferous, coriaceous or membranous. *Rhizome* creeping.—Name derived from *phleps*, *phlebos*, a vein; from the generally conspicuous venation.

The species of *Phlebodium* resemble some of the *Goniophlebiums* and *Drynariæ* in habit, and in the circumscription of their fronds. The technical characters by which they are distinguished from other genera are:—the sori being produced on the confluent parts of two or more veinlets, which generally terminate in the exterior row of areoles; the irregular branching of the veins and venules; and the costal areole being sterile. Fig. 13 represents a portion of a segment of *Phlebodium glaucum* (nat. size).

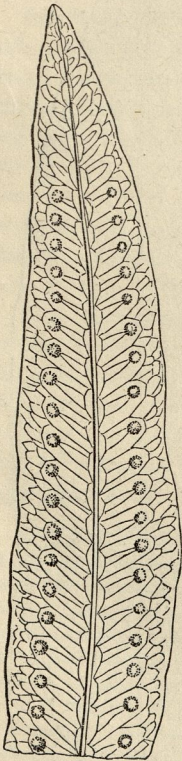


Fig. 13.

† *ANAPELTIS*, *J. Smith*.—Fronds simple; sori without scales.

1. *P. squamulosum*, *J. Smith* (*POLYPODIUM*, *Kaulfuss*; *P. MYRTILLIFOLIUM* of gardens; *PLEOPELTIS*, *Prest*).—A dwarf creeping evergreen stove Fern, from Brazil. Sterile fronds simple, oblong-elliptical, erect, two to three inches high, dull green, coriaceous, attenuated at the base, and articulated on a scaly creeping rhizome, of about the thickness of a goose-quill. Fertile fronds linear, obtuse.

2. *P. venosum*, *J. H.* (*POLYPODIUM*, *Desvaux*).—An elegant dwarf evergreen stove species, from South America. Sterile fronds simple, oblong-lanceolate, six to eight inches long, undulated, attenuated at the base, dull green, with conspicuous dark veins. Fertile fronds slightly contracted, linear-lanceolate, attenuated at the base, six to eight inches long. Both forms are scaly on the rachis and stipes, and are lateral, articulated on a creeping scaly rhizome, about the size of a goose-quill. Sori oval or oblong, uniserial.

3. *P. lycopodioides*, *J. Smith* (*POLYPODIUM*, *Linnaeus*; *P. GLABELLUM*, *Heward*; *PLEOPELTIS*, *Prest*).—A very dwarf creeping evergreen stove species, native of the West Indies. Fronds simple, two to four inches long, oblong-lanceolate, rather obtuse at the apex, attenuated at the base, membranous, undulated, and light green. Sori round, uniserial. Fronds lateral, articulated on a very slender scaly creeping rhizome.

4. *P. nitidum*, *J. Smith* (*POLYPODIUM NITIDULUM*, *Kunze*).—A dwarf evergreen stove Fern, from Honduras. Fronds glabrous, simple, three to six inches long, oblong-elliptical, rounded or obtuse at the apex, attenuated at the base, light green, subcoriaceous and shining. Sori round, uniserial. Fronds lateral, articulated on a scaly creeping rhizome, which is scarcely the size of a goose-quill.

5. *P. serpens*, *J. Smith* (*POLYPODIUM*, *Linnaeus*).—A dwarf creeping evergreen stove Fern, from the West Indies. Fronds simple, glabrous, lanceolate, subcoriaceous, three to nine inches long, of a bluish green, acuminate at the apex, attenuated at the base, entire on the margin, and decurrent on the stipes. Fronds lateral, indistinctly articulated with a creeping scaly rhizome, about the size of a goose-quill.



6. *P. NITENS*, *M. and H.*—A very slender creeping evergreen stove Fern, from Sierra Leone. Fronds simple, glabrous, oblong-lanceolate, undulated, four to six inches long, of a bright shining green, often obtuse at the apex, attenuated at the base, entire on the margin, and decurrent on the stipes. Fertile fronds contracted; lateral, indistinctly articulated with a slender creeping rhizome, about the size of a crow's quill, which is thickly covered with brown scales. Sori uniserial.

7. *P. OVARIENSE*, *M. and H.* (*POLYPODIUM*, *Desvaux*).—An evergreen hothouse Fern, from Sierra Leone. Sterile fronds simple, glabrous, coriaceous, obovate-elliptical, one and a half inch long, sub-sessile, dark green, and entire at the margin. Fertile fronds simple, linear-lanceolate, rather obtuse at the apex, undulated, about two inches long, and entire at the margin. Sori uniserial. Fronds lateral, articulated with a slender creeping scaly rhizome. This species was imported by Messrs. Garraway and Mayes, of Bristol, in 1850.

‡ *PLEOPELTIS*, *J. Smith*.—Fronds simple; sori at first covered by the scales of the frond.

8. *P. PERCUSSUM*, *J. Smith* (*POLYPODIUM*, *Cavanillas*; *PLEOPELTIS*, *Presl*).—An ornamental evergreen stove species, a native of various parts of South America. Fronds simple, about a foot long, lanceolate-acuminate, cuspidate, coriaceous, bright green, shining, attenuated at the base, and covered throughout with minute peltate fimbriate scales. Sori large, uniserial, seated in dense compact tufts of narrow scales. Fronds lateral, articulated on a scaly creeping rhizome, about the size of a duck's quill.

‡ *PHLEBODIA VERA*, *J. Smith*.—Fronds pinnatifid or pinnate.

9. *P. DECUMANUM*, *J. Smith* (*POLYPODIUM*, *Willdenow*; *PLEOPELTIS*, *Presl*).—A glabrous ornamental subevergreen stove species, from Jamaica, and various places in South America. Fronds slender, light green, somewhat ovate-lanceolate, broad at the base, pinnatifid, two to three feet long, with lanceolate-acuminate membranous segments, which are six to eight inches long, slightly serrated. Sori round, immersed, uniserial. Fronds lateral, articulated on a scaly creeping rhizome.

10. *P. AUREUM*, *R. Brown* (*POLYPODIUM*, *Linnaeus*; *PLEOPELTIS*, *Presl*; *CHRYSOPTERIS*, *Link*).—A noble subevergreen stove Fern, from the West Indies. Fronds glabrous, drooping, somewhat ovate-lanceolate, pinnatifid, three to four feet long, with lanceolate-acuminate broad undulated membranous segments, which are eight to ten inches long, with entire margins. Sori round, biserial, or scattered. Stipes and rachis very smooth, shining, light brown or purple; lateral, articulated on a thick creeping rhizome, densely covered with bright brown scales.

11. *P. SPORADOCARPUM*, *J. Smith* (*POLYPODIUM*, *Willdenow*; *P. GLAUCUM*, *of gardens*; ? *P. AREOLATUM*, *Willdenow*; *CHRYSOPTERIS*, *Link*).—A very beautiful and glaucous evergreen stove species, from Mexico. Fronds rather ovate in outline, glaucous throughout, pinnatifid, with stiff, coriaceous, obtuse, almost lanceolate segments, with entire margins. Sori large, uniserial, bright yellowish brown. Stipes very smooth, half the length of the frond, brownish green; lateral, articulated on a thick glaucous scaly creeping rhizome.

12. *P. MULTISERIALE*, *M. and H.*—A subevergreen hothouse Fern, from South America. Fronds glabrous, subpinnate, two to four feet long, bright green; segments lanceolate-acuminate, rather membranous, nine to ten inches long, dilated at the base, entire at the margin. Sori usually on the upper part, or on distinct fronds, in five to six series on each side the midrib of the segments. Fronds lateral; articulated with a thick creeping rhizome, densely clothed with light brown woolly scales. This Fern was introduced to the Royal Botanic Garden, Kew, in 1850; and has also been recently introduced from Demarara.

13. *P. INEQUALE*, *T. M.*—A noble subevergreen warm greenhouse Fern, from Guatemala. Fronds glabrous, broadly lanceolate, wide at the base, three to four feet long, drooping, light green, pinnate; pinnæ lanceolate-acuminate, undulated, rather membranous, six to ten inches long; the inferior petiolate, the superior adnate decurrent and unequal at the base, attenuated at the apex, and slightly crenulate at the margin. Sori large, uniserial, immersed. Stipes smooth, straw-coloured; lateral, articulated on a thick scaly creeping caespitose rhizome, which is covered with lanceolate-acuminate scales, broader and less attenuated than in *P. aureum*, which this plant resembles in general aspect, but from which it differs in being distinctly pinnate, and not at all glaucous. The venation is often that of *Goniophlebium*. It was imported, about nine years since, by Messrs. Loddiges of Hackney, and is known in gardens under the name of *Polypodium triseriale*.

### XIII. DRYNARIA, *Bory*.

*Sori* round or oblong, naked or squamiferous, produced on the angles or points of confluence of numerous venules (compital), superficial or deeply immersed forming elevated protuberances on the upper surface of the frond; transversely uniserial, or arranged in one or two oblique rows between each two of the primary veins, or irregular. *Veins* pinnate, parallel, or flexuose; *venules* compoundly anastomosing, producing from their sides, variously directed, free sterile *veinlets*, with apices generally rounded or club-shaped. *Fronds* from a few inches to four or five feet long, simple pinnatifid or pinnate, membranous or coriaceous, glabrous or pilose. *Rhizome* creeping.—Name said to be derived from that of the *Dryades*, nymphs of the woods, in allusion to their native habitation; but more probably from *dryinos*, of oak, the name having been originally applied to the oak-leaved *D. quercifolia*.



The species belonging to this genus have a varied aspect, as well as a wide geographical range; some are very membranous, others are remarkably rigid in texture, almost without parallel amongst Ferns. Many of the more beautiful species are at present unknown in cultivation. They all have creeping rhizomes, and are well adapted for cultivating on logs of wood, trunks of trees, or amongst light, open materials, where they form very beautiful and highly ornamental objects. Their compound anastomosing venation is met with also in other genera, even in the same section; but the characters that distinguish the *Drynarias* from all associates are the naked or squamiferous compital sori, and the compound or zigzag anastomosing branching of the veins, with sterile veinlets in the areoles. Fig. 14 represents a portion of *Drynaria Billardieri* (nat. size).

§ PHYLITIDIS, *J. Smith*.—Fronds simple.

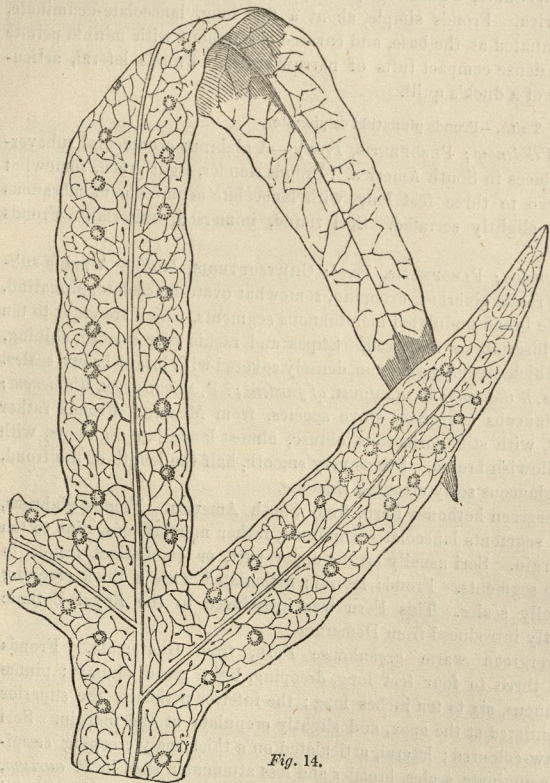


Fig. 14.

1. *D. FORTUNII*, *T. M.*—An interesting evergreen Fern, from China. Fronds simple, a foot or more in height, lanceolate, attenuated at both the base and apex, subcoriaceous, bright green, entire, or subsinuate, quite smooth, and punctulate with transparent dots, which indicate the apices of free veinlets within the areoles of the veins. Sori distinct, uniserial, near the costa, and chiefly produced at the upper part of the frond. Fronds much tapered below into the short, sparingly scaly stipes, which is lateral, and articulated on a slender scaly creeping rhizome. Received from Mr. Henderson, of Wentworth; and precisely accords with No. 18 of Fortune's Chinese plants, collected during his second journey.

2. *D. CONTIGUA*, *J. Smith* (*POLYPODIUM, Wallich*).—An evergreen stove species, from Borneo. Fronds simple, glabrous, linear-lanceolate, one to one and a half foot long, coriaceous, undulated, deep shining green, acute at the apex, attenuated at the base, decurrent on the stipes, and entire at the margin. Sori oblong, uniserial, submarginal, immersed, forming elevated protuberances on the upper surface. Fronds lateral, articulated with a small creeping rhizome. This species was introduced by Mr. Low, of the Clapton nursery, in 1847.

3. *D. HEMIIONITIDEA*, *J. Smith* (*POLYPODIUM, Wallich*; *P. MEMBRANACEUM, D. Don*; *SELLIGUEA HEMIIONITIDEA, Presl*).—A very

delicate evergreen stove species, from the East Indies. Fronds glabrous, simple, one to two feet long, lanceolate, light green, undulated, very membranous, attenuated at the base. Sori round, small, and irregular. Fronds lateral, articulated on a short scaly creeping rhizome.

4. *D. IRIOIDES*, *J. Smith* (*POLYPODIUM, Lamarck*; *P. POLYCEPHALUM, Wallich*; *PHYMATODES IRIOIDES, Presl*; *MICROSORUM IRREGULARE, Link.*).—A glabrous evergreen ornamental stove Fern, native of the Mauritius, East Indies, Sierra Leone, and New Holland. Fronds simple, two to three and a half feet long, light green, fleshy, linear-lanceolate, ensiform, attenuated at the base, and often irregularly lobed at the margin. Sori very small, numerous, thickly scattered on the upper half of the frond. Venation internal. Fronds lateral, articulated on a short scaly creeping rhizome.

5. *D. CRASSIFOLIA*, *J. Smith* (*POLYPODIUM, Linnaeus*; *ANAXETUM, Schott*).—A coarse-growing glabrous evergreen stove species, from Brazil, Peru, and the West Indies. Fronds simple, linear-lanceolate, attenuated at the base, two to three feet long, and three or four inches wide, coriaceous, dull green. Sori large, round, or oval, uniserial between each two of the primary veins. Fronds lateral, articulated on a short scaly creeping rhizome.

