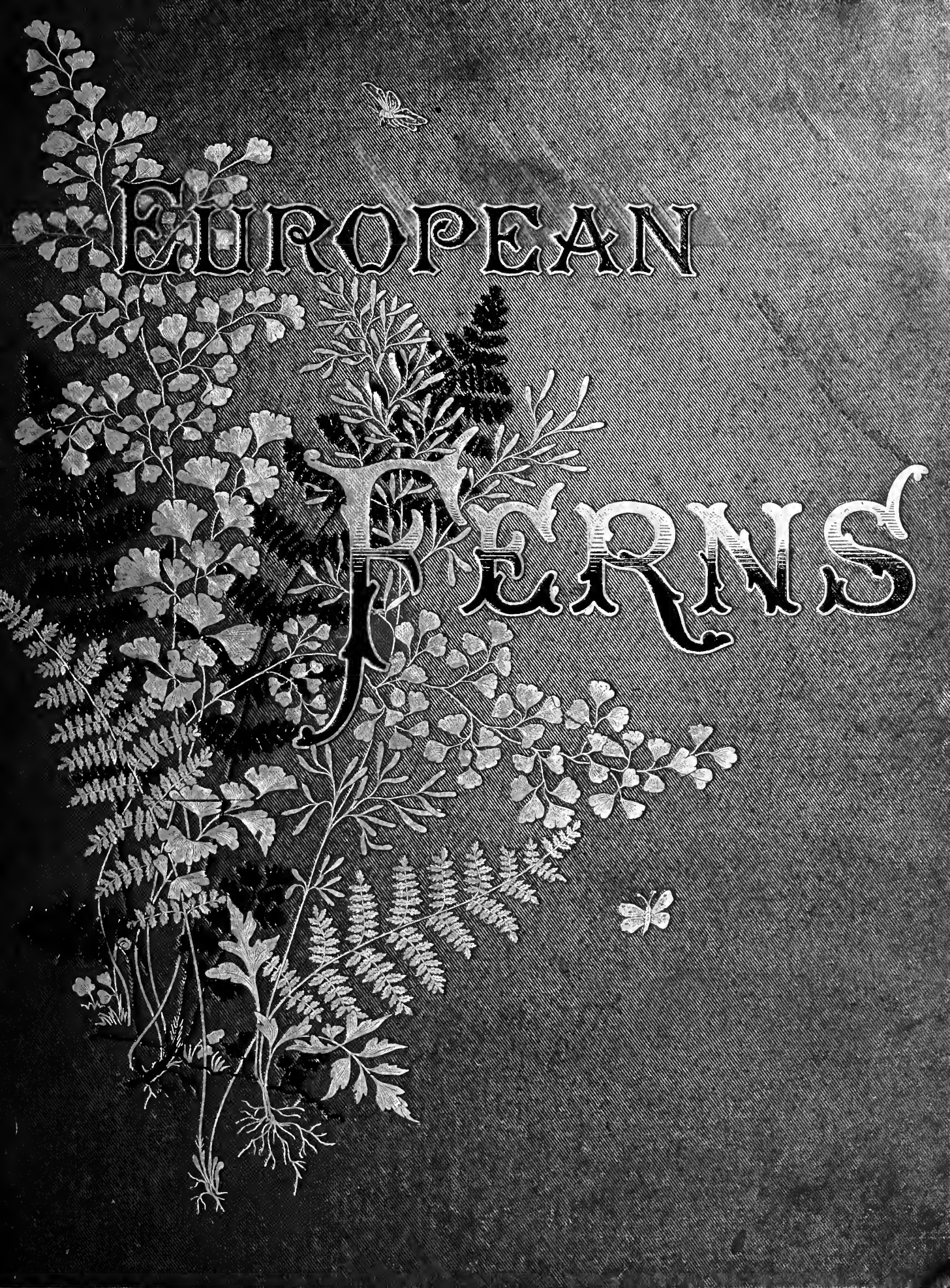
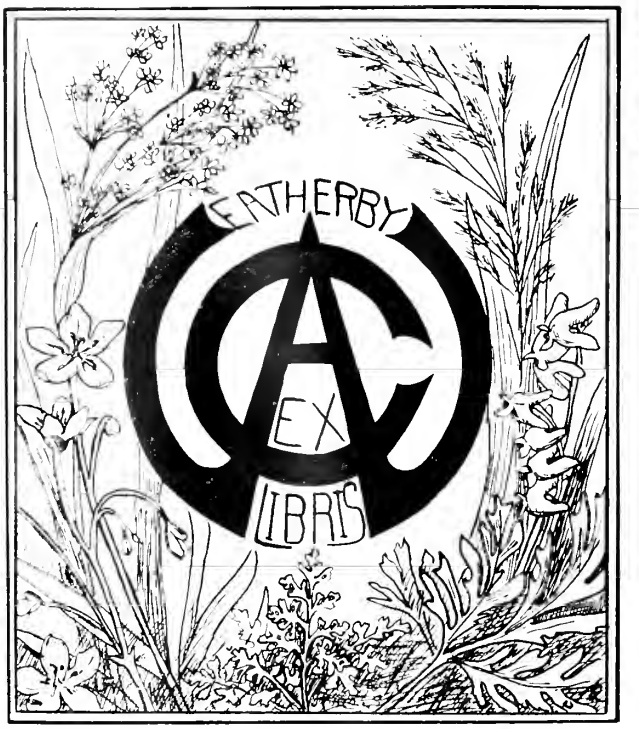

EUROPEAN
FERNS



1 LOMARIA SPICANT

(½ NATURAL SIZE)

2' UPPER SIDE OF PINNULE. 2 UNDER SIDE OF PINNULE. TWICE NATURAL SIZE

EUROPEAN FERNS

BY

JAMES BRITTEN, F.L.S.,

Department of Botany, British Museum.

WITH

Coloured Illustrations from Nature

BY

D. BLAIR, F.L.S.

CASSELL, PETTER, GALPIN & CO.:

LONDON, PARIS & NEW YORK.

CONTENTS.

LIST OF COLOURED PLATES.

LIST OF WOODCUTS.

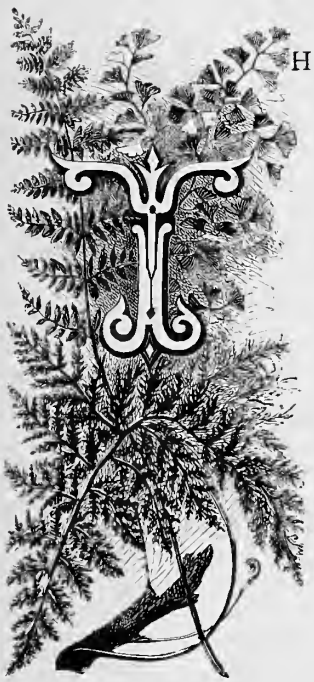
*** The present Work aims at giving a plain and intelligible account of European Ferns. In the introductory portion I have had the assistance of my former colleague, Dr. Trimen (now of the Royal Botanic Gardens, Ceylon), and for the portion relating to the geological aspect of the subject, I have to thank W. Carruthers, Esq., F.R.S., of the British Museum.

JAMES BRITTEN.

EUROPEAN FERNS.

INTRODUCTION.

ON FERNS IN GENERAL.

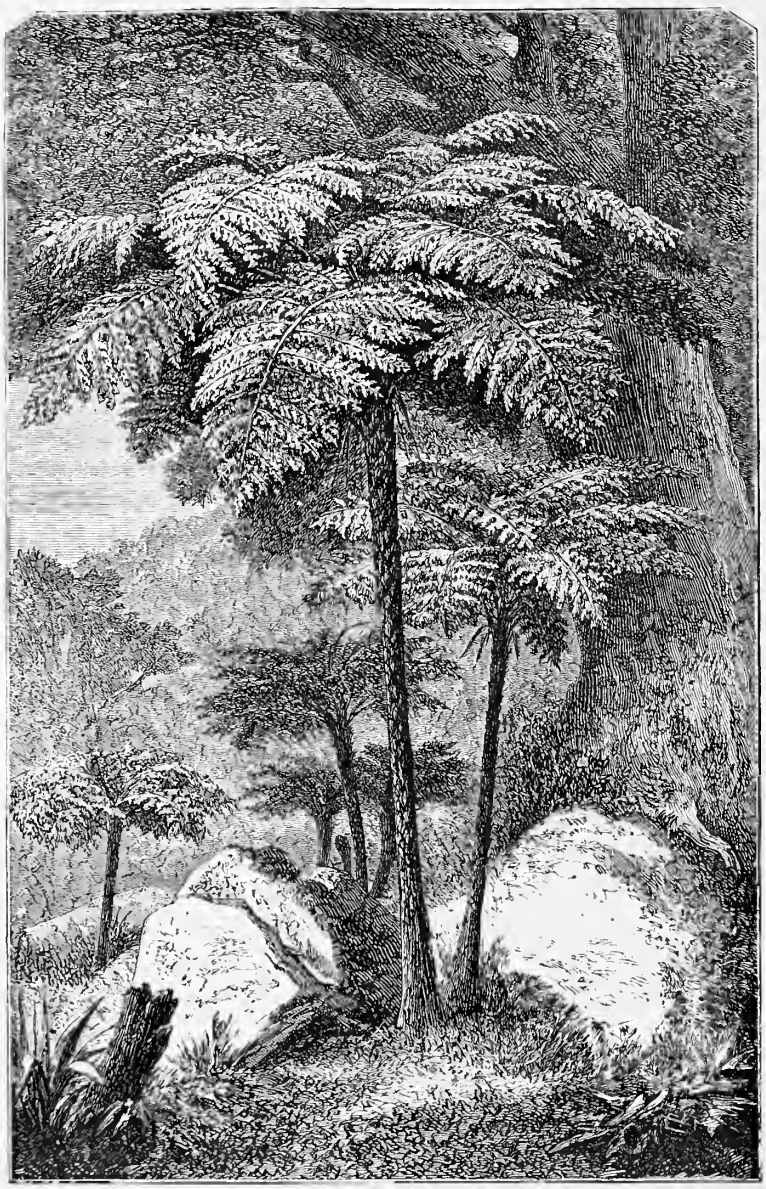


THERE is probably no group of plants which has more numerous or more enthusiastic admirers than the fern tribe. This, at first sight, appears somewhat remarkable, for their flowerless state deprives them to a great extent of that wonderful variety of form and hue which other plants can boast; but their ever-fresh green, and the graceful outlines of their delicate plume-like fronds, constitute strong claims to admiration, and in some measure account for the popularity which ferns have attained. Then, some of the commonest species are also some of the most beautiful; moreover, they can be grown with the greatest ease even in the back garden of a London house; they require little or no care, and once established, will go on, year by year, unfolding their graceful crosier-like fronds, and in this very point betraying their position in the vegetable kingdom. For this rolling up of the young fronds in watch-spring fashion, which in scientific language is termed *circinate vernation*, is characteristic of the fern tribe; although there are exceptions to the rule—as in the Adder's-tongue and Moonwort, in which the vernation is straight; while on the other hand, in some flowering plants, such as the Sundews, it is circinate.

We have said that ferns do not produce flowers; we might almost go farther, and say that they are equally destitute of leaves! Without putting the case so strongly, however, we shall readily perceive that the fronds of ferns differ essentially from true leaves, inasmuch as upon their under-side, or less frequently upon their margin, they bear the fructification, which a true leaf among flowering plants never does. This may at first sight seem surprising, as Cactuses and other plants, notably a pretty species of *Phyllanthus* often seen in hot-houses, and the familiar Butcher's Broom (*Ruscus aculeatus*), appear to bear flowers upon their leaves; but these seeming leaves are really stems or branches. The leafy portion of a fern is certainly not, however, a stem, but a modified leaf, and is usually known by the term *frond*. If we bear in mind that these fronds are circinate in vernation, and bear upon their backs or edges the cases containing the spores—which spores are, in some respects, analogous to the seed in flowering plants—we shall have gone some way towards seeing how Ferns differ from Phanerogams, as flowering plants are called in scientific parlance.

The absence of flowers determines the position of ferns, then, to be in the great lower division of the vegetable kingdom—the Cryptogamia, or Flowerless Plants. What are called "flowering"

ferns we shall see presently to be merely cases in which the fructification is restricted to the upper portion of a few of the fronds, and so crowded together over the surface as to conceal it. The immense number of cryptogamic plants is further divided into two great groups, founded upon the degree of complexity of their organisation. In the lower of these—called Thallophytes, or



TREE-FERNS.

Cellular Cryptogams—there is no separation of the vegetative organs into stem, root, and leaves, but the plant consists of a cellular structure (*thallus*) of homogeneous character. Fungi, Seaweeds, and Lichens, are examples of these Thallophytes. The higher group, on the contrary, has a differentiation of stem and leaf in nearly all cases, and the plants contained in it are called Cormophytes, or Vascular Cryptogams. The Mosses are the humblest of these Vascular

Cryptogams, whilst the Ferns present us with the most highly developed and conspicuous living representatives of the group (for we do not now speak of extinct plants). The scientific name for the family of Ferns is *Filices* or *Filicinæ*.

STRUCTURE.

Let us now bring before our notice the different parts or organs of which ferns are made up, and briefly examine their various modifications and structure.

By far the great majority are perennial, one of the few annual species being *Gymnogramme leptophylla*, fully described in the following pages. In appearance, as well as in what the botanist calls habit, they present infinite variety, some being very small, delicate, creeping, and moss-like, others rigid and leathery, whilst others, attaining the height and appearance of palms, are called Tree-Ferns. The main cause of this variety is due to modifications of the stem, which we proceed to describe.

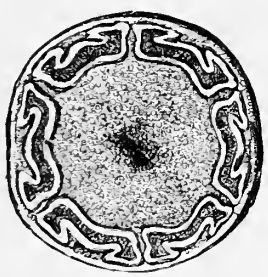
Stem.—The stem of a fern is either erect or creeping, and either subterranean or above ground. When under ground it usually receives the erroneous name of root, but its structure is the same whether above or beneath the surface of the ground. Good examples of the erect form of stem, called the *caudex*, are seen in our British Male Fern (*Nephrodium Filix-mas*), or Lady Fern (*Athyrium Filix-fœmina*), or in the Royal Fern (*Osmunda regalis*), when they have attained to a considerable age; but here the caudex rises at the best but a few inches above the ground. To see the erect stem in its highest development we must look at the tree-ferns of hot countries, none of which occur in Europe in a wild state, although they may be seen in the hot-houses of any of our large gardens, some very beautiful examples being noticeable in the tropical fern-house of the Royal Gardens, Kew. These show us an erect, slender or thick, column-like trunk, without branches, and with all its fronds borne upon its summit, and usually forming a beautiful spreading and drooping crown. The older part of the stem is either covered with the dry bases of the fronds of past years, or its surface is marked by their scars, and in all erect stems these are placed close together, and the scars form a diagonal pattern, as shown in the accompanying figure. Not unfrequently, the real stem is of small size, the bulk being composed of these persistent bases of the leaves, as is the case in our Male Fern. The true roots, which are long, tough, slender, and fibrous, and usually dark in colour, are given off on all sides of the caudex at the bases of the fronds, and often in the tree-ferns form a pyramidal or conical mass round the stem down to the ground; this is well seen in the *Dicksonia antarctica* of our conservatories. These roots may become welded together so as to form a solid wood-like mass, as in *Cyathea medullaris* of New Zealand, where it is called "weki," and cut into slabs by the Maoris. The caudex of this fern reaches a height of over a hundred feet, but the ordinary height of tree-ferns is from twenty to fifty feet, and some are much smaller: thus, *Todea Wilkesiana* of the Fiji Islands has an erect stem about seven feet high, and only as thick as a walking-stick. It is very uncommon for these erect stems of ferns to branch or divide.

EXTERNAL SURFACE OF STEM OF TREE-FERN.