6. *D. SESQUIPEDALIS*, *J. Smith* (*POLYPODIUM SESQUIPEDALIS, Wallich*; *PLEOPETIS NUDA, Hooker*).—An evergreen hothouse Fern, from the Mauritius and Nepal. Fronds simple, narrow lanceolate, a foot or more long, light green, undulated, attenuated at the base, and decurrent on the stipes, acuminate at the apex, entire on



the margin, and scattered over beneath with small cordate scales. Sori round, transversely uniserial on the upper part of the frond, immersed, forming large protuberances on the upper surface. Fronds lateral, articulated with a green creeping rhizome, which is scarcely the size of a goose-quill, and covered with soft scales.

‡ PHYMATODES, *J. Smith*.—Fronds pinnatifid or pinnate, all stipitate.

7. *D. PUSTULATA*, *J. Smith* (POLYPODIUM, *Forster*; *P. SCANDENS*, *Forster*; *P. CÆSPITOSUM*, *Link*; CAMPYLONEURUM CÆSPITOSUM, *Link*; *P. SCANDENS* and *P. PUSTULATA*, *Prestl*).—A dwarf glabrous evergreen greenhouse Fern, from New Zealand. Fronds from a few inches to a foot long, simple lanceolate or pinnatifid with lanceolate-acuminate membranous pale green segments. Sori round, uniserial, and submarginal. Fronds lateral, articulated on a small cæspitose creeping rhizome. The simple state is the *P. cæspitosum*.

8. *D. BILLARDIERI*, *J. Smith* (POLYPODIUM, *Brown*; PHYMATODES, *Prestl*; CHRYSOPTERIS, *Link*; POLYPODIUM SCANDENS, *Labillardiere*).—A creeping evergreen greenhouse Fern, native of New Holland, New Zealand, and Van Diemen's Land. Fronds glabrous, erect, about a foot high, simple or pinnatifid, with a few linear acuminate segments, coriaceous, deep green, attenuated at the base. Sori large, round, uniserial, immersed. Fronds lateral, articulated on a cæspitose creeping scaly rhizome, as thick as a goose-quill.

9. *D. VULGARIS*, *J. Smith* (POLYPODIUM PHYMATODES, *Linnaeus*; *P. PLEOPELTIFOLIUM*, of gardens; PHYMATODES VULGARIS, *Prestl*; CHRYSOPTERIS PHYMATODES, *Link*).—A beautiful evergreen glabrous stove species, native of the Mauritius, New Holland, East Indian and Malay Islands. Fronds rather erect, triangularly ovate, pinnatifid, one to one and a half foot long, decurrent at the base, light green and shining, with oblong-acute coriaceous segments, four to six inches long, the lower one often lobed. Sori round or ovate. There are two forms in cultivation. The fronds are articulated on a black scaly creeping rhizome, as thick as a swan's quill.

10. *D. LONGIPES*, *J. Smith* (POLYPODIUM, *Link*; CHRYSOPTERIS, *Link*; *P. ALTERNIFOLIUM*, *Link*).—A coarse-looking evergreen stove Fern, from the East Indies. Fronds glabrous, two to two and a half feet long, pinnatifid, decurrent at the base, coriaceous, with three or four large broad oblong acuminate segments, six or eight inches long, deep green. Sori large, oblong, biserial, immersed. Rachis and stipes pale green; stipes more than half the length of the frond; lateral, articulated on a creeping rhizome, nearly as thick as a swan's quill.

11. *D. LONGISSIMA*, *J. Smith* (POLYPODIUM, *Blume*; *P. MELANONEURON*, *Miquel*; *P. MELANOCOCCA*, *Hort. Amstel.*).—A tall slender evergreen stove species, from the East Indies. Fronds glabrous, pinnatifid, two to five feet long, narrow lanceolate, with lanceolate-acuminate membranous undulated distant pale green segments. Sori large, round, uniserial, immersed, forming elevated protuberances on the upper surface of the fronds. Fronds lateral, articulated on a scaly creeping rhizome, which is much elongated, and as thick as a swan's quill.

12. *D. OXYLOBUM*, *M. and H.* (POLYPODIUM, *Wallich*).—A deciduous hothouse Fern, from the East Indies. Fronds glabrous, pinnatifid, decurrent at the base, a foot or more long, somewhat glaucous beneath; segments lanceolate, three to five inches long, acuminate at the apex, entire at the margin. Sori large, uniserial. Fronds lateral, articulated with a cæspitose creeping rhizome. Introduced to Kew in 1852. This has an agreeable fragrance like new hay when dry.

13. *D. SESSILIS*, *M. and H.*—A deciduous stove Fern, a native of the East Indies. Fronds glabrous, lanceolate, pinnate, two feet long, palish green; pinnae sessile, oblong-ovate, three to six inches long, undulated, acuminate at the apex, roundish at the base, and articulated with the rachis. Sori uniserial. Fronds lateral, articulated with a thickish cæspitose creeping rhizome, clothed with narrow-lanceolate scales. This fern is closely allied to the *Polypodium venustum* of Wallich, but differs in the size and vestiture of the rhizome, and in being quite glabrous.

14. *D. CAPITELLATA*, *J. Smith* (POLYPODIUM, *Wallich*; *P. JUGLANDIFOLIUM*, *D. Don*; PHYMATODES CAPITELLATA, *Prestl*).—A neat evergreen stove Fern, from the East Indies. Fronds glabrous, pinnate, one to one and a half foot long, with a few oblong ovate mucronate cuspidate membranous pinnae, which are round at the base and articulated with the rachis, glaucous, with a thickened white margin. Sori large, round, uniserial. Fronds lateral, articulated on a scaly creeping rhizome.

15. *D. LEIORHIZA*, *J. Smith* (POLYPODIUM, *Wallich*; *P. CUSPIDATUM*, *D. Don*; PHYMATODES LEIORHIZA, *Prestl*).—A very ornamental evergreen stove species, a native of Nepal. Fronds glabrous, pinnate, two to three and a half feet long, with lanceolate-acuminate bright green pinnae, the inferior ones petiolate six to eight inches long, the upper ones adnate and decurrent. Sori round, uniserial, very large. Fronds lateral, articulated on a thick creeping rhizome.

16. *D. PROPINQUUM*, *M. and H.* (POLYPODIUM, *Wallich*).—An ornamental evergreen stove Fern, from the East Indies. Fronds glabrous, ovate-lanceolate, pinnatifid or pinnate below, one to one and a half foot long, light green; segments lanceolate-acuminate, three to six inches long, rather membranous, undulated, dilated, and adnate at the base, decurrent on the stipes, and crenately-serrate at the margin. Sori uniserial. Fronds lateral, articulated with a short thickish creeping rhizome, half an inch in diameter, and densely clothed with woolly scales. Introduced to Kew in 1852.

\*  
‡ DRYNARIA VERÆ, *J. Smith*.—Rhizome bearing sessile, sinuose, sterile fronds, with rigid veins.

17. *D. DIVERSIFOLIA*, *J. Smith* (POLYPODIUM, *R. Brown*; *P. GLAUCISTIPES*, *Wallich*).—A beautiful evergreen stove Fern, from the East Indies, Java, and subtropical New Holland. Fronds of two kinds. Sterile fronds sessile, cordate-oblong, pinnatifid, three to four inches long. Fertile fronds slender, stipitate, reclining, one and a half to two



feet long, pinnate, bright green; pinnae sessile, linear-lanceolate, acuminate, four to six inches long, and about a quarter of an inch wide, cuneate at the base, crenulate at the margin, and indistinctly articulated with the rachis. Sori uniserial. Fronds lateral, adherent to a thick scaly caespitose creeping rhizome. Introduced by Messrs. Rollisson in 1850.

18. *D. QUERCIFOLIA*, *J. Smith* (*POLYPODIUM*, *Linnaeus*; *PHYMATODES*, *Presl*).—An evergreen stove Fern, having an extensive geographical range through the tropics of the eastern hemisphere. Fronds of two kinds: sterile—sessile, oblong-ovate, cordate at the base, sinuose or laciniated, with the vascular structure rigid, and permanent: fertile—stipitate, pinnatifid, with linear acuminate undulated segments, having a thick margin, and articulated with the rachis. Sori round, obliquely and rather irregularly disposed throughout the whole under surface of the frond. The rhizomes are thick, scaly and creeping. There are various well-defined forms of this species distributed throughout the Eastern hemisphere.

19. *D. CORONANS*, *M. and H.* (*POLYPODIUM*, *Wallich*; *PHYMATODES*, *Presl*).—A noble evergreen stove Fern, native of the East Indies. Fronds glabrous, rigid, sessile, rather erect, cordate-oblong, three to four feet long, lightish green, deeply pinnatifid; segments oblong, undulated, articulated with the rachis, lower ones round at the apex, upper ones acuminate, margin thick and entire. Sori uniserial, between each two of the primary veins, and confined to the upper half of the frond, which is lateral, adherent to a thick decumbent fibrose slightly creeping rhizome.

#### XIV. DICTYMIA, *J. Smith*.

*Sori* oblong, compital, transversely uniserial, receptacle immersed. *Venation* uniform, reticulated, internal. *Fronds* simple, glabrous, coriaceous. *Rhizome* creeping.—Name derived from *diktyon*, a net; alluding to the netted venation.

This genus is established on habit more than any technical characters. The two species which it comprises are natives of New Holland and New Zealand. Their uniform reticulated venation distinguishes them from *Drynaria*, the areoles being all sterile. Fig. 15 represents the upper part of a frond of *Dictymia attenuata* (nat. size).

1. *D. ATTENUATA*, *J. Smith* (*POLYPODIUM*, *Brown*; *P. BROWNIANUM*, *Sprengel*; *DICTYOPTERIS*, *Presl*).—An ornamental evergreen greenhouse Fern, from New Holland. Fronds simple, linear-acuminate, dark green, about a foot long, coriaceous, attenuated at the base. Sori oblong, rhizome, nearly as thick as a goose-quill.

#### XV. DRYMOGLOSSUM, *Presl*.

*Sori* linear, continuous, marginal or intramarginal, produced on the transverse sides and junctions of the venules, forming a broad marginal or intramarginal soriferous band, which is pilose or squamiferous. *Venation* uniform, compoundly anastomosing, producing variously directed free veinlets. *Fronds* simple, elliptical, or lanceolate, coriaceous, from one to sixteen inches long. *Rhizome* creeping.—Name derived from *drymos*, a forest, and *glossa*, a tongue; alluding to the form of the fronds, and the native habitat of the plants.

Comparing the venation in this genus with what occurs in *Drynaria* and *Sellignea*, it is only by the position of the linear continuous sori that it is distinguishable. The essential characters are a com-

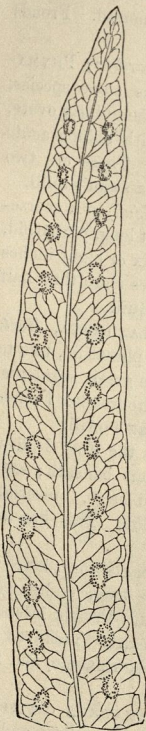


Fig. 15.

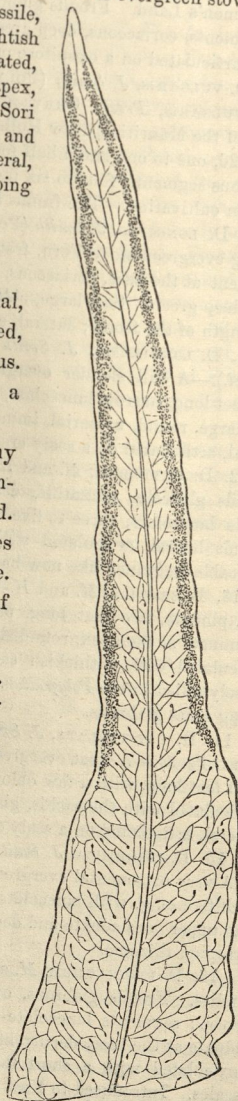


Fig. 16.



pound anastomosing venation, with the naked linear continuous sori running parallel with and near to the margin. Fig. 16 represents the upper portion of a frond of *Drymoglossum lanceolatum* (nat. size).

1. *D. PILOSELLOIDES*, Presl (PTERIS, *Linnaeus*; PTEROPSIS, *Desvauz*; NOTHOCHLÆNA, *Kaulfuss*).—A dwarf creeping evergreen stove Fern, native of the East Indies and Malay Islands. Fronds of two kinds: sterile—elliptical or roundish-ovate, one inch high, attenuated at the base: fertile—linear, narrow, two inches high, attenuated at the base; both are lateral, articulated on a filiform creeping rhizome. Sori confluent, covering the whole surface of the frond. This Fern is at present extremely rare in cultivation, although in 1843 it was covering the end of a pine stove in the garden of the Duke of Northumberland, at Syon.

2. *D. LANCEOLATUM*, *J. Smith* (PTERIS, *Linnaeus*; PTEROPSIS, *Desvauz*; TÆNITIS, *Kaulfuss*).—An ornamental evergreen stove Fern, from Jamaica. Fronds uniform, lanceolate, from ten to sixteen inches long, contracted at the apex where they are soriferous, pale green and attenuated at the base; they are lateral, articulated on a slender slowly creeping rhizome. Venation internal.

#### XVI. TÆNIOPSIS, *J. Smith*.

*Sori* linear, continuous, immersed in an intramarginal groove. *Veins* simple, parallel, their apices combined, and forming a transverse sporangiferous receptacle. *Fronds* simple, linear-lanceolate, one to two feet long, plane or with the margin revolute.—Name derived from *tainia*, a fillet or band, and *opsis*, resemblance, from the long narrow outline of the fronds.

In habit, venation, and external appearance, the species of this genus are precisely identical with *Vittaria*; the only ground on which they are separated is the position of the sporangiferous receptacle, which in *Vittaria* is marginal, and in *Tæniopsis* is intramarginal. Fig. 17 represents a frond of *Tæniopsis graminifolia* (med. size).

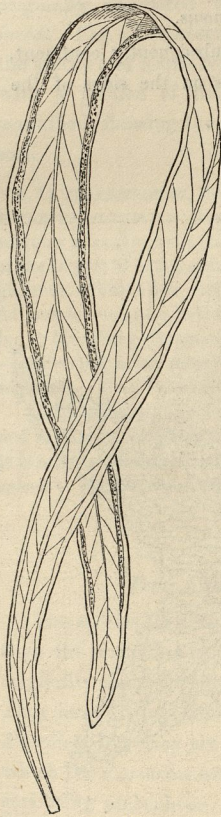


Fig. 17.