In some creeping caudices which are above ground, and anchor themselves to it by roots, the fronds are also crowded, and form a tufted crown; but much more usually such stems or rhizomes bear the fronds at intervals (or, as botanists would say, the *internodes* are developed). The intervals between the origin of fronds are longer or shorter in different cases. Our common Polypody (*Polypodium vulgare*), or, still better, the Hare's-foot Fern (*Davallia canariensis*), are

examples of this mode of growth, in which the growing end of the rhizome will be seen to be always in advance of the last leaf. This is still more the case in the Filmy Ferns (*Hymenophyllum*) where the long, slender, prostrate rhizome develops several internodes beyond and before the youngest leaf. Most of such stems in our ferns are subterranean, as the common Bracken, the Marsh Fern (*Nephrodium Thelypteris*), in both of which they are considerably branched, or bifurcated, and either smooth or covered with a fine coating of hairs. When above the ground they are generally, when young at all events, set with close scaly bodies, usually brownish in colour, dry, membranous, and lightly attached; these are called *paleæ* or *ramenta*, and are conspicuous in the Hare's-foot Fern. The roots in these creeping species are not connected with the bases of the fronds, but come off irregularly from the rhizome; some Hymenophyllums have no roots, but the stems are then covered with absorbent hairs, which perform the same function.

The internal structure of Fern-stems, though of great interest to the botanist, is not to be understood without a long technical description, which would be here quite out of place. The accompanying woodcut will show that, even in a large tree-fern with a thick stem, no wood is formed, the hard tissues, forming what are known as the *fibro-vascular bundles*, being few in number, large, and separate, and forming a regular circle in the soft substance of the stem, but not consolidated into a mass of wood. There is also no pith in these stems, nor any separable bark, though the outer layers of tissue are sometimes hardened and brown.



TRANSVERSE SECTION OF STEM OF TREE-FERN.

FRONDS, OR LEAVES.—It is to these organs that the name Fern is generally given in popular language, and in them a very great diversity in form, size, and mode of division is found. There are a few points common to all fronds which must, however, be here mentioned. The stalk, or petiole, or *stipes*, is the part which connects the frond with the stem, and it is like the foot-stalk of a leaf, either articulated with its support or continuous with it: articulated and therefore deciduous fronds are rare; they have been called *eremobryoid*, whilst the ordinary non-articulated adherent ones are termed *desmobryoid*. The Hare's-foot and the common Polypody are examples of the first group; and the veteran pteridologist, Mr. John Smith, of Kew, who first noted this distinction, states that ferns of the eremobryoid group are endowed with much greater tenacity of life, and are more readily grown from spores than those belonging to the desmobryoid section. The frond-stalk (stipes) is usually stiff and erect, and is very often covered, especially at the base, with paleæ similar to those on the caudex; it is circular or flattened, and on a section it exhibits the fibro-vascular bundles* continuous with those in the stem—for each frond is always given off from opposite an opening in the meshes of the fibro-vascular cylinder in the stem, and its bundles are connected with those forming the margin of the opening. The base is often thickened or dilated, and, in the species with closely-placed fronds, gives off two or three roots.

The continuation or upper part of the stipes bearing the blade of the frond is called the *rachis;* in much-divided ferns the stipes has rather the appearance of a stem, and this is especially the case in the Climbing Fern (*Lygodium*), where the rachis is of indefinite length and completely simulates a stem. Mr. Darwin† states that these Climbing Ferns do not differ in their habits from other twining plants. In *Lygodium articulatum* the two internodes of the rachis which are first

* The structure of the stipes of most of the European species is fully described and well figured by M. Duval-Jouve, in Billot's "Annotations à la Flore de France" (1855—62).

† "Climbing Plants," p. 38.

formed above the root-stock do not move ; the third from the ground revolves, but at first very slowly. This species is a slow revolver : but *Lygodium scandens* made five revolutions, each at the average rate of 5h. 45m. ; and this represents fairly well the usual rate, taking quick and slow movers, amongst flowering plants. The movement is in the usual direction—namely, in opposition to the course of the sun ; and when the stem twines round a thin stick it becomes twisted on its own axis in the same direction. In *Gleichenia* and other tropical ferns the rachis is dichotomous, or forked. When, as in the Hart's-tongue, the frond is undivided, the rachis forms its mid-rib: but more usually the frond is more or less broken up into separate portions, and as in describing ferns it is necessary to use some terms expressing the nature of such division, we must here explain them. If the division does not extend down to the rachis, the frond still remains in a single piece, and the term *segment* is applied to the lobes, the frond being said to be *pinnatifid* or *pinnatisect ;* and should these lobes be again partially cut into segments, the frond is called *bipinnatifid* or *bipinnatisect.* More generally, the division is more complete, and the frond is separated down to the rachis: the separate portions are then termed *pinnæ*, and the frond said to be *pinnate ;* each pinna may be divided again into segments (pinnatisect), or cut into separate *pinnules*—when the frond is *bipinnate.* A further division results in a *tripinnate* fern, where the pinnules are divided into *tertiary divisions.* It is rare for fronds to be more compound than this, but the *ultimate divisions* are always described, and may be lobed, or toothed, or quite *entire.*

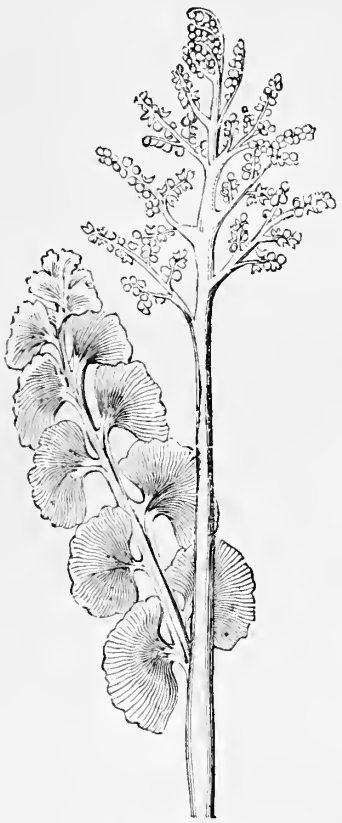
Another important point to be observed is the *venation*, or the arrangement of the little veins or nerves which run in the substance of the frond. These are easily observed, and will be found very varied in character. Of course the simplest form is that where a single vein (*mid-rib* or *costa*) runs down the centre of the segments, and this is seen in the filmy *Hymenophyllcæ.* More frequently there are secondary veins (veinlets) coming off in a pinnate manner from the central one, and running parallel to one another to the edge, or these may be forked, the branches proceeding to the margin, and ending before they reach it. This latter is a very common form, and may be seen in the Male Fern and the Bracken. Another type is found in the Maiden-hair, where there is no mid-rib, but the veins radiate in a fan-like way from the base. All these are cases of *free* venation, the separate veins, even when branched, never uniting again ; but there are numerous cases of *anastomosing* venation, where the branches of separate veins unite with one another to form a network of various kinds. Mr. John Smith, of Kew, Mr. T. Moore, of Chelsea, and other writers on Ferns, have very carefully observed these differences, and have reduced the kinds of anastomosing venation to about seven different types. These it is not necessary to define here, as they are not represented in the European species to any extent. *Woodwardia*, however, affords a good example of one of the forms of anastomosing venation, in which the veinlets are connected by little arched veins, and form thus many small spaces or *areolæ.*

PINNA OF MAIDEN-HAIR.

By some writers a decided difference in venation is considered sufficient to make separate genera of ferns, whilst others pay little attention to this, and include in the large genera, such as *Polypodium* and *Acrostichum*, plants showing all the above varieties. It is this difference of treatment which causes the very great diversity in the estimate of the number of fern genera, and is one great reason of the numerous names (synonyms) which so embarrass the student.

The growth of the fronds of ferns is very slow, much more so than that of the leaves of flowering plants. It takes two years to form a frond of the Male Fern, and others are probably longer in course of evolution before they commence to expand. When first noticeable they are closely curled up, the whole frond being rolled in on itself from sides and top, and forming a

crozier-like body. In botanical language, the vernation or prefoliation is *circinate*, and this is very characteristic of ferns and very rare in other plants. One order of ferns, however, does not have this kind of vernation, the *Ophioglossaceæ*, containing the Adder's-tongue and Moonwort, and from this and other special characters the group is often separated from the true ferns. Another peculiarity of the development of fronds is that the base is first formed and first unrolled, as any one can see in watching the expansion of a large fern, the lower portion being quite spread out, whilst the upper part is still in process of evolution. In some cases the growth of the top continues for a long time, as in the Climbing Fern (*Lygodium*); this kind of growth is called *basifugal*.

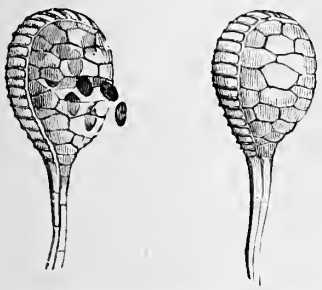


THE MOONWORT (*Botrychium Lunaria*).

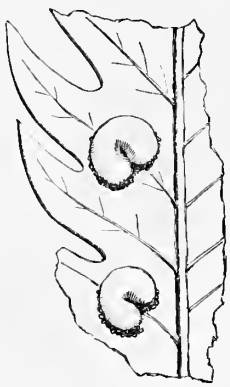
We shall presently see that the fructification is produced on the fronds. Usually all the fronds produce fructification, to a greater or less extent, according to accidental circumstances; but in a considerable number of ferns there are always some *fertile* and some *barren* fronds, bearing definite relations to one another, and very generally the two kinds of fronds differ considerably in form, size, and often in shape. Our Hard Fern (*Blechnum boreale*) and the Ostrich Fern (*Onoclea Struthiopteris*) are examples. This *dimorphism*, as it is called, in the two kinds of fronds, may be carried to an extraordinary extent, as in the Elk's-horn (*Platycerium alcicorne*), familiar in our greenhouses, where the barren fronds are flat, small, and undivided, and spread out over the surface on which the fern grows, while the fertile ones are erect, large, and branched like a stag's antlers. Another very striking example is found in *Trichomanes* (*Hymenostachys*) *elegans*, where the sterile fronds are numerous and deeply pinnatifid, much as in the common Polypody, whilst the fertile ones are only two or three in number, and simply linear with the numerous receptacles crowded along the edge. Or we may instance *Polypodium* (*Drynaria*) which well deserves its specific name (*diversifolium*) since the two kinds of fronds are so different that they would be supposed to belong to quite distinct plants; the sterile ones are a few inches long, sessile, oblong-ovate, slightly lobed, and brown in colour like a dry oak-leaf; the fertile are from two to four feet in length, on long stalks, with long distant, linear, bright green pinnæ. We might give many other remarkable cases, but we must now pass on to consider the fructification itself.

Fructification.—As above remarked, ferns have no flowers; consequently, they have no seeds, for seeds can only be produced by flowers of some kind or another. The little bodies which reproduce—after some curious changes and developments, to be presently noticed—the Fern-plant are, as in the case of other Cryptogamic plants, called *spores*. They are excessively small, and contained in little capsules, called *sporangia*, of which we shall presently speak. These *sporangia*, or capsules, are variously arranged, but there are always several, often very many, together, and the group which they form is termed a *sorus*, the point at which they are attached being called the *receptacle*. The sori are the little patches, usually brown in colour, so noticeable on the under surface of fully-grown fronds, which distinguish them also so readily from true leaves. They vary very much in their position and arrangement, and upon these points the classification of ferns is very largely based. It will be found, on examination, that in most cases

the sori have some definite relation to the veins of the frond, the receptacle being usually situated at the extremity or on the back of a vein; but this is not always the case. The most familiar form of sorus is circular, as is seen in the Male Fern and Polypody; frequently they are oval or oblong, as in many Aspleniums; at other times elongated and linear, as in the Hart's-tongue. When they occupy the margin of the frond or its under-surface, as in the Bracken, several sori are confluent to form the long line of fructification; and in some foreign ferns (*Acrostichum*, *Platycerium*) the sori occupy the whole under (and even upper) surface of the frond with a continuous layer. In the Filmy Ferns the sori are marginal and quite peculiar, the receptacle extending beyond the edge of the frond, and being, in fact, the end of a vein. In many Ferns which have special fertile fronds the fructification is often greatly crowded, so that the leafy portion becomes contracted and curled up so as to be scarcely observable, and this former seems to constitute by itself a spike or raceme of fruit; this is noticeable in the Parsley Fern and the Royal Fern amongst European species, and is still more remarkable in some exotic ones.

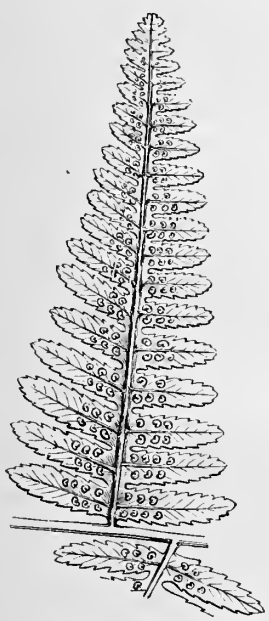


SPORANGIA OF FERNS, SHOWING DISTRIBUTION OF SPORES.



SPORANGIA OF MALE FERN.

The *sporangia*, or capsules, are very characteristic in form, and of a remarkable constitution. They are delicate little sacks, with thin, semi-transparent walls, and are attached to the receptacle either by a slender stalk or are sessile. In shape they are usually oval, blunt, and a little lop-sided, in consequence of the existence of a ring, which runs vertically round one side and over the top, which is called the *annulus*. This is a provision of Nature for causing the bursting of the sporangium, which happens by the contraction (from drying up) of the ring, and the consequent rupture transversely of the wall on the opposite side, which allows the escape of the contained spores. In the Filmy Ferns, however, the ring is horizontal and extends round the whole sporangium, hence the splitting here is vertical; the splitting is also vertical in *Osmunda*, where the ring, however, is very faint and imperfect. In *Ophioglossum* and *Botrychium*, what are still called the sporangia are wholly different from those above described, and are modified portions of the frond, and the spores are formed from changes taking place in its inner tissue. All these points are considered by the botanist of fundamental importance.



UNDERSIDE OF PINNA OF MALE FERN.

Another organ connected with the sori must also be examined, for though of less intrinsic value to the plant, it is principally employed in the classification of ferns generally adopted. This is the *indusium*, or involucre, which is a membranous body of various form, which covers to a greater or less extent the sorus. It is very readily observed in most ferns, as our Male Fern, and as a rule is of much the same form as the sorus, with which it is connected. In a number of species, however, it does not exist at all, as may be seen in the Polypody, in which the sori are naked at all periods of their existence. In some cases the involucre is difficult to

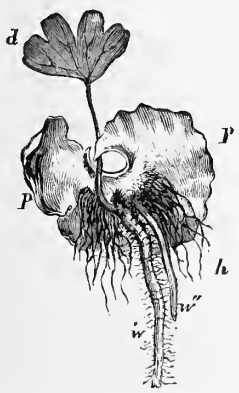
observe, either from its small size or from becoming torn and withered, or being concealed by the numerous full-grown sporangia. It is quite necessary always carefully to examine into this point. In the case of the covering found in several marginal sori, in which the edge of the frond is turned back and partially covers the sporangia, it is not always easy to say whether there is an indusium present or not. Thus, in the Parsley Fern we have the reflexed portion of the edge of the frond scarcely altered at all, whilst in *Pteris cretica*, *Adiantum*, and other ferns, there is a distinct membrane extending from the margin, and more or less covering the line of sori. In the uncertainty as to the true nature of this organ it is convenient to call it a *false indusium*. Our common Bracken shows, besides this false indusium, a true indusium also, which is situated beneath the sori. And this leads us to notice that the indusium may be either inferior—*i.e.*, forming a cup or a scale below the sporangia—or (more usually) superior, when it covers them. Examples of the former kind are seen in the Ostrich Fern, and very beautifully in the little Woodsias; also in the species of *Cystopteris* and in the Filmy Ferns, all of which kinds present differences which are fully described in the succeeding pages. The superior indusia present less variety. They form, when young, a complete investment over the sporangia, but as the latter become ripe the indusium becomes detached at its edge. Their attachment is generally to the receptacle, either by their centre to its summit or at the side.