1. *T. LINEATA*, *J. Smith* (VITTARIA, *Swartz*).—A singularly narrow evergreen stove Fern, from the West Indies. Fronds simple, glabrous, pendulous, one to two feet long, and about an eighth of an inch broad. Veins internal, and very few; costa obsolete. Fronds lateral, forming a dense mass on a short creeping scaly rhizome. Sori intramarginal, in a groove nearly the whole length of the frond.

2. *T. GRAMINIFOLIA*, *J. Smith* (VITTARIA, *Kaulfuss*).—An ornamental evergreen species, from the West Indies. Fronds simple, glabrous, rather erect, about ten inches high, lanceolate-acuminate, undulated and attenuated at the base. Sori submarginal, continuous or interrupted, and confined to the upper half of the frond. Venation internal.

#### XVII. VITTARIA, *Smith*.

*Sori* linear, continuous, immersed in a marginal groove. *Veins* simple, parallel, combined at their apices by a transverse marginal vein, on which is produced the sporangiferous receptacle. *Fronds* simple, linear-elongate, from one to four or five feet long. *Rhizome* creeping.—Name derived from *vitta*, a ribband; which the long narrow fronds resemble.

This genus consists of a few narrow-fronded grassy-looking tropical Ferns, and originally comprised ten or twelve species. In aspect, habit, and venation, they coincide with *Tæniopsis*, from which, on account of the variation in the position of their sori, they have been divided. The species of *Vittaria* have their sori in the edge of the frond, opening outward; whilst those of *Tæniopsis* have their sori medial or intramarginal, in the plane under surface of the frond. In both cases the sori are immersed

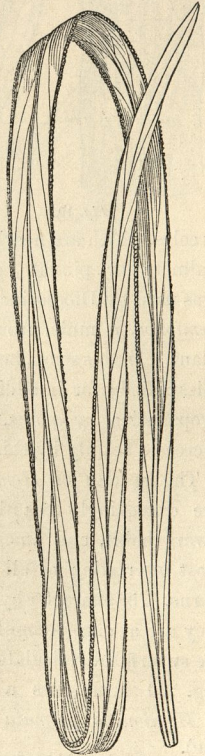


Fig. 18.

in grooves. Fig. 18 represents a small frond of *Vittaria zosteræfolia*.



1. *V. ZOSTERÆFOLIA*, Willdenow (*V. ANGUSTIFRONS*, Bory).—A pendulous-growing evergreen stove Fern, from the Mauritius. Fronds simple, glabrous, subcoriaceous, from one to four feet long, and about a quarter of an inch wide, of a rather bright green. They are lateral, adherent to a small creeping rhizome, densely covered with dark scales. Venation internal; costa within the substance of the frond. This species was introduced to Kew in 1852.

### XVIII. ANTROPHYUM, Kauffuss.

*Sori* linear, continuous or interrupted, reticulated; *sporangiferous receptacle* immersed in the substance of the frond. *Venation* uniform, reticulated; sides of the areoles more or less sporangiferous. *Fronds* simple, linear-lanceolate or elliptical, coriaceous.—Name derived from *antron*, a cavern, and *phyo*, to grow; alluding to the hollows on the under surface of the fronds, from whence the spore-cases arise.

The character which distinguishes this genus from *Hemionitis* is the immersed sporangiferous receptacle; the sori of *Hemionitis* being superficial. Fig. 19 represents the upper portion of a frond of *Antrophyum lanceolatum* (nat. size).

1. *A. LANCEOLATUM*, Kauffuss (*HEMIONITIS LANCEOLATA*, Linnaeus).—A delicate evergreen stove species, from the West Indies. Fronds simple, glabrous, one foot long, linear-lanceolate, acuminate, attenuated at the base, slightly undulated, and of a light green colour. Fronds lateral, somewhat fleshy, forming a dense tuft on a short creeping rhizome. Venation internal.

### XIX. HEMIONITIS, Linnaeus.

*Sori* linear, reticulated, superficial, and subsequently confluent. *Venation* uniform, reticulated, sporangiferous on the sides of the

areoles, which are nearly equal. *Fronds* simple, cordate palmate or pinnate, glabrous or villose.—The name was used by Dioscorides, and is said to be derived from *hemionos*, a mule, from the supposed sterility of the plant. In this sense, however, the name is here obviously misapplied; for in addition to the ordinary method of propagation by spores, *H. palmata* is viviparous, and increases readily by this means also.

The species of *Hemionitis* are exceedingly beautiful, of dwarf habit, and among the most interesting of all dwarf Ferns. The character by which they are at once recognised, is the superficial reticulated sori. Fig. 20 represents a frond of *Hemionitis palmata* (med. size).

1. *H. PALMATA*, Linnaeus.—A very elegant evergreen stove Fern, from Brazil and the West Indies. Fronds hairy, nearly one foot high, cordate and palmate, with five oblong-obtuse or acuminate segments, crenulate or bluntly lobed. Fertile fronds erect, the sterile ones nearly horizontal, both proliferous in the sinuses; terminal, adherent to a fasciculate rhizome.

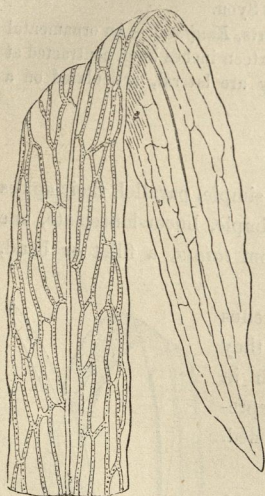


Fig. 19.

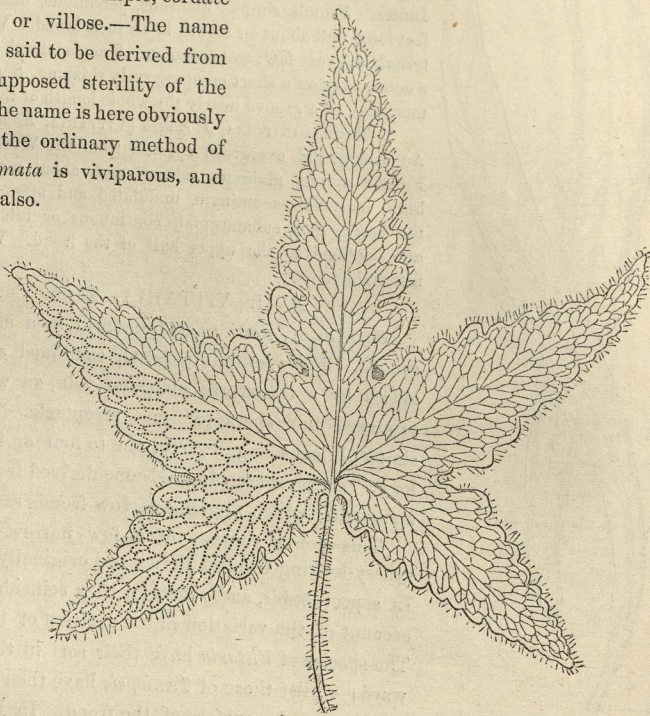


Fig. 20.



2. *H. CORDATA*, *Roxburgh*.—A beautiful low-growing evergreen stove Fern, from the East Indies. Fronds simple, cordate, hairy, especially on the rachis and margin; the sterile ones deep green, four to six inches long, roundish at the apex; the fertile erect, cordate-sagittate or sub-trilobate and triangular, six or eight inches high. Stipes ebeneous. Fronds terminal, adherent to a small tufted rhizome. This Fern was raised at Kew, in 1852, from spores, but has not yet produced fructification.

## XX. CERATOPTERIS, *Brongniart*.

*Sori* linear, continuous, parallel, superficial, produced on the lengthened transverse sides of the venules, and concealed by the reflexed margin of the segments. *Veins* transversely elongated, and distantly anastomosing. *Fronds* flaccid, of two kinds: sterile—pinnatifid or bipinnatifid, sinuate and viviparous; fertile—contracted, decompound, membranous, multifid, with linear forked and viviparous segments having their margins reflexed and indusiform.—Named from *keras*, *keratos*, a horn, and *pterus*, a fern; alluding to the fertile fronds.

The peculiar habit and structure of this genus render it difficult to determine its real affinity. The spore-cases are sessile, large and globose, furnished either with a broad nearly complete, or very short nearly obsolete ring. It was originally associated with *Gleicheniaceæ*. Fig. 21 represents portions of the sterile and fertile fronds (nat. size), with a portion of the fertile frond magnified, showing the position of the sori.

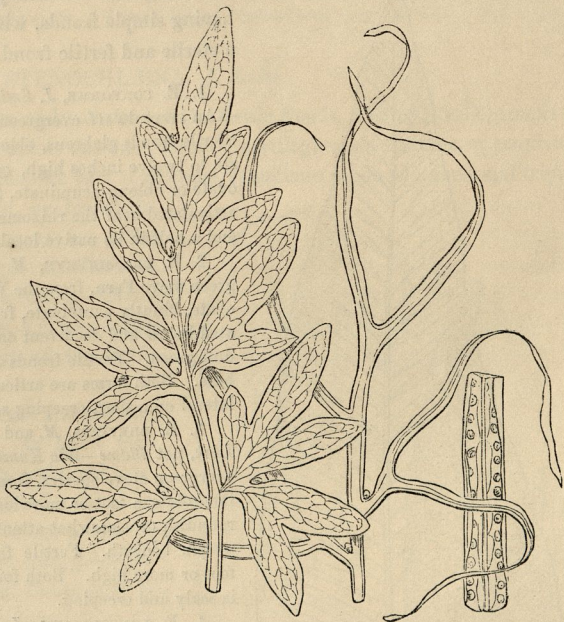


Fig. 21.

1. *C. THALICTROIDES*, *Brongniart* (*ELLOBOCARPUS OLERACEUS*, *Kaulfuss*).—A very singular annual aquatic stove Fern, native of the tropics of both hemispheres. Fronds glabrous, of two kinds: sterile—bipinnatifid, one to one and a half foot long, reclining, with oblong obtuse segments; fertile—contracted, erect, three or four times pinnate, one and a half to two and a half feet high, with linear revolute segments. Both forms are viviparous, of a light green, with the stipes nearly quadrangular.

*C. PARKERI*, *J. Smith* (*PARKERIA PTEROIDES*, *Hooker and Bauer*), was raised by Mr. H. Shepherd, of Liverpool, and so closely resembles the *Ceratopteris thalictroides*, in all respects except the elastic ring of the spore-case, that it is only to be discriminated by the aid of a very powerful microscope. Mr. J. Smith informs us that he has raised *C. thalictroides* from the spores of this supposed species.

### Tribe ACROSTICHEÆ, *J. Smith*.—*Sori* amorphous, without an indusium.

The species forming this extensive natural group are probably the easiest of all Ferns to recognize, from the sori being spread generally throughout the under surface of the frond. The species were originally comprehended under two or three genera; but they have been subdivided into nearly twenty. They have distinct sterile and fertile fronds, in which respect they are similar to *Lomaria*, in the tribe *Pterideæ*, but they are at once distinguished from that group by the absence of an indusium, with which the *Lomarias* are furnished. Their most obvious point of distinction from *Polypodiæ* is in the sori being amorphous; that is, not produced in round or linear masses, but closely occupying an irregular portion or the whole of the fertile disk, which in one or two genera is not confined to the inferior surface alone, the contracted rachiform segments being sporangiferous on both sides.



Sect. ORTHOPHEKIEÆ, J. Smith.—Veins free, i. e., not reticulated or anastomosing.

## XXI. ELAPHOGLOSSUM, Schott.

*Sori* amorphous, thickly covering the whole under surface. *Veins* simple or forked, internal; *venules* parallel, their apices free and clavate, terminating within a thickened margin. *Fronds* simple, from a few inches to two feet long, linear-lanceolate, coriaceous, glabrous, pilose, or squamose.—Named from *elaphos*, a deer, and *glossa*, a tongue; the small simple fertile fronds being supposed to resemble the tongue of the deer. In most modern catalogues the name is strangely enough said to be derived from *elephas*, an elephant, and *glossa*, a tongue—elephant's tongue!

This genus is readily distinguished from its congeners by having simple fronds, with forked free veins. Fig. 22 represents a sterile and fertile frond of *Elaphoglossum conforme* (med. size).

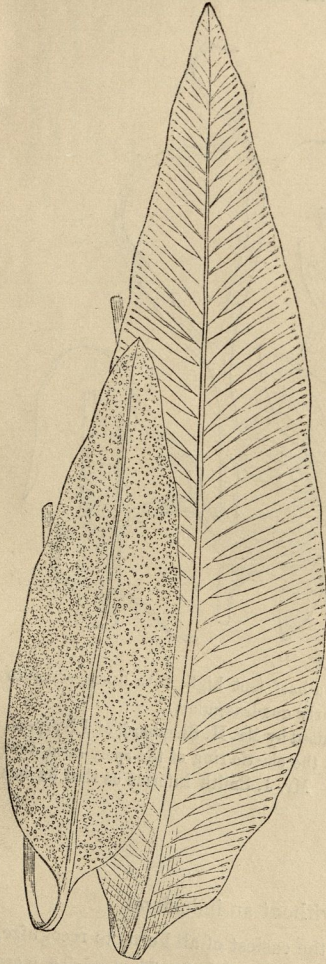


Fig. 22.

1. *E. CONFORME*, J. Smith (ACROSTICHUM, Swartz; OLFERIA, Presl).—An erect dwarf evergreen stove Fern, from the Cape of Good Hope. Sterile fronds glabrous, oblong-acuminate, attenuated at the base, from six to twelve inches high, coriaceous, deep green. Fertile fronds small, ovate or oblong-acuminate, from six to ten inches high. Both forms are articulated near the rhizome. This species attains the height of a foot and a half in its native locality. Rhizome scaly and caespitose, creeping.
2. *E. CRASSINERVE*, M. and H. (ACROSTICHUM, Kunze).—An evergreen stove Fern, from the West Indies. Sterile fronds glabrous, oblong-ovate, bluntly acuminate, from twelve to eighteen inches long, attenuated below and decurrent on the stipes, thick and coriaceous, undulated, dull green. Fertile fronds oblong-ovate, one foot high, attenuated at the base. Both forms are articulated near the base of the stipes, and are lateral on a short creeping scaly rhizome.
3. *E. BREVIPES*, M. and H. (ACROSTICHUM, Kunze; A. CALLÆFOLIUM, Link, not Blume—fide Kunze; E. CALLÆFOLIUM, J. Smith).—A glabrous evergreen stove species, from Java. Sterile fronds oblong-ovate or ovate-lanceolate, a foot or more long, coriaceous, deep green, shining, undulated, roundish or somewhat attenuated at the base. Rachis and stipes dark purple beneath. Fertile fronds erect, ovate-elliptical, acuminate, one foot or more high. Both forms are articulated near the rhizome, which is scaly and creeping.
4. *E. LONGIFOLIUM*, J. Smith (ACROSTICHUM, Jacquin; OLFERIA, Presl; CANDOLLEA, Mißel; ACONIOPTERIS, Fee; A. LATIFOLIUM, Swartz).—A glabrous evergreen stove Fern, from the West Indies. Sterile fronds coriaceous, bright green, lanceolate-acuminate, one to one and a half foot long; slightly undulated, attenuated at the base. Fertile fronds erect, lanceolate-acuminate, one to one and a half foot high, attenuated at the base. Both articulated near the base of the stipes; lateral, on a scaly caespitose creeping rhizome.
5. *E. SCOLOPENDRIFOLIUM*, J. Smith (ACROSTICHUM, Raddi; OLFERIA, Presl).—An ornamental evergreen stove species, from Brazil. Sterile fronds lanceolate, acuminate, twelve to fifteen inches long, undulated, pale green, with stipes one third the length of the frond; stipes, rachis, and margin of frond covered with fimbriate-acuminate cordate brown scales. Fertile fronds small, erect, lanceolate, acuminate, one foot long, with a stipes eight inches long. Both forms are articulated near the base of the stipes, and are lateral, on a very short scaly creeping rhizome.
6. *E. VILLOSUM*, J. Smith (ACROSTICHUM, Swartz; OLFERIA, Presl).—[Plate III]—An ornamental evergreen stove Fern, from Jamaica. Sterile fronds hairy, lanceolate, acuminate, undulated, pale green, about a foot long. Fertile frond narrow, lanceolate, acuminate, eight inches long. Both forms are articulated near the base of the stipes, and are lateral, on a very short creeping scaly rhizome.
7. *E. CUSPIDATUM*, M. and H. (ACROSTICHUM, Willdenow; OLFERIA, Presl).—A dwarf evergreen hothouse Fern, from South America. Sterile fronds linear-lanceolate, acuminate, from eight inches to a foot long, and nearly an inch wide, of a dullish green, attenuated at the base, and thickly covered, especially on the upper surface, with stellate or fimbriate scales. Fertile fronds of the same form as the sterile, but narrower, nearly a



foot long, with stipes nearly half their length. They are lateral, indistinctly articulated with a slender creeping rhizome. This plant was introduced in 1851, and was then referred to *E. Dombeyanum*, Fee.

8. *E. STRICTUM*, *T. M.* (*ACROSTICHUM*, *Raddi*; *OLFERSIA*, *Prest.*).—A delicate little stove species, received from Wentworth, which we refer to *A. strictum* of Raddi, a native of Brazil. Fronds small; the sterile ones four or five inches long, linear-lanceolate, narrowed above in a long point, and below into a short scaly stipes, the upper surface clothed with silvery scales, the lower more densely with tawny scales, the scales lanceolate, and strongly ciliate. The fertile fronds are linear oblong-obtuse, narrowed below in a long slender stipes, which is twice their length, and almost equalling the barren fronds; upper surface densely lepidote with ferruginous scales, lower with a scaly midrib.

9. *E. HIRTUM*, *M.* and *H.* (*ACROSTICHUM*, *Swartz*; *A. VESTITUM*, *Lowe*; *A. LOWEANUM*, *Kunze Herb.*; *OLFERSIA VESTITA*, and *O. PALEACEA*, *Prest.*).—An evergreen warm greenhouse Fern, from Madeira. Sterile fronds linear-lanceolate, about a foot long, acute at the apex, attenuated at the base, and densely covered throughout with ciliated scales. Fertile fronds lanceolate, about a foot long, rather obtuse at the apex, attenuated at the base. Stipes elongate, and densely scaly. Fronds lateral, articulated near the base, with a short creeping scaly rhizome.

## XXII. STENOCHLÆNA, *J. Smith.*

*Sori* amorphous, densely covering the under surface of the fertile fronds. *Veins* (sterile) simple or forked, external; *venules* parallel, their apices exserted, forming cartilaginous serratures, or conniving and forming a thickened margin. Rachis-like part of rhizome, sometimes producing abnormal tripinnatifid sterile fronds. *Fronds* pinnate, or bipinnate, from one to four feet long, glabrous or squamose. *Pinnules* (fertile) linear, narrow, the margin membranous, revolute and indusiform. *Rhizome* creeping.—Name derived from *stenos*, narrow, and *chlaina*, a cloak; alluding to the narrow membranous margin of the fertile pinnae.

The species of this genus have a distinct and peculiar aspect, and form a very natural group. In habit they resemble *Polybotrya*, having a creeping scaly rhizome. The narrow linear segments of the fertile frond, with their indusiform margins, are analogous to what occurs in *Lomaria*; but they differ materially from that genus in the margin being revolute, whereas in *Lomaria* it is plane, and usually the axis of an indusium. Fig. 23 represents a pinna of the sterile frond, with part of a pinna of the fertile frond of *Stenochlæna scandens* (med. size); for the latter we are indebted to Mr. Henderson, gardener to Earl Fitzwilliam, at Wentworth House, Yorkshire.

1. *S. SCANDENS*, *J. Smith* (*ACROSTICHUM*, *Linnaeus*; *LOMARIA*, *Willdenow*; *OLFERSIA*, *Prest*; *ONOCLEA*, *Swartz*).—An elegant evergreen stove Fern, with a scandent habit of growth, native of the East Indian and Malay Islands, and the Cape of Good Hope. Sterile fronds glabrous, shining, lanceolate, pinnate, somewhat pendulous, from three to four feet long; pinnae linear-acuminate, cuneate at the base, rather membranous, nearly a foot long, with a serrated cartilaginous margin; veins simple or forked, parallel, connected at the base by arcuate costal veins, forming a row of long narrow areoles close to the midrib. Fertile fronds bipinnate; pinnae six to eight inches long; pinnules linear, narrow, and sporangiferous on the under surface. Both kinds of fronds are lateral, adherent to a scandent slender green rhizome, which is covered with long narrow scales, attached by their centre.

2. *S. LONGIFOLIA*, *J. Smith* (*LOMARIA*, *Kaulfuss*).—An ornamental evergreen scandent stove Fern, from Guiana and the West Indies. Sterile fronds glabrous, pinnate, one and a half foot long, deep green; pinnae

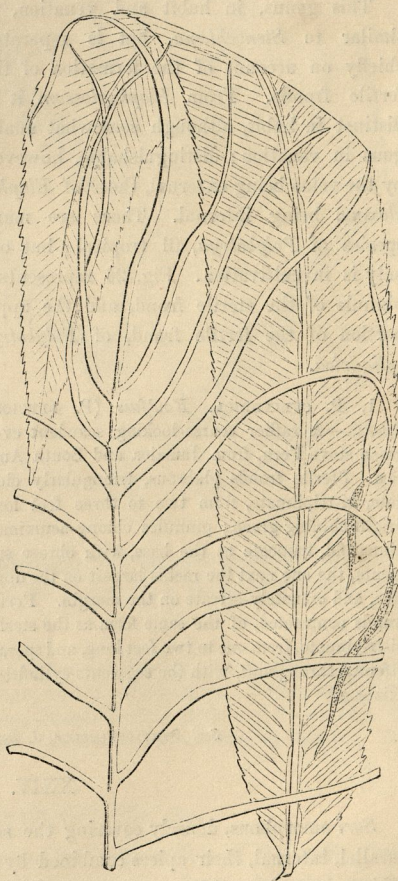


Fig. 23.



ovate or oblong, lanceolate, sessile, acute or acuminate at the apex, obtusely cuneate at the base, entire on the margin, and articulated with the rachis. Fertile fronds glabrous, pinnate, about a foot long; pinnæ linear-lanceolate, the terminal one elongate. Fronds lateral, adherent to a scandent rhizome.

3. *S. SORBIFOLIA*, *J. Smith* (*ACROSTICHUM*, *Linnaeus*).—A dwarf evergreen scandent stove Fern, from Jamaica. Sterile fronds glabrous, lanceolate, pinnate, about a foot long, with ovate or oblong acuminate, undulated, coriaceous, shining, bright green pinnæ, which are obtusely cuneate at the base, and articulated with a winged rachis. Fertile fronds erect, one foot high, pinnate, the pinnæ entire and articulate with the rachis. Both are lateral, adherent to a scaly creeping rhizome, about the size of a goose-quill.

### XXIII. POLYBOTRYA, *Humboldt and Bonpland*.

*Sori* amorphous, occupying one or both sides of the spiciform segments of the contracted fertile frond. *Veins* pinnate; *venules* simple, free, external. *Fronds* bi-tripinnate. *Rhizome* creeping.—Named from *polys*, many, and *botrys*, a raceme; alluding to the appearance of the fertile frond.

This genus, in habit and venation, is similar to *Stenochlæna*, but is separated chiefly on account of the formation of the fertile fronds. From *Elaphoglossum* it is distinct in habit, although somewhat analogous in venation; distinguishable, however, by the veins being external, those of *Elaphoglossum* being internal. There are many species of *Polybotrya*, all tropical; but one only is in cultivation. Fig. 24 represents a pinnule of the sterile frond, and the upper portion of the fertile frond, of *Polybotrya cylindrica*.

1. *P. CYLINDRICA*, *Kaulfuss* (*P. SPECIOSA*, *Schott*).—A rather coarse-looking scandent evergreen stove Fern, from Jamaica and South America. Sterile fronds glabrous, triangularly elongate, bi-tripinnate, from two to three feet long, bright shining green; pinnules oblong-acuminate, pinnatifid, truncate at the base, with obtuse segments, the one next the rachis largest on the upper side, and crenately-serrate on the margin. Fertile fronds contracted, of the same form as the sterile, bi-tripinnate, from one to two feet long, and sporangiferous throughout, with the segments cylindrical. Both forms are lateral, adherent to a rough scaly creeping rhizome.

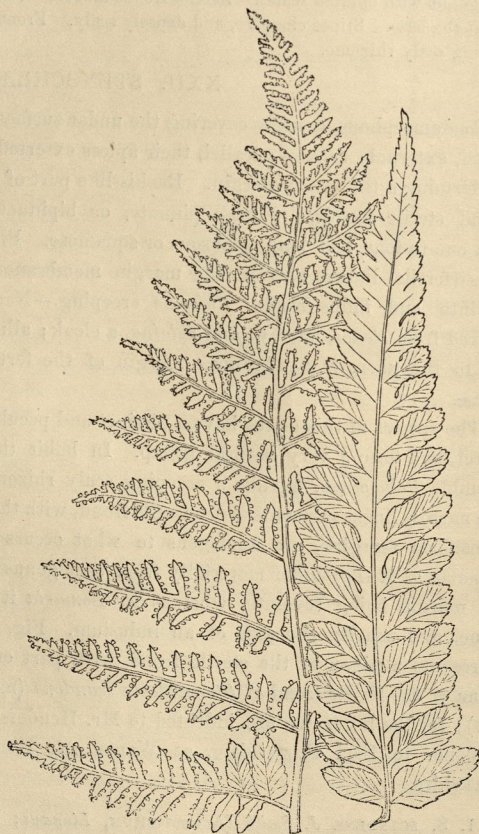


Fig. 24.

Both forms are lateral, adherent to a rough scaly creeping

*Sect. SYMPLIOPHLEETÆ*, *J. Smith*.—Veins netted, or variously anastomosing.

### XXIV. OLFERSIA, *Raddi*.

*Sori* amorphous, densely covering the segments of the fertile frond throughout. *Veins* forked, parallel, internal, their apices combined by a transverse continuous marginal vein. *Fronds* pinnate. *Rhizome* creeping.—Name probably commemorative of Olfers, which is the name of a German writer, but we do not find it explained.

Of this very elegant genus only one species is known. The venation is not very readily seen in the fertile fronds, in consequence of its being contracted and sporangiferous on both sides; but in the



sterile fronds, where it is evident it indicates a decisive character, by which the genus may be readily distinguished—namely, a continuous marginal transverse vein, connecting all the oblique veins by their apices. Fig. 25 represents a pinna of the sterile frond, and a portion of the fertile frond of *Olfersia cervina* (med. size).

1. *O. CERVINA*, Presl (ACROSTICHUM, Swartz; POLYBOTRYA, Kaulfuss).—A very elegant evergreen stove Fern, from the West Indies. Sterile fronds glabrous, lanceolate, pinnate, reclining, from two to three feet long; pinnae oblong-acuminate, coriaceous, bright green, rounded at the superior base, the inferior truncate. Fertile fronds erect, bipinnate, from two to three feet long; pinnae linear, sporangiferous throughout; stipes covered with long narrow scales. The fronds are terminal, adherent to a thick short creeping scaly rhizome.

The fertile frond of this species is usually bipinnate; when pinnate only, it is the *O. corcovadensis* of Raddi. We have both forms, gathered at the same time from one plant; they are, consequently, merely accidental modifications of one species.

## XXV. ANETIUM, Splitgerber.

Spore-cases few, irregularly scattered throughout the under surface of the fronds, often collected in small groups or lines. Venation uniform, reticulated, the areoles elongated. Fronds simple. Rhizome creeping.—Name derived from *anetos*, lax; alluding to the sori being sparse and scattered.

The habit of this genus (which contains but one species), and its few scattered sporangia, are the characters by which it is separated from *Acrostichum*. Fig. 26 represents a frond of *Anetium citrifolium* (med. size).

1. *A. CITRIFOLIUM*, Splitgerber (ACROSTICHUM, Linnæus; ANTROPHYUM, Fee).—A dwarf ornamental evergreen stove Fern, from the West Indies. Fronds simple, uniform, glabrous, somewhat membranous, oblong-elliptical, attenuated at the base, six to ten inches long; lateral, articulated with a scaly fibrous creeping rhizome. Sori irregularly scattered.

## XXVI. HYMENODIUM, Fee.

Sori amorphous, densely covering the under surface of the fertile frond. Venation uniform, internal, reticulated, forming large elongated areoles. Fronds simple, one foot or more in length, hairy. Rhizome creeping, and densely covered with hair-like scales.—Name derived from *hymen*, a membrane; from the membranaceous texture of some of the species.