Mode of Reproduction.—We have seen that the spores are liberated from the sporangia when ripe by the rupture of the latter; we have now to examine in what way the new fern has its origin. When the spores fall in a suitable damp place, they, usually after some little period, germinate. But their germination is quite unlike that of a seed; there is no young embryo plant in the spore, and no putting forth and unfolding of a delicate root and little fronds belonging to a young fern. A plant is produced, to be sure, but it is wholly unlike the parent. The germination of fern spores can readily be watched in any hot-house, and what is seen as the result is a very small, flat, membranous green body, which is attached to the soil by several delicate rootlets. Its outline varies, but is usually more or less circular or kidney-shaped; its transparent, clear, green, and cellular texture gives it a great similarity to the little plants called Liverworts. To this structure the name *prothallium* is given. Though so delicate a structure, it is not always an evanescent one, and may even last several years.

The prothallium seems to have been first clearly seen by Dr. Lindsay, whose observations are recorded in the "Transactions of the Linnean Society" for 1792 (vol. ii., p. 93). He well figures the commencement of the new fern, but it was not for many years after that the *mode* in which it originated from the prothallium was understood. It was in the year 1844 that the mystery was cleared up by the discovery of the reproductive organs—which everybody had hitherto looked for upon the mature fern—on the minute prothallium. These organs are necessarily of two kinds, and may be roughly considered to be analogous to the stamens and pistils of flowering plants. They are, of course, very minute, and require the microscope for their examination, and are termed *antheridia* and *archegonia*. In the great majority of cases both kinds are found on the same prothallium; their usual position is on the under-surface, the antheridia among the rootlets at one end, and the archegonia in the kidney-shaped prothallia, just behind the indented portion. The antheridia are minute cellular sacks, which burst, when mature, to liberate a number of microscopic, spirally-twisted, ciliated bodies endowed with movement, and called *spermatozoids*. The archegonia are larger and bottle-shaped, with a rather long neck, and contain at the base a minute central cell, which is the

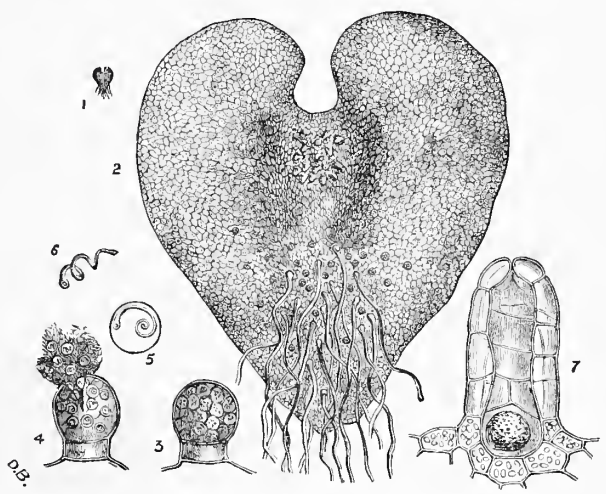
oosphere. It is this little oosphere which gives origin to the new fern. After the spermatozoids escape, some of them pass down the neck of the archegonium, and by their action on the oosphere fertilise it, and set up in it the series of changes resulting in the growth of a new plant. This new plant is at first, of course, very small, and draws its nourishment from the prothallium to which it remains attached, but it is soon evident that it is developing, not into a prothallium, but into a fern, like its grandparent. It soon becomes established with roots of its own, and the prothallium disappears.

It will thus be seen that the reproduction of ferns is very different from that of flowering plants, though a more or less similar mode is very general in the Cryptogamia. Two generations are necessary to complete the cycle of life of the plant, and thus the alternate generations are different. It may be as well to mention, however, that occasionally the new



Prothallium of Adiantum Capillus Veneris, seen from below, with the young fern attached to it.

p p. Prothallium × about 30 times; *d.* The young fern; *w' w''.* Its first and second roots; *h.* Root-hairs of the Prothallium. (After Sachs.)



1. Prothallium of Aspidium Filix-mas, natural size; 2. The same, much enlarged; 3. An Antheridium before bursting; 4. The Antherozoid-cells escaping from the Antheridium; 5. An Antherozoid-cell; 6. An Antherozoid; 7. An Archegonium: all much enlarged. (After Berg and Schmidt.)

fern arises from the prothallium by a process of budding, without the intervention of reproductive organs, as was first observed by Dr. Farlow, of Boston, U.S.A.

Besides the true sexual reproduction above described, ferns, like other plants, are capable of increase by means of buds and offsets. Many species constantly *viviparous* in this way are in cultivation; the buds are either scattered over the fronds or produced in the axils of the pinnæ. Other species root at the end of the fronds, and so produce there new plants.

CLASSIFICATION OF FERNS.

It is not our intention here to exhibit the classification of the whole of the ferns, further than to point out the main divisions into which they fall. But it will be convenient to show the system upon which the European ferns are most readily arranged, although in the following pages this arrangement has not in every case been strictly followed, and to give the botanical characters of the different genera to which they respectively belong.

The above account of the structure of ferns will have shown that there is not a very great amount of difference between the various kinds. We have not, as in flowering plants, organs

like the calyx, corolla, stamens, and pistil, susceptible of almost infinite variety and modification, upon which the numerous genera are based. The minute reproductive organs on the prothallia of ferns have as yet been examined in comparatively few species, and even the prothallia themselves have not afforded any points of difference which can be used for classification, and the botanist accordingly does not take them into consideration. But the organs on the fully-developed fern connected with the production of the spores—that is, the sporangia both individually and as combined with sori and the indusium—present us with important modifications, and it is these which are principally used in the classification generally followed. It is therefore quite necessary, when determining the name of any fern, first of all to examine these parts, by which alone its position can with certainty be ascertained.

THE ADDER'S-TONGUE (*Ophioglossum vulgatum.*)

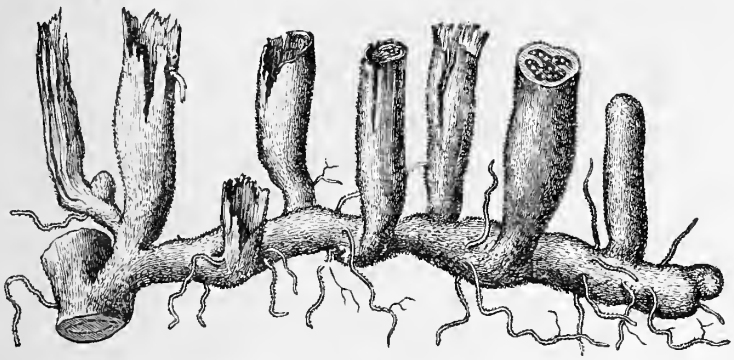
Before attempting to classify the bulk of our species, there are two genera which are so very different from all the rest as clearly to belong to a group of themselves: these are *Ophioglossum* and *Botrychium*. Their appearance is quite unlike that of the remainder of our species; their fronds when young are not circinate, and the spike of fructification is given off from the base of the barren one; the spores, too, are contained in cavities very unlike, and indeed quite different in origin from, the sporangia of other ferns. So fundamental are these points (and there are others), that the *Ophioglossaceæ* are by some botanists removed from the true ferns altogether, and constituted a distinct family. It contains one other genus, not European, called *Helminthostachys*.

The great bulk of ferns remain, and they are found to fall under seven groups, of which the distinguishing marks are given below; but only three of them have representatives in Europe—the *Hymenophyllaceæ*, the *Polypodiaceæ*, and the *Osmundaceæ*, and by far the greater part belong to the second of these, which contains, indeed, three or four times more species than all the other groups put together, and has to be divided into a number of tribes. Of our European Ferns, *Trichomanes* and *Hymenophyllum* fall under the *Hymenophyllaceæ*, and *Osmunda* under the *Osmundaceæ;* all the remainder belong to the *Polypodiaceæ*. The above-named ferns are each so characteristic as to be readily recognised, and the difficulty of determining the genus to which any specimen belongs can scarcely occur with any of them. It is different with the *Polypodiaceæ*, and we must now say a few words on the classification of this great sub-order.

Many plans have been proposed for grouping this: the character of the rhizome—desmobryoid or eremobryoid (see above*); the venation, and the habit; but the most convenient single

* These two terms have been unfortunately transposed at p. iv.

point for a primary division is found in the existence or absence of an indusium to the sori. This is the first thing to be looked for, and from what has been said above, in our description of the indusium, it will be seen that the necessary examination must be careful, or the indusium



DESMOBRYOID RHIZOME OF PTERIS AQUILINA (*half natural size*). (After Sachs.)

EREMOBRYOID RHIZOME OF POLYPODIUM VULGARE (*half natural size*), SHOWING SCARS OF FALLEN FRONDS.

really present will be overlooked. Taking the whole world, there are recognised eleven distinct tribes of *Polypodiaceæ*—eight with an indusium and three without it. Of these two (in each division, one) have no European representative. The differences are briefly given in the table of classification below, and will be seen to depend chiefly on the nature and form of the indusium (where present), and the form and position of the sori. Under each tribe we have given the genera (nineteen in all) of the European Fern-flora, with the distinguishing character of each, so that it is hoped that the reader will be able to ascertain the genus of an unknown species without much difficulty. For the description of the species themselves he must of course refer to the body of the work itself, to which this sketch is only intended as an introduction. The sub-order *Hymenophyllaceæ*, which is here placed at the head of the list, follows the *Dicksonieæ* in the body of the book. The classification involves the use of a number of technical terms which at first sight appear somewhat alarming; but an explanation of all of them will be found in the preceding pages.

CLASSIFICATION OF THE GENERA OF THE FERNS OF EUROPE.

Sub-Order I. HYMENOPHYLLACEÆ.—Sporangia sessile, rounded but compressed, surrounded by a complete transverse ring, splitting vertically, and seated on a long, stalk-like receptacle, which is terminal or marginal, continued from the end of a vein. Indusium inferior, half-cup-shaped. Ferns with membranous filmy fronds, and a filiform, long, creeping caudex.

Genus 1. *Trichomanes.*—Sporangia occupying the base of the very long receptacle which is exserted beyond the truncate indusium.

Genus 2. *Hymenophyllum.*—Sporangia occupying the whole (or nearly so) of the shorter receptacle which is contained within the two-lipped indusium.

[Sub-Order *Gleicheniaceæ.*—Sporangia sessile, surrounded by a complete transverse ring, splitting vertically, very few (from 2 to 10) combining to form dorsal sori, which have a short receptacle. No indusium. Ferns with a creeping caudex and rigid dichotomously-branched fronds. No European genus.]

[Sub-Order *Cyatheaceæ*.—Sporangia sessile or stalked, surrounded by a vertical or rather oblique incomplete ring, splitting transversely, very numerous, and seated on a barrel-shaped receptacle to form dorsal globose sori. Indusium inferior, or none. Usually tree-ferns. No European genus.]

Sub-Order II. POLYPODIACEÆ.—Sporangia stalked, furnished with a usually incomplete vertical ring, splitting transversely, numerous, forming dorsal or marginal sori, with the receptacle not prominent. Indusium present or absent.

* With an indusium, true or false. (*Involucratæ*.) Tribes 1—7.

Tribe 1. *Dicksonieæ*.—Sori globose, situated on the back or apex of a vein. Indusium inferior, either covering the whole sorus, and bursting irregularly, or cup-shaped. Venation free or anastomosing.

Genus 3. *Onoclea*.—Fronds dimorphic, the fertile ones contracted. Indusium semi-circular, becoming ragged and evanescent. Sori dorsal, confluent.

Genus 4. *Woodsia*.—Fronds uniform. Indusium completely cup-shaped, with a fimbriated margin. Sori dorsal.

Genus 5. *Dicksonia*.—Fronds uniform. Indusium forming with the segment a marginal two-lipped pouch. Sori terminal.

Tribe 2. *Davallieæ*.—Sori marginal or nearly roundish. Indusium scale-like, inferior, attached by a broad base, and free or attached to the frond at its sides.

Genus 6. *Davallia*.—Indusium attached by a semi-circular base and sides, upper margin free. Sori marginal or terminal.

Genus 7. *Cystopteris*.—Indusium attached by its base only. Sori dorsal.

[Tribe *Lindsayeæ*.—Sori in a line at edge of the frond, and covered with its margin. Indusium membranaceous, short. No European genus.]

Tribe 3. *Pterideæ*.—Sori marginal, oblong or linear. False indusium, formed from the inflexed margin of the segment, of the same shape as the sorus, opening inwardly.

Genus 8. *Pteris*.—Sori occupying the intra-marginal arched nerve connecting the veins, and covered with a continuous false indusium; a true indusium also present in one species.

Genus 9. *Adiantum*.—Sori occupying the upper part of the veins on separate lobules, and covered by distinct reflexed false indusiums. Fronds smooth.

Genus 10. *Cheilanthes*.—Sori occupying the thickened apices of the veins, and covered by the reflexed false indusium. Fronds very hairy.

Genus 11. *Cryptogramme*.—Sori occupying the unaltered apices of the veins, oblong, covered by the reflexed margin of the frond. Fronds dimorphic.

Tribe 4. *Blechneæ*.—Sori dorsal, parallel with the mid-rib and edge of the segments, but not close to the latter, oblong or linear. Indusium superior, opening towards the mid-rib.

Genus 12. *Blechnum*.—Fronds dimorphic. Sori in a continuous line, on longitudinal anastomosing veins.

Genus 13. *Woodwardia*.—Fronds uniform. Sori in an interrupted line.

Tribe 5. *Asplenieæ*.—Sori dorsal, attached to the veins, and oblique with respect to the mid-rib, linear or oblong. Indusium as in the last, sometimes double.

Genus 14. *Asplenium*.—Sori linear, straight. Indusium nearly flat. Frond not scaly beneath.

Genus 15. *Athyrium*.—Sori oblong-reniform. Indusium with a fringed margin

Genus 16. *Ceterach.*—Sori linear. Indusium very narrow, erect. Frond covered on the back with chaffy scales.

Tribe 6. *Scolopendricæ.*—Sori as in the Asplenieæ, except that the indusia are arranged in pairs, and open towards each other.

Genus 17. *Scolopendrium.*

Tribe 7. *Aspidieæ.*—Sori dorsal, round or nearly so. Indusium superior, attached by its centre or an indentation.

Genus 18. *Aspidium.*

** Without an indusium (*Exinvolucratæ*). (Tribes 8 and 9.)

Tribe 8. *Polypodieæ.*—Sori dorsal, round or nearly so.

Genus 19. *Polypodium.*

Tribe 9. *Grammitidcæ.*—Sori dorsal, linear or long-oblong.

Genus 20. *Nothochlæna.*—Fronds very densely clothed with paleæ beneath.

Genus 21. *Gymnogramma.*—Fronds without paleæ.

[Tribe *Acrosticheæ.*—Sori not confined to the veins, but spread over the under-surface (or both surfaces) of the frond. No European genus.]

Sub-Order III. Osmundaceæ.—Sporangia stalked, furnished with a short horizontal bar or very incomplete ring, splitting vertically.

Genus 22. *Osmunda.*

[Sub-Order *Schizæaceæ.*—Sporangia sessile, crowned by a small, complete, opercular ring, splitting vertically. No European genus.]

[Sub-Order *Marattiaceæ.*—Sporangia without a ring, opening by a pore at the apex, and usually fused together into a concrete mass. Vernation circinate. No European genus.]

Sub-Order IV. Ophioglossaceæ.—Sporangia without a ring, opening down the side nearly to the base. Vernation erect, not circinate.

Genus 23. *Ophioglossum.*—Sporangia in two rows, connate, two-valved, forming a distichous spike.

Genus 24. *Botrychium.*—Sporangia separate, two-valved, forming a branched panicle.

GEOGRAPHICAL DISTRIBUTION OF FERNS.