Fig. 26.



Fig. 25.



This genus differs from *Acrostichum* in habit more than in technical characters. Its nearest affinity is with *Anetium*, which it resembles in habit, having simple fronds and a creeping rhizome; but it is separated by the dense amorphous sori, the sori in *Anetium* being few and irregularly scattered, while in *Hymenodium* they densely cover the whole under surface, except the margin. Fig. 27 represents a fragment of the sterile, and a fertile frond of *Hymenodium crinitum* (less than half the nat. size).

1. *H. CRINITUM*, *Fee* (*ACROSTICHUM*, *Linneus* *OLFERSIA*, *Prest*; *DICTYOGLOSSUM*, *J. Smith*).—An evergreen stove Fern, with a very peculiar aspect; a native of Jamaica. Sterile fronds simple, oval-elliptical, coriaceous, twelve to fifteen inches long, and eight to ten inches wide, dull green, and hairy throughout. Fertile fronds simple, erect, oval-elliptical, contracted, from twelve to fifteen inches high, with a stipes of six to nine inches, densely covered, as well as the upper surface of the frond with long narrow black hair-like scales. Both forms

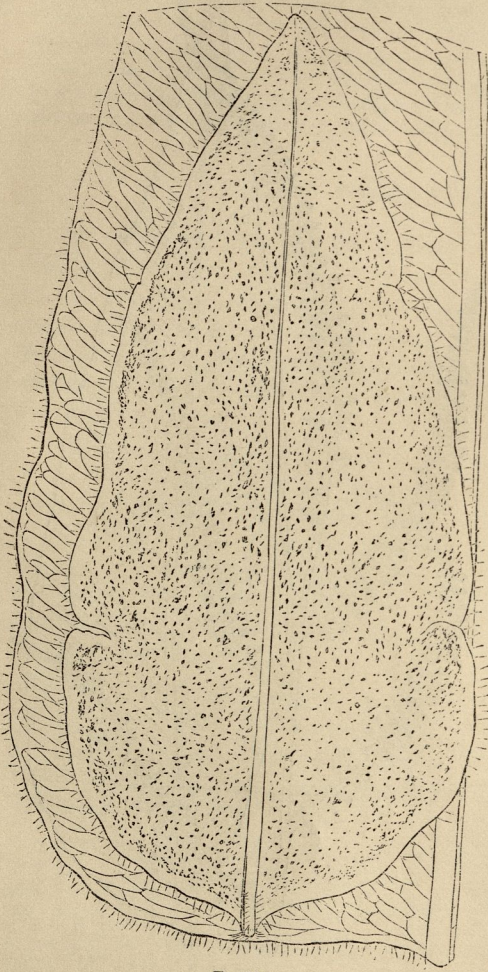


Fig. 27.

are terminal, adherent to a thick creeping rhizome, which is densely covered with criniform scales.

## XXVII. ACROSTICHUM, *Linneus*.

*Sori* amorphous, universal on the under surface of the fertile frond. *Venation* uniform, reticulated, forming elongated areoles.—Named from *akros*, high, and *stichos*, order; the fructification occupying the upper portion of the fertile disk.

The species belonging to this group are but few in number, all tropical plants, and varying from six to eight feet in height. The technical characters by which the genus is distinguished are:—the uniform reticulated venation, and erect caudiciform rhizome. Fig. 28 represents a pinna of the sterile and fertile fronds of *Acrostichum aureum* (med. size).

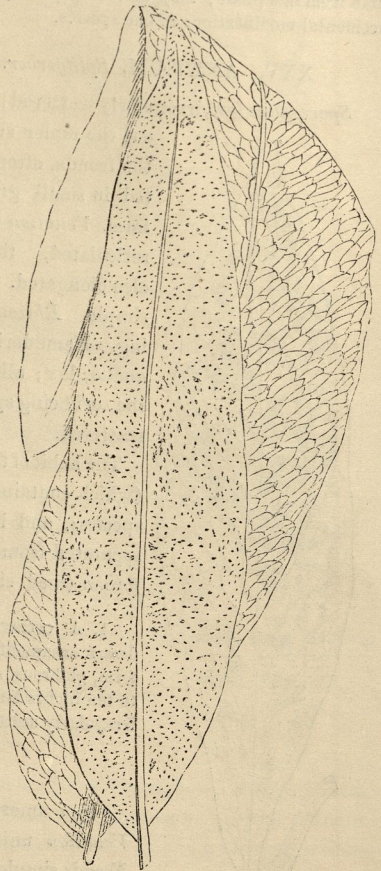


Fig. 28.



1. *A. AUREUM*, *Linneus* (*CHRYSODIUM VULGARE*, *Fee*).—A noble evergreen glabrous stove Fern, native of the West Indies, tropical America, Natal, and the East Indian and Polynesian Islands. Sterile fronds pinnate, six to eight feet long, reclining; pinnae lanceolate-acuminate, rather membranous, light green, the lower ones petiolate, cuneate at the base, the upper adnate at the inferior base, and decurrent. Fertile fronds contracted, erect, lanceolate, pinnate, from six to eight feet high, soriferous throughout; or with two or three of the lower pairs of pinnae sterile. The fronds are terminal, adherent to an erect caudiciform rhizome. Mr. Heward mentions of this species, that it is very plentiful in morasses and water-courses in the lowlands of Jamaica, and never occurring at any great elevation above the sea shore. In cultivation, it requires a mixture of turfy loam and sand, abundance of water, and a heat of 85° or 90° Fahrenheit, and with this treatment will form a splendid object.

XXVIII. PLATYCERIUM, *Desvaux*.

*Sori* amorphous, produced in irregular patches towards the extremities of the fertile fronds, or on a special lateral thickened lobe; sporangiferous receptacle formed of an accessory layer of parallel anastomosing veinlets, which cross the sterile ones, and produce crowded linear lines of spore-cases. *Veins* repeatedly forked, and distantly anastomosing; *venules* internal, compoundly reticulated, with variously directed free veinlets, terminating in the areoles. *Fronds* simple, forked, coriaceous, thick and spongy; the sterile sessile, rounded or elongated, uniform, depressed or ascending, sublobate, permanent and successively imbricated, forming an elevated spongy mass; the fertile widening upwards, and dividing into broad forked segments.—Named from *platys*, broad, and *keras*, a horn; the fertile fronds resembling broad horns, as those of the elk.

The few species of this genus have an epiphytal habit, and produce their fertile fronds annually; these are attached by an articulation, and when mature fall spontaneously, the persistent depressed alternate sterile ones then having the appearance of a lichen or fungus. In the absence of fructification, the genus is readily known by the stellate pubescence that covers the whole surface. Fig. 29 represents a portion of the fertile frond of *Platycerium alaicorne* (med. size).

1. *P. ALCICORNE*, *Desvaux* (*ACROSTICHUM*, *Swartz*; *NEUROPLATYCEROS*, *Fee*; *ALCICORNIVM VULGARE*, *Gaudichaud*).—A very singular epiphytal evergreen Fern, a native of Madagascar, Java, and New Holland, requiring to be cultivated in a warm greenhouse. Sterile fronds sessile, round or elongated, the upper portion sublobate, permanent, elevated, spongy, reniform, and depressed. Fertile fronds simple, divided, horizontal or oblique, thick and coriaceous, twelve to fifteen inches long, widening upwards, white on the under surface, and articulated on a short slightly creeping rhizome. *Sori* amorphous in patches, occupying the lobes or extremities of the fronds, which, as in the other species, are densely covered throughout with a stellate pubescence.

2. *P. STEMMARIA*, *Desvaux* (*ACROSTICHUM*, *Paliset de Beauvais*; *NEUROPLATYCEROS ETHIOPICUS*, *Plukenet*).—An ornamental evergreen epiphytal Fern, from Western Africa. Sterile fronds sessile, elongated, ascending, upper part scarcely lobed, reniform, permanent, elevated, spongy and depressed. Fertile fronds simple, divided, horizontal, thick and coriaceous, one to two feet long, widening upwards, and articulated with the rhizome. *Sori* occupying the lobes.

3. *P. GRANDE*, *J. Smith* (*ACROSTICHUM*, *A. Cunningham*; *NEUROPLATYCEROS*, *Fee*; *PLATYCERIUM BIFORME*, *Hooker in Comp. to Bot. Mag.—in part*).—One of the most singular of all Ferns. It is an epiphytal evergreen

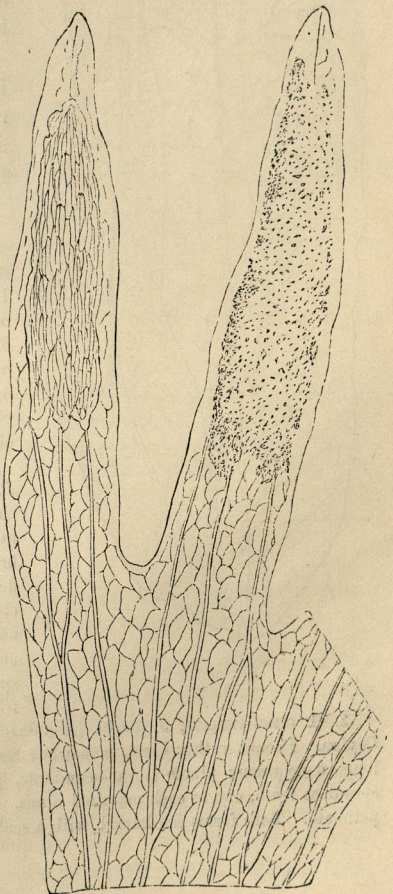


Fig. 29.



stove species, a native of New Holland and the Malayan Islands. Sterile fronds sessile, reniform, round or elongated, ascending, two to two and a half feet high, the upper portion dividing into many broad blunt segments permanent, elevated, spongy, and depressed. Fertile fronds simple, two to three times divided, horizontal and pendulous, thick and coriaceous, two and a half or three feet long, widening upwards, articulated on a short rhizome. Sori in a large irregularly triangular patch, adjacent to the sinus of the first furcation of the fronds.

## XXIX. CYRTOGONIUM, *J. Smith.*

*Sori* amorphous, universal on the under side of the contracted fertile fronds, or sometimes crowded on the venules. *Veins* pinnate; *venules* arcuately or angularly anastomosing, producing from their exterior sides or angles of meeting, one or more excurrent free or irregularly anastomosing veinlets. *Fronds* pinnate, from one to two feet long. *Rhizome* creeping.—Named from *kyrtos*, curved, and *gonu*, the knee; in allusion to the peculiar knee-bent curve of the venules.

The aspect of the species of *Cyrtogonium* varies but little from that of *Gymnopteris*; the principal distinguishing character, is their more simple anastomosing venation. Fig. 30 represents the base of a pinna of the sterile, and a pinna of the fertile fronds of *Cyrtogonium flagelliferum* (nat. size).

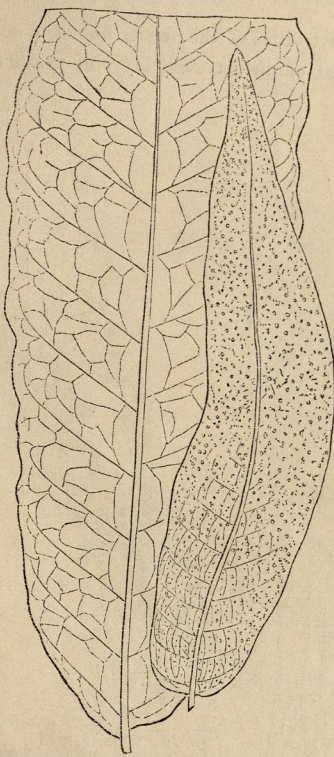


Fig. 30.

1. *C. FLAGELLIFERUM*, *J. Smith* (*ACROSTICHUM*, *Wallich*; *HETERONEURON HETEROCLITON*, *Fee*; *PECILOPTERIS HETEROCLITA*, *Prest*).—A proliferous, free-growing, evergreen stove Fern, from the East Indies. Sterile fronds glabrous, rather membranous, pinnate, from one and a half to two and a half feet long; pinnae petiolate, ovate or oblong-acuminate, undulate, the terminal one a foot or more long, narrowing upwards, and proliferous near the apex. Fertile fronds contracted, erect, pinnate, from one to one and a half foot high; pinnae oblong-acuminate, petiolate, the terminal one narrow and elongate. Both forms are lateral, adherent to a creeping rhizome.

2. *C. REPANDUM*, *J. Smith* (*ACROSTICHUM*, *Blume*; *CAMPIDUM*, *Prest*; *HETERONEURON*, *Fee*).—A glabrous evergreen stove Fern, from the East Indies and Java. Sterile fronds slender, reclining, triangular-elongate, pinnate, one and a half to two feet long, membranous, bright green; pinnae proliferous, repand, ovate-acuminate, petiolate, deeply crenate, or slightly lobed, undulate, the terminal one sinuose, elongate. Fertile fronds erect, pinnate; pinnae oblong-acuminate, and petiolate. Stipes with a few scattered scales. Both sterile and fertile fronds are lateral, adherent to a creeping rhizome. This species has been recently introduced by Messrs. Rolisson, of Tooting, from Java.

3. *C. CRISPATULUM*, *J. Smith* (*ACROSTICHUM*, *Wallich*).—A very handsome evergreen stove Fern, from Ceylon. Fronds rather erect, somewhat lanceolate, broad at the base, acuminate, pinnate, one to two feet long, deep green; pinnae linear-acuminate, petiolate, glabrous, undulate, the margin crenate, with a row of spinulose teeth, one to each marginal sinus. Fertile fronds erect, pinnate, one foot high; pinnae narrow, and petiolate. Both forms are lateral, with a scaly stipes, adherent to a creeping, scaly rhizome.

## XXX. GYMNOPTERIS, *Bernhardi.*

*Sori* amorphous, densely covering some portion or the whole of the fertile pinnae. *Veins* pinnate; *venules* compoundly anastomosing, producing variously directed straight or curved free veinlets, terminating in the areoles. *Fronds* simple or pinnate, from one to three feet long. *Rhizome* creeping.—Named from *gymnos*, naked, and *pteris*, a fern; alluding to the exposed fertile fronds.



The species of *Gymnopteris* mostly agree in habit with *Cyrtogonium*; but they are distinguished by the more irregular and compound anastomosing of the venules. The genus contains ten or twelve species, but only three are at present in cultivation. Fig. 31 represents a portion of the sterile frond, and a pinna of the fertile frond, of *G. nicotianæfolia* (med. size).

1. *G. REVOLUTA*, *M. and H.* (*HYMENOLEPIS*, *Blume*; *HYALOLEPIS*, *Kunze*).—A singular-looking evergreen stove Fern, from Java. Fronds simple, glabrous, linear-lanceolate, nearly a foot long, light green, contracted and soriferous on the upper half, attenuated at the base, entire at the margin, becoming revolute, and partly concealing the sori during the early stages of their development. Fronds lateral, articulated with a slender creeping rhizome. We are indebted to G. Norman, Esq., of Hull, for a cultivated specimen of this very remarkable Fern.

2. *G. DECURRENS*, *Fee* (*LEPTOCHILUS*, *Blume*).—A singular evergreen stove Fern, from Ceylon. Sterile fronds simple, glabrous, a foot long, lanceolate-acuminate, attenuated at the base, light green, and slightly undulated. Fertile fronds simple, slender, linear, very narrow, one to two feet long, and one-eighth of an inch broad. Stipes one-half the length of the frond. Sori linear, continuous, forming a row on each margin. Both forms are lateral, articulated on a creeping rhizome about the size of a crow's quill.

3. *G. NICOTIANÆFOLIA*, *Presl* (*ACROSTICHUM*, *Swartz*).—An ornamental evergreen stove Fern, from the West Indies. Sterile fronds glabrous, triangular, pinnate, one to two and a half feet long, bright green, and shining; pinnae large, rather membranous, oblong-acuminate, undulated, the lower petiolate, and roundish at the base, the upper sessile, adnate on the lower side. Fertile fronds erect, pinnate, or occasionally bipinnate below, one to two feet high; pinnae oblong-ovate, the lower petiolate, the upper sessile, adnate at the inferior base. Stipes scaly near the base. Both forms are lateral, adherent with a creeping rhizome.

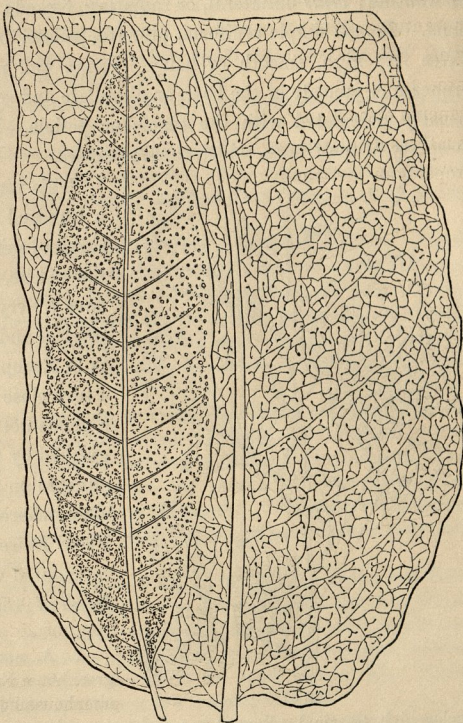


Fig. 31.

*Tribe PTERIDÆ, J. Smith.*—Sori parallel with and situated on or near the margin or the costa, and furnished with a special indusium, having its inner margin free.

Ferns are very obviously divided into two groups, in one of which the sorus is furnished with a membrane, which at first completely covers it, and is termed an indusium or involucre; and in the other the sori are naked or without indusia. The *Polypodiæ* and *Acrosticheæ* form the non-indusiate group. The *Pteridæ* belong to the group which possess an indusium, and are characterized by having that organ produced on the exterior side of the sporangiferous receptacle, with its inner margin free, and with the spore-cases in its axis of attachment, or on its inferior disc. This tribe is represented by the genera *Adiantum*, *Pteris*, and *Blechnum*, of older authors, and is at once distinguished from *Polypodiæ* and *Acrosticheæ* by the presence of the indusium, although closely allied to the latter tribe, through the genus *Lomaria*.

*Sect. CHILOSOREÆ, J. Smith* (from *cheilos*, a lip, and *sorus*).—Sori marginal, continuous, or interrupted.

### XXXI. ADIANTUM, *Linnaeus*.

*Sori* round reniform oblong or linear, marginal, continuous or interrupted. *Indusium* venose, formed of a reflexed crenule, reniform oblong or linear, according to the more or less crenulate or



entire margin of the fronds, sporangiferous on its under surface, at length replicate. *Costa* excentric or wanting; *veins* unilateral, or radiating, forked; *venules* direct, terminating in the axis of the indusium. *Fronds* simple reniform, pinnate, pedate, bipinnate or decompound, from six inches to two or three feet high, smooth or hairy. *Stipes* and *rachis* usually ebeneous; *pinnæ* generally oblique, truncate or cuneate at the base, or dimidiate and soriferous on the upper margin only, petiolate, and usually articulated with the rachis or petiole.—Named from *adiantos*, dry; alluding to a curious property of the fronds, which repel moisture.



Fig. 32.

This very extensive and natural group contains upwards of a hundred known species, of graceful form, whose ebeneous slender, shining stipes and rachis contrast admirably with the pinnæ, which are of a very delicate green colour. They have a very extensive geographical range, being found in the tropical and subtropical regions of both hemispheres, as well as in Europe, New Zealand, and North America. They have a very close affinity with *Cheilanthes* and *Hewardia*, the latter a genus not in cultivation. From the former they are distinguished by the position of the sori, which in *Cheilanthes* are situated on the apex of single venules in the axis of the indusium, whereas in *Adiantum* the sorus is placed on the indusium. From *Hewardia* they are distinguished by the latter having a reticulated venation. Fig. 32 represents a small portion of a frond of *Adiantum tenerum* (nat. size).

1. *A. RENIFORME*,—[Plate IV.]—*Linnaeus*.—A dwarf evergreen greenhouse Fern, from Madeira, and the Azores and Canaries. Fronds simple, round or reniform, glabrous, bright shining green, about six inches high, terminal, adherent to a scaly, somewhat creeping rhizome. Sori oblong, contiguous.
2. *A. WILSONI*, *Hooker*.—An evergreen stove Fern, from Jamaica. Fronds glabrous, one foot long, simple, pinnate; pinnæ ovate or oblong-acuminate, coriaceous, shining green, cordate at the base; the sterile ones broad, serrate at the margin, petiolate, persistent and not articulate with the rachis; fertile fronds with from three to five pinnæ. Sori linear, continuous. Fronds lateral, adherent to a creeping rhizome about the size of a duck's quill.
3. *A. MACROPHYLLUM*, *Swartz*.—A very beautiful evergreen stove species, from the West Indies and tropical America. Fronds glabrous, oblong-acuminate, broad at the base, pinnate, one to one and a half foot long; pinnæ large, ovate or oblong, sub-sessile, acuminate, chartaceous, of a lively green, unequally cuneate at the base, the sterile ones lobed and slightly dentate. Sori linear, continuous. This is rather an erect-growing plant, with the fronds lateral, adherent to a creeping rhizome.
4. *A. LUCIDUM*, *Swartz*.—A glabrous evergreen stove Fern, native of the West Indies and South America. Fronds lanceolate, pinnate, one foot long; pinnæ trapezio-lanceolate, acuminate, coriaceous, bright green, shining, truncate, and parallel with the rachis at the upper base, the lower cuneate, the margin serrate. Rachis and stipes very hairy; lateral, adherent to a slender creeping rhizome. Sori linear, continuous, or sometimes interrupted.
5. *A. KAULFUSSII*, *Kunze* (*A. OBLIQUUM*, *Hooker* and *Greville*, not *Willdenow*—*fide Hooker*).—A glabrous evergreen stove species, from the West Indies and South America. Fronds lanceolate, pinnate, one foot long; pinnæ ovate-oblong, acuminate, deep green on the upper surface, and glaucous beneath, the inferior base truncate, the superior rounded and slightly auriculate, margin serrate. Sori oblong, linear, numerous throughout each fertile pinna. Fronds nearly all fertile, lateral, adherent to a slender creeping rhizome. Rachis and stipes hairy.
6. *A. LUNULATUM*, *Burmman* (*A. ARCUATUM*, *Swartz*).—An elegant, deciduous stove Fern, from the East Indies, Ceylon, Africa, and South America. Sterile fronds glabrous, pinnate, pendulous, a foot or more long, and rooting at the apex; pinnæ oblong-dimidiate, bright green, lobed on the upper margin, and obtuse at the base. Fertile fronds erect, narrow-lanceolate, a foot or more long, glabrous, pinnate; pinnæ with long petioles, lunate on the upper margin, truncate-cuneate at the base. Sori oblong-linear, often confluent. Fronds terminal, adherent to a fasciculate rhizome.
7. *A. CAUDATUM*, *Linnaeus* (*A. HIRSUTUM*, *Bory*; *A. FLAGELLIFERUM*, *Wallich*).—A neat evergreen stove species, from India, Ceylon, China, and the Mauritius. Fronds hairy, narrow linear-lanceolate, elongate,



pinnate, one to two feet long, void of pinnæ near the apex, and rooting at the point; pinnæ oblong-dimidiata, numerous, subimbricate, lower ones flabellate, round at the apex, the upper margin divided into small dilatate segments or inciso-serrate, the lower entire, the base truncate, parallel with and close to the rachis. Sori small, numerous, crowded on the upper margin, and around the apex. Indusium small, scale-like, and very hairy. Rachis and stipes light brown. Fronds terminal, adherent to a small erect rhizome.

8. *A. INTERMEDIUM*, Swartz (*A. FOVEARUM*, Raddi; *A. BRASILIENSE*, Link).—An ornamental evergreen stove Fern, native of tropical America and the West Indian Islands. Fronds bipinnate, a foot or more long; pinnæ lanceolate, five to seven in number; pinnules oblong, obtuse at the apex, membranous, light green above, rather glaucous beneath, the terminal pinnule subrhomboidal; the sterile ones serrate. Sori oblong-linear, contiguous, produced on the upper and lower margins. Rachis and stipes slightly hairy; lateral, adherent to a slender creeping rhizome.

9. *A. SCHOMBURGKIANUM*, J. Smith.—A neat-looking evergreen stove Fern, from South America. Fronds sub-glabrous, slender, bipinnate, about a foot long, bright green; pinnæ lanceolate, four to six inches long; pinnules rather small and membranous, the lower ones flabellate, the rest oblong, dimidiata, the base truncate, parallel with and close to the rachis, the upper margin crenate-serrate, the lower straight or slightly curved, obtuse and serrate at the apex. Sori oblong, slightly curved, five to ten on the upper margin and around the apex. Rachis, stipes, and midrib of pinnæ thinly scattered over with rusty down. Fronds lateral, adherent to a slender creeping rhizome.

10. *A. VILLOSUM*, Linnaeus.—A beautiful evergreen hothouse Fern, from the West Indies and South America. Fronds bipinnate, with three to six pairs of pinnæ, one to one and a half foot long, lightish green; pinnæ lanceolate; pinnules petiolulate, subcoriaceous, dimidiata-oblong or forming an oblique parallelogram, lower ones small subflabellate, terminal one rhomboidal; upper base truncate and parallel with the rachis, lower ones dimidiata. Sterile pinnules broad, roundish at the apex, inciso-serrate at the margin. Sori linear, continuous on the upper margin, and round the apex of the pinnules. Rachis and midrib of pinnæ covered with rusty hair-like scales. Fronds lateral, adherent to a creeping rhizome.

11. *A. PULVERULENTUM*, Linnaeus.—An ornamental evergreen stove Fern, from the West Indies and South America. Fronds slender, bipinnate, with four to six pairs of pinnæ, one to one and a half foot long, bright green; pinnæ linear-lanceolate; pinnules rather small, petiolulate, dimidiata-oblong, subfalcate; upper base truncate and parallel with the rachis, lower dimidiata, round at the apex, sharply serrate at the margin, terminal one narrow-elongate. Sori oblong, continuous, occupying three-fourths of the upper margin only. Rachis and midrib of pinnæ covered with rusty down. Fronds lateral, adherent to a creeping rhizome.

12. *A. PEDATUM*, Linnaeus.—A very elegant deciduous frame or greenhouse species, from North America. Fronds glabrous, a foot or more high, pedately tripartite, branches linear-lanceolate, pinnate; pinnules membranous, tender green, dimidiata, oblong obtuse at the apex; cuneate or truncate at the base, the upper margin lobate or obtusely crenate. Sori oblong, solitary. Fronds lateral, on a short creeping rhizome about the size of a duck's quill.

13. *A. CURVATUM*, Kaulfuss.—An extremely elegant evergreen stove Fern, from Brazil. Fronds glabrous, one and a half to two feet high, pedately tripartite, branches lanceolate or linear-lanceolate, acuminate; pinnules narrow, curvate, oblong-obtuse, imbricate, deorsely falcate, the superior margin inciso-serrate or crenate, the apex serrate, and more or less acuminate. Sori solitary, oblong. Fronds lateral, adherent to a creeping rhizome.

14. *A. FLABELLULATUM*, Linnaeus (*A. AMGENUM*, Wallich).—A neat low-growing evergreen warm greenhouse or stove Fern, from China and the East Indies. Fronds subglabrous, flabellate, bipartite-pedately-divided, tri-pinnate, from nine inches to a foot high, dark green above and glaucous beneath; pinnæ lanceolate-acuminate; pinnules obliquely cuneate, repand, inferior ones semiobicular-cuneate; superior base truncate; sterile margin serrate-dentate, fertile, two to four lobed, the lobes soriferous. Indusium large, the breadth of the lobes. Rachis pubescent. Stipes ebeneous, terminal, adherent to a creeping rhizome. This species was introduced to Kew in 1851.

15. *A. HISPIDULUM*, Swartz (*A. PUBESCENS*, Schkuhr; *A. PLICATUM*, Kaulfuss; *A. NERVOSUM*, Swartz).—An ornamental evergreen greenhouse species, from New Holland, New Zealand, the East Indies, &c. Fronds pubescent, one foot high, pedately tripartite, branches linear, narrow, acuminate, pinnate, of a deep green; pinnules numerous, dimidiata, oblong obtuse, cuneate or truncate at the base, slightly serrate or crenate on the upper margin. Sori small, numerous; indusium hairy and reniform. Fronds nearly all fertile, lateral or terminal, on a short somewhat tufted rhizome.