Ferns are generally distributed over the globe, being least frequent in the polar regions, and most abundant in the tropics, where they attain their most magnificent proportions and fullest development in the form of the tree-ferns, which are confined to those regions, or extend but slightly beyond them, as in the case of a few species of Cyathea, Dicksonia, and Alsophila, which occur in the Cape and New Zealand. Mr. Baker has treated the subject at length in the twenty-sixth volume of the "Transactions of the Linnean Society," and his paper, to which we acknowledge our obligations, should be consulted by those who wish to obtain a more complete view of the matter than can be attempted in a sketch like the present. He says that here, if anywhere, we may hope to find a large order, with distinctly marked and clearly definable climatic relations. "Without a single prominent exception, we find that the whole order, of between two and three thousand clearly marked species, requires shade and a damp atmosphere, that everywhere within the tropics there are no ferns at all (or very few) in the dry countries and provinces, that, with the precision of an hygrometer, an increase in the fern vegetation (it may be in species, or it may be in the number and luxuriance of individuals, but usually in both) marks the wooded humid regions, and that,

receding from the tropics, although with latitude, the species diminish in number, there is the same contrast between the two categories of climate—the dry continental type with a large, and the damp insular type with a small hiberno-æstival range."

The view taken of species in Mr. Baker's comparative lists, like that in the "Synopsis Filicum," is somewhat larger than that adopted by most writers; but following it for purposes of comparison, we learn that only twenty-six species are found in the Arctic zone, of which all but two, Athyrium crenatum, and Aspidium fragrans, are natives of Britain. Tropical America and tropical Asia—the latter including the Polynesian islands—are the two richest regions in ferns. In tropical Asia there are eight hundred and sixty-three species, of which four hundred and seventy-seven are peculiar to that region, while tropical America has nine hundred and forty-six species, seven hundred and eight of which do not occur elsewhere. Of course this estimate is slightly below the actual number of ferns at present known, more than ten years having elapsed since its publication; but the numbers are relatively correct. One remarkable feature connected with the distribution of ferns is the large proportion they bear in the vegetation of some of the African islands. Thus in the Mascarene Archipelago—understanding by this term the islands of Madagascar, Mauritius, Bourbon, and the Comoros—there are more than two hundred species of ferns, more than double the number of the most fully represented order of flowering plants, *i.e.*, the Orchidaceæ; while there is reason to believe that, in Madagascar, at any rate, many ferns have yet to be discovered, as recent collectors have quite lately added several species to the list. In the little island of Tristan d'Acunha, the proportion of ferns to flowering plants is remarkably large, there being no less than twenty-three of the former to twenty-nine of the latter. St. Helena comes next of known floras to Tristan d'Acunha, in the proportion which ferns bear to phanerogamia, which is nearly as two to three, and it is very remarkable from the fact that half of them are peculiar to it.

Among the European ferns there are some which do not extend beyond the continent; these are, Hymenophyllum Wilsoni, Asplenium germanicum, A. Heuffleri, A. Petrarchæ, A. fissum, A. Seelosii, Cystopteris alpina, C. sudetica, and Cheilanthes hispanica, the two first being British species. Aspidium æmulum and Davallia canariensis are only a little less restricted in their range, the former (which in Europe is confined to Britain) occurring also in Madeira and the Azores, while the latter is confined to Spain and Portugal, and the islands of Madeira and Teneriffe.

Ferns reach their maximum concentration in tropical America, "amongst the dripping rocks of the higher level of the Andes, the forests of their slopes and ravines, and the dense humid flats that border the innumerable branches of the Amazon, where the sun's rays and the wind never penetrate the recesses of the primeval jungles, and climbers and parasites contest with the leaves of bright flowering trees for the possession of the branches." About nine hundred and fifty species are found in this region, constituting forty-two per cent. of all known ferns, and more than three out of four are quite peculiar to it. For tropical Asia and Polynesia, eight hundred and sixty-three species were on record at the date of Mr. Baker's paper, of which four hundred and seventy-seven are peculiar to the district; the Polynesian list containing three hundred and eighty species, of which a hundred and fifty are peculiar. In tropical Arabia we have a million square miles "almost a blank, so far as ferns are concerned." The fern-flora of tropical Africa (including the islands of the Mascarene group) has three hundred and forty-six species, of which a hundred and twenty-seven are peculiar. South temperate America yields only a hundred and eighteen

species, of which only thirty-two are peculiar; while in temperate South Africa we have a hundred and fifty-three species, twenty-one of which are known only from Cape Colony. Temperate North America has only a hundred and fourteen species, thirty-seven of which are confined to that region; while, on the other hand, in temperate Asia, where the fern-flora of the temperate regions attains its maximum, we have "four hundred and thirteen species, eighteen per cent. of the total number, more than half the whole number of species that grow anywhere in temperate regions, twice as many as grow in any other temperate district, more than five times as many as we possess in Europe, and of these, one out of between every three and four is peculiar to it," these being for the most part concentrated in Japan, East China, and the Himalayas.

The accompanying table, which we have adapted from Mrs. Lyell's "Geographical Handbook of all known Ferns," may be found useful as showing at a glance the distribution throughout the world of the European species. The division to which the figures correspond are as follow:—

I.—Europe and North Africa.

1. Europe proper.
2. Algeria, Madeira, Canaries, Azores.

II.—Asia.

3. Northern, Central, and Western Asia, China, and Japan.
4. Northern India, including Assam, and all north of the Deccan.
5. Southern India, including Concan, Deccan, Orissa, Ceylon.
6. Eastern Peninsula and Archipelago, Philippine Isles.

III.—Australia and Polynesia.

7. Tropical Australia, New Guinea, Caroline and Solomon Isles, New Hebrides, New Caledonia.
8. Temperate Australia, Tasmania, New Zealand, Auckland Isles, etc.
9. Polynesia, Friendly, Society, Sandwich, Marquesas Isles, etc.

IV.—Africa.

10. Tropical Africa and Islands.
11. Cape Colony and Natal, Tristan d'Acunha.

V.—North America.

12. Sub-arctic Greenland, Canada, and westerly to the Rocky Mountains.
13. United States, Bermuda.
14. California and New Mexico, British Columbia, covering the slope from the Rocky Mountains to the Pacific.

VI.—South America.

15. Mexico, Panama, West India Islands.
16. Venezuela, New Granada, Ecuador, Peru, Bolivia, Galapagos Isles.
17. Guiana, Brazil, Paraguay, Uruguay.
18. Chili, La Plata, Patagonia, Falkland Isles, Juan Fernandez.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I. HYMENOPHYLLACEÆ.																		
Hymenophyllum tunbridgense	1	2	...	...	5	...	...	8	9	...	...	...	...	...	15	16	17	18
„ Wilsoni	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichomanes radicans	1	2	...	4	...	...	...	...	9	10	...	...	13	...	15	16	17	...
II. POLYPODIACEÆ.																		
Tribe 1.—*Dicksonieæ.*																		
Onoclea Struthiopteris	1	...	3	...	...	...	...	...	...	...	...	12	13	...	...	...	...	...
Woodsia ilvensis	1	...	3	...	...	...	...	...	...	...	...	12	13	...	...	...	...	...
„ hyperborea	1	...	...	4	...	...	...	...	...	...	...	12	...	...	...	...	...	...
„ glabella	1	...	...	...	...	...	...	...	...	...	...	12	...	...	...	...	...	...
Dicksonia Culcita	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tribe 2.—*Davallieæ.*																		
Davallia canariensis	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cystopteris fragilis	1	2	3	4	...	...	...	8	9	10	11	12	13	14	15	16	...	...
„ alpina	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ sudetica	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ montana	1	...	3	...	...	...	...	...	...	...	...	12	13	...	...	...	...	...
Tribe 3.—*Pteridæ.*																		
Pteris aquilina	1	2	3	4	5	6	7	8	9	10	11	...	13	14	15	16	17	...
„ arguta	1	2	...	...	...	...	...	...	...	10	...	...	...	...	...	...	...	...
„ ensifolia	1	2	3	4	5	6	7	8	9	10	11	...	13	...	15	16	...	...
„ cretica	1	...	3	4	5	6	...	...	9	10	11	...	13	...	15	...	...	...
Adiantum Capillus-veneris	1	2	3	4	5	...	...	...	9	10	11	...	13	14	15	16	17	...
Cheilanthes fragrans	1	2	3	4	...	...	...	...	...	...	...	...	...	...	...	..	...	...
„ Szovitzii	1	2	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ hispanica	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cryptogramme crispa	1	...	...	4	...	...	...	...	...	...	...	12	13	14	...	...	...	...
Tribe 4.—*Blechneæ.*																		
Blechnum Spicant	1	2	3	...	...	...	...	...	...	...	...	12	...	14	...	...	...	...
Woodwardia radicans	1	2	...	4	...	6	...	...	...	...	...	...	...	14	15	...	...	...
Tribe 5.—*Aspleniæ.*																		
Asplenium Hemionitis	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ viride	1	...	...	4	...	...	...	...	...	...	...	12	...	14	...	...	.	...
„ Trichomanes	1	2	3	4	5	...	...	8	9	...	11	12	13	14	15	16	...	...
„ Heuffleri	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ Petrarchæ	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
„ marinum	1	2	...	...	...	...	...	...	...	10	...	12	...	...	15	...	17	...
„ fontanum	1	...	...	4	5	...	...	...	...	...	...	...	...	...	...	...	...	...
„ lanceolatum	1	2	...	...	...	...	...	...	...	10	...	...	...	...	...	..	...	...
„ Adiantum-nigrum	1	2	3	4	...	6	...	...	9	10	11	...	...	...	...	...	...	...
„ Seelosii	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ Ruta-muraria	1	2	3	4	...	...	...	...	...	...	11	...	13	...	...	...	...	...
„ septentrionale	1	...	3	4	...	...	...	...	...	...	...	...	...	14	...	...	...	...
„ germanicum	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ fissum	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ lepidum	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Athyrium Filix-fœmina	1	2	3	4	5	...	...	...	...	10	11	12	13	14	15	16	...	...
„ crenatum	1	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ceterach officinarum	1	2	3	4	...	...	...	...	...	10	11	...	...	...	...	...	...	...
„ Pozoi	1	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...	...	18