16. *A. TENELLUM*, T. M. (*A. HISPIDULUM*, of gardens, not of Swartz; ? *A. HISPIDULUM*, Brown).—A pretty little evergreen greenhouse species, supposed to be a native of New Holland. Fronds small, rather hairy, bi-tripinnate, lower branches bipartite, pinnate above, six or eight inches high, branches small, narrow, and slender; pinnules small, subrotund or oblong obtuse, dark green, cuneate or truncate at the base, the margin crenate. Sori small; indusium reniform. Fronds lateral, adherent to a slender creeping rhizome. This species, long known in gardens as the *A. hispidulum*, is not the plant of Swartz, as Sir W. J. Hooker has shown, that being the *A. pubescens* of gardens. Whether it be the plant so called by Mr. Brown, as has been suspected, we have no means of ascertaining. It is certainly and abundantly distinct from the true *hispidulum*.

17. *A. AFFINE*, Willdenow (*A. SETULOSUM*, J. Smith).—A neat evergreen stove Fern, from New Zealand and Norfolk Island. Fronds about a foot high, three-branched or subpedate, lower pinnæ bipartite; pinnules



dimidiate, curved, oblong-obtuse, membranous, tender green, with black bristle-like hairs on the upper surface, superior margin obtusely crenate. Sori punctiform, from four to six on each pinnule; indusium hairy, reniform. Rachis and stipes glabrous; lateral, adherent to a slender creeping rhizome, forming dense tufts.

18. *A. CRISTATUM*, *Linnaeus* (*A. STRIATUM*, *Swartz*; *A. VILLOSUM*, *of some gardens*).—A beautiful evergreen stove species, from Jamaica. Fronds glabrous, bipinnate, one foot long; pinnæ linear-acuminate, narrow, six or eight inches long, pendulous; pinnules small, dimidiate, rigid, obtuse, imbricate, deep green, and truncate at the base. Sori oblong, subcontiguous, one to four on the upper margin only. Stipes dull black, minutely muricated; lateral, adherent to a short creeping scaly rhizome. This species is sometimes cultivated under the name of *A. villosum*.

19. *A. CAPILLUS-VENERIS*, *Linnaeus* (*A. MORITZIANUM*, *Link*).—A dwarf evergreen frame or greenhouse Fern, indigenous to Britain, common in the south of Europe, and occurring in the East Indies, Mauritius, China, North and South Africa, the Canaries, the temperate parts of North America and Central America, and the Cape de Verd Islands. Fronds glabrous, membranous, tender green, usually somewhat ovate, bi-tri-pinnate, six or eight inches high; pinnules obovate-cuneate, inciso-sublobate, serrate at the margin. Sori oblong. Fronds lateral, adherent to a scaly creeping rhizome. This species, although indigenous to Britain, is one of those delicate Ferns that cannot be cultivated in exposed places, for if planted in such situations it invariably dwindles away, and is soon lost. It grows freely in a close frame, or in a greenhouse where the atmosphere is kept moist. In the warmer climate of Madeira, and the tropics, it attains the height of eighteen inches, and in this state has been called *A. Moritzianum*; but the native plant, if cultivated in a moist stove with a high temperature, will produce fronds of equal magnitude, and identical in structure.

20. *A. ASSIMILE*, *Swartz*.—A very neat and delicately beautiful evergreen greenhouse Fern, from New Holland and New Zealand. Fronds slender, glabrous, broadly lanceolate, tripinnate, a foot or more long; pinnules small, somewhat roundish or subrhomboidal, cuneate at the base, bright green, and slightly lobed or crenate at the margin. Sori small; indusium reniform. Fronds lateral, adherent to a slender creeping rhizome.

21. *A. CUNEATUM*, *Langsdorf and Fischer*.—An evergreen stove Fern, from Brazil. Fronds glabrous, tri-angularly elongate, three or four times pinnate, a foot or more high; branches very slender, and of a light green; pinnules small, numerous, oblong, wedge-shaped, inciso-sublobate, sterile lobes serrulate, fertile emarginate. Sori small; indusium reniform. This species is one of the most delicately beautiful of the genus; the fronds grow rather erect, and are adherent to a somewhat tufted rhizome. It is sometimes called *A. pedulinum*.

22. *A. CONCINNUM*, *Humboldt, Bonpland, and Kunth*.—A very graceful pendulous evergreen stove species, from the West Indies, Venezuela, and other parts of South and Central America. Fronds slender, glabrous, lanceolate, tripinnate, two to three feet long; pinnules somewhat round or rhomboidal, membranous, tender green, obtuse with crenate lobes, the lowest erect and appressed to the rachis. Sori small, numerous; indusium reniform. Fronds lateral, adherent to a somewhat creeping rhizome.

23. *A. CHILENSE*, *Kaulfuss*.—An elegant evergreen greenhouse Fern, from Chili, Valparaiso, and Juan Fernandez. Fronds ovate-deltoid, about one foot high, grass green, tripinnate; pinnules petiolulate, coriaceous-membranous, hairy beneath, subrhomboid-reniform, more or less obliquely cuneate, often truncated at the base, the margin irregularly lobed, the lobes retuse, soriferous. Sori oblong-reniform, distant in the lobed pinnules, crowded in the more entire ones. Stipes and rachis ebeneous, glossy. Fronds lateral, adherent to a creeping rhizome. Recently introduced to Kew from the Continent.

24. *A. FRAGILE*, *Swartz*.—A remarkable stove Fern, native of Jamaica. Fronds one to two feet long, bright green, ovate-lanceolate, tri-quadrif-pinnate; pinnules thin, membranous, obovate wedge-shaped, petiolulate, rounded at the apex, serrated when sterile, three or four lobed when fertile, the fertile lobes retuse, and bearing a sorus in the sinus. Involucres oblong, straight. Stipes very short, and, as well as the rachis, ebeneous and glossy. Fronds adherent to a tufted rhizome. The pinnules in this species are remarkably deciduous, being all cast off while drying.

25. *A. TENERUM*, *Swartz*.—A very elegant evergreen stove Fern, from the West Indies and Central America. Fronds glabrous, triangular, four times pinnate, two to two and a half feet high; pinnules membranous, bright green, rhomboidal, obtuse at the apex, inciso-lobate; sterile lobes serrulate, fertile entire. Sori oblong-reniform. Fronds lateral, adherent to a short creeping rhizome, forming dense tufts.

26. *A. CUNNINGHAMI*, *Hooker* (*A. AFFINE*, *of gardens*).—An ornamental evergreen greenhouse Fern, from New Zealand. Fronds glabrous, somewhat pentagonal, bi-tripinnate, twelve or fourteen inches high; pinnules dimidiate, oblong-obtuse, cuneate or truncate at the base, deep green, superior margin inciso-serrate. Sori numerous; indusium reniform. Stipes scaly near the base, lateral, adherent to a scaly creeping rhizome nearly the size of a crow's quill.

27. *A. FORMOSUM*, *R. Brown*.—An ornamental evergreen greenhouse Fern, from New Holland. Fronds deltoid or pentagonal, branching, four times pinnate, one and a half to two feet high; pinnules small, membranous, rhomboidal, obtuse, inciso-lobate, pale green, the sterile serrate; rachis pubescent. Sori small; indusium reniform. Stipes scabrous, lateral, adherent to a slender creeping rhizome.

28. *A. CULTRATUM*, *J. Smith*.—A very handsome stove Fern, native of Brazil. Fronds one and a half to two feet or more high, glabrous, tripartitely bipinnate, that is, bipinnate with the lower pair of pinnæ two-parted; pinnules dull green, somewhat cordately rhomboid-oblong, the upper side and more or less attenuated apex lobed



with serrated lobes, the lower margin recurvate. Sori small, narrow linear-oblong occupying the apices of the lobes, and chiefly produced on the upper margin. Stipes and rachis dark chestnut-coloured when young, becoming blackish when mature, at first scaly throughout with narrow deciduous scales; lateral, adherent to a creeping rhizome. This species has been introduced to the Chelsea and some other gardens, from the establishment of M. Van Houtte of Ghent, under the name of *A. pentadactylon*. It is allied to *A. trapeziforme*, but is a more slender plant, with a scaly brown-black rachis, narrower deorsely falcate pinnules, and smaller linear-oblong, not oblong-reniform, sori, and is wanting altogether in that delicate green colour which in *A. trapeziforme* is so strikingly contrasted with the ebony-black smooth stipes; the pinnules, moreover, are scarcely at all glaucous beneath.

29. *A. TRAPEZIFORME*, *Linnaeus* (*A. RHOMBOIDEUM*, *Schkuhr*; *A. FORMOSISSIMUM*, *Klotzsch*).—An erect-growing evergreen stove Fern, from Jamaica and other West India Islands, and South America. Fronds glabrous, pentagonal, four times pinnate, two to three feet high; pinnules large, bright green, ovato-rhomboidal, acuminate, the apices serrate and sub-crenate. Sori large, oblong; indusium reniform. This is a very beautiful Fern, from the contrast of its large delicate green pinnules with the shining black stipes and rachis. The fronds are lateral, adherent to a thick scaly creeping rhizome.

### XXXII. CHEILANTHES, *Swartz*.

*Sori* round, marginal, solitary or contiguous, often becoming confluent. *Indusium* sometimes reniform, rarely oblong, and including more than one sorus. *Veins* forked; *venules* direct, their apices free, and sporangiferous. *Fronds* from a few inches to two or three feet long, glabrous, pilose, glandulose, or squamose; segments of the pinnules sometimes very small, concave, and orbicular.—Named from *cheilos*, a lip, and *anthos*, a flower; in allusion to the lip-formed indusium which covers the fructification.

With one or two exceptions, the species of *Cheilanthes* are small plants, less than a foot in height; they are all of very delicate texture, and are mostly natives of elevated regions in tropical or subtropical countries. They are best cultivated in an intermediate house, and should be potted in sandy peat soil, well drained; water being very sparingly used over the fronds. During winter they should be kept rather dry. The species are often very difficult to determine, unless examined in a living state. In the small convex segments of the pinnules, and the paucity of spore-cases,

they are analogous to *Nothochlæna*, but from that genus they are distinguished by the presence of an indusium. From *Adiantum* they are known by the position of the sori, which is here produced on the apex of the venules in the axis of the indusium, that of *Adiantum* being on the indusium. Fig. 33 represents a small portion of a frond of *Cheilanthes viscosa* (nat. size).



Fig. 33.



Fig. 34.

1. *C. MICROPTERIS*, *Swartz*.—A neat dwarf evergreen greenhouse Fern, from Quito, Brazil, and the Argentine provinces. Fronds slender, linear, four to six inches long, and covered throughout with glandulose hairs, pinnate; pinnæ numerous, small, petiolate, light green, subrotund, concave, and subcrenate. Rachis and stipes brown, terminal, adherent to a slender creeping rhizome. Sori consisting of a few spore-cases on each segment, which ultimately become confluent.

2. *C. FARINOSA*, *Kaulfuss* (*PTERIS*, *Forskål* and *Swartz*; *CASSEBEERA*, *J. Smith*; *ALLOSORUS*, *Presl*; *C. DEALBATA*, *Don*; *PTERIS ARGYROPHYLLA*, *Swartz*).—An exceedingly beautiful evergreen stove Fern, from Nepal. Fronds glabrous, triangular, one to one and a half foot long, bipinnatifid; segments oblong-obtuse, the upper surface dull green; densely covered beneath with a white farinose powder. Rachis and stipes ebeneous; terminal, adherent to a fasciculate erect rhizome. Sori linear, continuous, subsequently confluent; indusium

universal throughout every segment of the frond. Fig. 34 represents a full-sized pinnule of this species.



3. *C. FRAGRANS*, *Webb and Berthelot* (*C. ODORA*, *Swartz*; *C. SUAVEOLENS*, *Swartz*; *C. MADERENSIS*, *Lowe*).—A dwarf evergreen greenhouse Fern, from the South of Europe. Fronds glabrous, triangularly elongate, bipinnate, about six inches high, of a light green; pinnae oblong-obtuse, sinuate-pinnatifid, the lower ones distant and pinnatifid. Rachis and stipes scattered over with narrow scales. Sori confluent. Fronds terminal, adherent to a somewhat tufted rhizome.
4. *C. MICROPHYLLA*, *Swartz*.—An ornamental evergreen stove Fern, from the West Indies. Fronds slender, somewhat lanceolate, broad at the base, bipinnate, one to one and a half foot long, pale green, slightly pubescent; pinnules oblong, rather obtuse; segments roundish-ovate, the sterile ones dentate. Rachis and stipes ebeneous, terminal, adherent to a short creeping rhizome. Sori continuous, confluent; indusium very small.
5. *C. ALABAMENSIS*, *Kunze* (*PTERIS*, *Buckley*; *P. GRACILIS*, *Rugel*).—An ornamental evergreen greenhouse Fern, from the Southern United States of America. Fronds glabrous, subcoriaceous, ten to twelve inches high, lanceolate, acuminate, bipinnate below; pinnae ovate-lanceolate acuminate; pinnules of the lowest pinnae almost again pinnate the segments oblong-obtuse, of the upper ones entire, or auricled, or lobed at the base. Stipes and rachis deep glossy black, adherent to a creeping rhizome. Sori continuous on the lobes and pinnules.
6. *C. MICROMERA*, *Link*.—An evergreen greenhouse species, from Mexico. Fronds lanceolate-acuminate, bipinnate, about a foot long; pinnae linear-acuminate, pinnules rather obtuse; segments obovate, deep green, the sterile crenate. Stipes, rachis, and midrib of pinnae ebeneous, and covered with narrow brown scales; fertile segments concave. Sori continuous, confluent; indusium very small. Fronds nearly all fertile, terminal, adherent to a short creeping rhizome. This is certainly distinct from *C. microphylla*.
7. *C. PROFUSA*, *Kunze* (*NOTHOCHLENA PUMILA*, *of gardens*).—A warm greenhouse Fern, native of Namaqua Land. Fronds slender, lanceolate, bi-tri-pinnate, six to ten inches long, light green; pinnules oblong, rather obtuse, segments adnate, subdecurrent at the base, crenate at the margin. Sori confluent. Rachis, midrib of pinnae, and pinnules, scattered over with narrow elongated light brown scales. Fronds terminal, adherent to a slender creeping rhizome.
8. *C. HIRTA*, *Swartz*.—A very delicate evergreen greenhouse species, from the Cape of Good Hope. Fronds linear, lanceolate, subtripinnate, one foot long, pale green, and covered throughout with glandulose hairs; pinnules small, oblong-obtuse, pinnatifid; segments crenate. Rachis and stipes brown, terminal, adherent to a rather erect rhizome. Sori distinct, subsequently confluent, on each segment of the fertile fronds.
9. *C. TENUIFOLIA*, *Swartz*.—A very tender deciduous greenhouse Fern, from the East Indies and New Holland. Fronds somewhat ovate or triangularly elongate, tripinnate, one foot long, light green; pinnules linear-acuminate; segments oblong-ovate, deflexed. Rachis, stipes, and midrib of pinnae brown, and scattered over with narrow scales. Fronds terminal, adherent to a creeping rhizome. Sori round, subsequently confluent; indusium very small.
10. *C. EXILIS* M. & H.—A delicate deciduous warm greenhouse Fern, the native country of which is unknown. Fronds very slender, glabrous, linear-oblong, one foot or more long, bi-tri-pinnate, lightish green; pinnae ovate-triangular; pinnules oblong, pinnatifid; segments small, linear-oblong, adnate-decurrent at the base. Sori crowded on the teeth or segments. Rachis and stipes of a shining brown. Fronds terminal, adherent to a slender creeping rhizome. This Fern differs from *C. tenuifolia*, to which it is allied, in its slender and narrowly-elongated form; and from *C. Sieberi*, which it resembles in outline, in its more delicate habit and texture: indeed we should have been inclined to refer it to the latter species, were it not that it never assumes any degree of stoutness and rigidity, but is slender, fragile, and membranous, and of very delicate constitution.
11. *C. MORITZIANA*, *Kunze* (*C. ELONGATA*, *Klotsch MS.*, not *Willdenow*).—A neat-looking evergreen warm greenhouse Fern, from Mexico and Venezuela. Fronds glabrous, triangularly elongate, tripinnate, nine inches to a foot long, lively green; pinnules remote, deeply pinnatifid, with small roundish ovate segments, inferior ones entire, superior decurrent at the base, crenulate on the margin. Sori small, but few spore-cases on each segment. Stipes, rachis, and midrib of pinnae shining; terminal, adherent to a creeping rhizome. This species has been introduced under the name of *C. elongata* by G. Norman, Esq., of Hull, from the Continental gardens.
12. *C. MARGINATA*, *Humboldt, Bonpland, and Kunth* (*C. RUFESCENS*, *Link*; *C. CHEROPHYLLA*, *Kunze*; *ALLOSORUS CILLATUS*, *Presl*).—A very neat, evergreen, greenhouse Fern, from the Peruvian Andes and other parts of South America, and the West Indies. Fronds glabrous, somewhat ovate-triangular, from six to ten inches high, delicate green, tripinnate; pinnules oblong, with oblong-ovate rather obtuse segments, decurrent at the base. Stipes and rachis black; rhizome somewhat creeping. This plant is now very scarce in cultivation; although, in 1840, it was growing freely in the Birmingham Botanic Garden.
13. *C. CUNEATA*, *Link* (*CASSEBEERA*, *J. Smith*).—A neat evergreen greenhouse Fern, from Mexico. Fronds glabrous, triangular, bipinnate, six to ten inches high, of a lively green; fertile pinnules oblong-acuminate, pinnatifid, with the segments narrowed at the base; sterile segments oblong, wedge-shaped, and serrate at the margin. Sori linear continuous. Rachis and stipes ebeneous; rhizome somewhat creeping.
14. *C. VISCOSA*, *Link*.—A beautiful evergreen stove species, from Central America. Fronds triangular or pentagonal, one foot high; branches tripinnate, light green, and covered throughout with viscid glandulose hairs; pinnules oblong-obtuse, pinnatifid; segments of the sterile frond dentate. Sori linear, continuous around every segment of the fertile fronds. Rachis and stipes brown, terminal, adherent to a short creeping rhizome.
15. *C. LENDIGERA*, *Swartz* (*C. LENTIGERA*, *Willdenow*).—An elegant evergreen stove species, from Quito,



Mexico, and other parts of South America. Fronds ovate-lanceolate, tripinnate, one foot long, with copious soft hair-like scales; pinnules oblong; segments small, roundish ovate, cuneate at the base, crenate, reflexed, and concave. Sori linear, consisting of a single row of spore-cases, partly concealed in the axis of the broadly reflexed margin of each segment; indusium linear, continuous. Fronds terminal, adherent to a creeping rhizome.

16. *C. ELEGANS*, Desvauz (C. LENDIGERA, of gardens).—An exquisitely beautiful evergreen stove Fern, a native of Chili, Mexico, the Peruvian Andes, and other parts of South America. Fronds lanceolate tripinnate, one foot long, clothed with copious brownish chaffy scales; pinnules oblong-linear; segments very small, obovate, revolute and concave. Sori consisting of two or three spore-cases on each segment, partly concealed by the reflexed margin. Stipes, rachis, midrib of pinnæ, and pinnules, densely covered with brown fringed scales. Fronds terminal, adherent to a short creeping rhizome.

17. *C. SPECTABILIS*, Kaulfuss (C. BRASILIENSIS, Raddi; HYPOLEPIS, Hooker).—A straggling-growing evergreen stove Fern, native of Brazil. Fronds slender, glabrous, oblong-acuminate, broad at the base, tripinnate, three to four feet long, light green; pinnæ linear-acuminate; pinnules oblong-linear; segments oblong-obtuse, slightly crenate, adnate and decurrent throughout the whole frond. Stipes and rachis ebeneous, glossy, terminal, adherent to an erect fasciculate rhizome. Sori distinct, subsequently confluent.

18. *C. RADIATA*, J. Smith (ADIANTUM, Linnaeus; HYPOLEPIS, Hooker).—A delicate and exceedingly beautiful evergreen species, native of the West Indies and tropical America. Fronds glabrous, one foot high, digitate; branches linear, pinnate, radiating; segments oblong-obtuse, subimbricate, petiolate, articulate at the base, auriculate, with a crenate margin. Sori distinct, often crowded throughout the frond; indusium reniform. Rachis and stipes ebeneous; terminal, adherent to an erect fasciculate rhizome.

19. *C. PTEROIDES*, Swartz (CASSEBEERA, Presl; ADIANTUM, Linnaeus; PTERIS ORBICULATA, Houttyn).—An ornamental evergreen warm greenhouse Fern, from the Cape of Good Hope. Fronds somewhat triangular, glabrous, one to one and a half foot long, bipinnate, light green; pinnules ovate-elliptical, petiolate, round at the apex, slightly cordate at the base, and crenulate on the margin. Sori marginal. Indusium membranous, scale-like, contiguous. Stipes and rachis shining, especially when dry. Fronds adherent to a somewhat creeping rhizome. The only cultivated frond of this plant we have seen, was communicated by G. Norman, Esq., of Hull.

### XXXIII. HYPOLEPIS, Bernhardt.

Sori round, terminal, marginal, partly concealed by a reflexed indusoid crenule, and situate opposite the sinus of the segments. Veins forked or pinnate; venules direct, free, the lower exterior one sporangiferous. Fronds from two to six or twelve feet high, bi-tri-pinnate, segments crenulated, smooth, or covered with glandulose hairs.—Name derived from *hypo*, under, and *lepis*, a scale; in allusion to the sori being placed under scale-like reflexed crenules.

This genus, formerly placed near *Cheilanthes*, among the *Pterideæ*, was removed by Mr. J. Smith to the *Polypodiææ*, and we had adopted Mr. Smith's view of its affinities. It appears to us, however, on a reconsideration of the matter, that the plants which led Mr. Smith to this opinion, though analogous in habit to the genuine species of *Hypolepis*, cannot properly be associated with them, no trace of an indusium being present; and the other characters of the plants being altogether those of *Polypodium*. We have, consequently, referred back to *Polypodium* the *Hypolepis rugulosa* (J. Smith), and retain *Hypolepis* itself among the *Pterideæ*, where it was originally stationed. Fig. 35 represents a pinnule of *Hypolepis dicksonioides* (nat. size).



Fig. 35.

1. *H. DICKSONIODES*, Hooker (H. REPENS, of gardens, not of Presl; CHEILANTHES, Endlicher; HYPOLEPIS ENDLICHERIANA, Presl; DICKSONIA DAVALLIODES, Brown—according to Kunze).—A large coarse-growing evergreen greenhouse Fern, native of Norfolk Island. Fronds triangularly elongate, from three to six, or even twelve feet high, covered with glandulous hairs; decomposed, three or four times pinnate; pinnules lanceolate-acuminate, with oblong-linear rather obtuse pinnatifid segments, which are somewhat convex, the lower pair distant; margin crenulate. Sori round, terminal, and partly concealed by a reflexed marginal crenule. Fronds lateral, adherent to a scaly creeping rhizome.

2. *H. PRAYA*, M. and H.—A very singular-looking and deformed-growing evergreen warm greenhouse or stove Fern, the origin of which is unknown. Fronds triangularly elongate, tripinnate, one to two feet long, dull green, and covered throughout with glandulose hairs; pinnæ lanceolate; pinnules unequal, rugose, pinnatifid, with unequal segments, obtusely crenate. Sori very few, thinly scattered throughout the frond, which is lateral, adherent to a slender creeping scaly rhizome. Perhaps only a dwarf abnormal state of the former.



XXXIV. PLATYLOMA, *J. Smith.*

*Sori* linear-oblong, continuous, subsequently confluent, occupying a portion of the upper half of the venules, forming a broad marginal band. *Indusium* narrow, attached transversely to the outer margin of the broad sporangiferous receptacle. *Veins* forked; *venules* direct, their apices free and sporangiferous. *Fronds* from one to two feet long, pinnate bipinnate or tripinnate, glabrous pilose or squamiferous; *stipes* generally ebeneous, pinnæ articulate with the rachis.—Name derived from *platys*, broad, and *loma*, a margin; in allusion to the broad marginal sori.

The species arranged under this genus, with one or two exceptions, vary but little in habit from those of *Adiantum*. The principal technical distinction is in the presence of a broad sporangiferous receptacle, with the margin of the frond slightly reflexed, and edged with a narrow linear indusium, which is continued, more or less, throughout every pinna or pinnule of the whole frond. Fig. 36 represents a portion of the frond of *Platyloma falcata* (med. size).

1. *P. ROTUNDIFOLIA*, *J. Smith* (PTERIS, *Forster*; ALLOSORUS, *Kunze*).—A pretty evergreen greenhouse Fern, from New Zealand. Fronds linear, pinnate, one to one and a half foot long, reclining; pinnæ glabrous, dull green, coriaceous, subrotund or oblong-elliptical, rather obtuse, cordate at the base, and slightly crenate at the margin. Rachis and stipes densely covered with brown scales; lateral, adherent to a creeping rhizome. *Sori* linear, continuous, very broad; indusium very narrow. This seems to merge insensibly into the next species.

2. *P. FALCATA*, *J. Smith* (PTERIS, *R. Brown*; ALLOSORUS, *Kunze*).—An ornamental evergreen greenhouse species, from New Holland. Fronds lanceolate, pinnate, one to two feet high, rather erect; pinnæ glabrous, coriaceous, linear-lanceolate, oblong, bluntly acuminate, falcate, cordate at the base, and of a dull green colour. Rachis and stipes squamiferous; lateral, adherent to a creeping rhizome. *Sori* linear, continuous, very broad; indusium very narrow.

3. *P. BROWNII*, *J. Smith* (ADIANTUM PARADOXUM, *R. Brown*; ALLOSORUS PARADOXUS, *Kunze*; PTERIS LATIZONA, *A. Cunningham*).—An ornamental evergreen greenhouse Fern, from New Holland and New Zealand. Fronds ovate or ovate-oblong, erect, pinnate, one to two feet high, with from about seven to eleven large pinnæ near the top; pinnæ alternate, cordato-oblong-lanceolate, somewhat oblique or subfalcate, thick, almost coriaceous, dull dark green above, paler and somewhat glaucous beneath. *Sori* broad, linear, continued along both sides of the pinnæ from the base to the apex. Indusium very narrow. Rachis and stipes purple-ebeneous, covered, the former especially, with appressed rust-coloured hair-like scales; lateral, adherent to a short creeping rhizome. The younger immature fronds are simple and cordate; and the stipes are two or three times as long as the leafy portion in the perfect fronds. This Fern has been recently imported from New Zealand by Messrs. Henderson, of the Edgeware Road.

4. *P. TERNIFOLIA*, *J. Smith* (PTERIS, *Cavanilles*; PELLÆA, *Link*; PTERIS SUBVERTICILLATUS, *Swartz*; ALLOSORUS SUBVERTICILLATUS, *Presl*).—A rather pendulous evergreen stove Fern, from Mexico. Fronds glabrous, bluish green, linear, pinnate, one to one and a half foot long, reclining; pinnæ coriaceous, opposite or alternate, sessile, trilobed, cordate at the base, with a cartilaginous margin. *Sori* linear, continuous; indusium very narrow. Rachis and stipes purple; stipes pubescent, terminal, adherent to a short scaly creeping rhizome.

5. *P. CALOMELANOS*, *J. Smith* (PTERIS, *Swartz*; PELLÆA, *Link*; ALLOSORUS, *Presl*).—A dwarf evergreen stove species, from the Cape of Good Hope. Fronds deltoid, bipinnate, about a foot long; pinnules deltoid, coriaceous, quite smooth, glaucous, and of a bluish green colour, cordate at the base, subtrilobate, with a narrow cartilaginous margin. Stipes scaly near the base, terminal, adherent to a short creeping rhizome. *Sori* linear continued round every fertile pinnule; indusium very narrow.

6. *P. ATROPURPUREA*, *J. Smith* (PTERIS, *Linnaeus*; PELLÆA, *Link*; ALLOSORUS, *Kunze*).—[Plate V.]—An elegant dwarf evergreen frame or greenhouse species, native of North America. Fronds bluish green, ovate-lanceolate, bipinnate, six to ten inches long; pinnules glabrous, oblong or ovate, obtuse, cordate at the base, terminal one elongate. *Sori* linear, continuous, forming a broad band; indusium narrow. Rachis and stipes pubescent, terminal, adherent to a somewhat creeping rhizome.

7. *P. CORDATA*, *J. Smith* (PTERIS, *Cavanilles*; PELLÆA, *Link*; ALLOSORUS, *Presl*).—A very elegant soft erect-growing deciduous greenhouse Fern, from Mexico. Fronds delicate, light green, oblong-acuminate, broad at the base, bipinnate, one and a half to two feet high; pinnules ovate, cordate-sagittate, membranous, and densely



Fig. 36.

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