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Tribe 6.—*Scolopendrieæ.*																		
Scolopendrium vulgare	1	2	3	...	...	...	...	...	...	...	...	...	13	...	15	...	...	...
„ Hemionitis	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tribe 7.—*Asplenieæ.*																		
Aspidium Lonchitis	1	...	...	4	...	...	...	...	...	...	...	...	13	14	...	...	...	...
„ aculeatum	1	2	3	4	5	6	...	8	9	10	11	12	13	14	15	16	17	18
„ angulare	1	2	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ Thelypteris	1	...	3	4	...	...	...	8	...	10	11	12	13	...	...	...	...	...
„ montanum	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
„ Filix-mas	1	2	3	4	5	6	...	...	9	10	11	12	13	14	15	16	17	...
„ remotum	1	...	...	...	...	...	...	...	...	...	...	...	13	...	...	...	...	...
„ rigidum	1	...	...	...	...	...	...	...	...	...	...	...	...	14	...	...	...	...
„ cristatum	1	...	...	...	...	...	...	...	...	...	...	12	13	...	...	...	...	...
„ spinulosum	1	2	...	4	...	...	...	...	...	10	11	12	13	...	...	...	...	...
„ dilatatum	1	2	3	...	...	...	...	...	...	...	...	12	...	14	...	...	...	...
„ æmulum	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tribe 8.—*Polypodieæ.*																		
Polypodium vulgare	1	2	3	...	...	...	...	...	...	...	...	12	13	14	15	...	...	...
„ Dryopteris	1	...	3	4	...	...	...	...	...	...	...	12	13	14	...	...	...	...
„ Robertianum	1	...	3	4	...	...	...	...	...	...	...	...	13	...	...	...	...	...
„ Phegopteris	1	...	3	...	...	...	...	...	...	...	...	12	13	14	...	...	...	...
„ rhæticum	1	...	3	...	...	...	...	...	...	...	...	12	...	14	...	...	...	...
„ flexile	1	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tribe 9.—*Grammitideæ.*																		
Notholæna Marantæ	1	2	...	...	...	...	7	...	...	10	...	...	...	...	...	...	...	...
„ lanuginosa	1	2	...	4	...	...	...	...	...	10	...	...	...	...	...	...	...	...
Gymnogramme leptophylla	1	2	3	...	5	...	...	8	...	10	11	...	...	...	15	16	...	...
III. Osmundaceæ.																		
Osmunda regalis	1	2	3	4	5	...	...	...	...	10	11	12	13	...	...	...	17	...
IV. Ophioglossaceæ.																		
Ophioglossum vulgatum	1	2	3	4	5	...	7	8	9	10	11	...	13	...	...	...	...	...
„ lusitanicum	1	2	...	...	...	...	...	...	...	10	...	...	...	...	...	...	...	...
Botrychium Lunaria	1	...	3	4	...	...	...	8	...	...	...	12	...	...	...	16	...	18
„ boreale	1	...	...	...	...	...	...	...	...	...	...	12	...	...	...	...	...	...
„ matricariæfolium	1	...	...	...	...	...	...	...	...	...	...	12	...	...	...	...	...	...
„ lanceolatum	1	...	3	...	...	...	...	...	...	...	...	12	...	...	...	...	...	...
„ simplex	1	...	...	...	...	...	...	...	...	...	...	12	13	...	...	...	...	...
„ ternatum	1	...	3	...	...	...	...	8	...	...	...	12	13	14	...	...	...	...
„ virginicum	1	...	3	4	5	...	...	...	...	...	...	12	13	...	15	...	...	...

THE CULTIVATION OF FERNS.

As we have already observed, few plants have gained so wide a popularity as ferns, on account of the extreme beauty and elegance of their fronds, and the great diversity of form found amongst them; and the European species, to which these pages are devoted, will especially recommend themselves to dwellers in towns, where gardens are, as a rule, very restricted in area, and glass-houses are scarce.

The majority of the ferns indigenous to Europe may be successfully grown in the open air in any part of Britain. Some few species from the most southern parts require protection

but even these thrive admirably and produce a beautiful appearance if they have the protection of a Ward's or window case. Nevertheless, many mistakes are made in the cultivation of these plants, apparently for the reason that this, although not difficult, requires, like most other things, a certain amount of attention. For instance, it is a mistake to suppose that for the cultivation of ferns nothing is required but to give them plenty of water and keep them in the shade. Acting upon this advice, the poor ferns are kept drenched with water until the soil becomes a perfect bog, and they are carefully excluded from even a chance streak of sunshine; the result of such treatment naturally is, that after a short existence they miserably perish. Another mistake into which people fall is based on the theory that ferns require plenty of heat, shade, and moisture; and this is acted upon without the slightest qualification, no matter whether the ferns in question are natives of California or Cochin China, Botany Bay or Bengal. To a certain extent these views are right enough, but they require modification and special application in particular cases, in order that they may be acted upon successfully.

It may safely be laid down as a general principle that moisture in abundance is essential to the well-being of all ferns, but provision must always be made to carry it away quickly, for if allowed to become stagnant about their roots, sickness and death will speedily follow. Again, ferns enjoy shade, but it is quite erroneous to suppose that in a state of nature they grow only in sunless spots, for some of the most delicate kinds are found growing on the sunny side of mountain slopes, although some species do grow most luxuriantly on a northern aspect.

In the matter of heat, even with the strictly tropical kinds, cultivators usually err on the side of excess, the consequences of which are weakly growth and a plague of thrips; for it may be taken for granted that when these insect pests abound, the atmosphere is too hot or too dry, or in all probability both, and the subject of their attacks must at once be removed to a cooler temperature. European ferns generally are easy to cultivate, and yet there are amongst their numbers some few species which are quite as difficult to grow creditably as any in the known world. Amongst these we may enumerate *Asplenium Seelosii*, *A. Petrachæ*, and *A. septentrionale*, *Cheilanthes fragrans*, *Notholæna Marantæ*, and *Ceterach officinarum*, all of which require to be grown with a large admixture of limestone and a sunny exposure. On the other hand, many species grow in very varied situations: on barren spots fully exposed to the influence of the sun and all the winds that blow, or in some deep moist recess, almost hidden from the sun and scarcely ever disturbed by wind. Enough, however, has been said on generalities, and we shall now devote ourselves to a few specialities necessary to the successful cultivation of the ferns of Europe, and in doing so shall place our remarks under four heads, viz., Open Ground Culture, Pot Culture, Wardian Case Culture, and Propagation.

Open Ground Culture.

That ferns display the greatest beauty when thus treated none can deny, but many amateurs are deprived, through want of space, from indulging their tastes in this manner, and must perforce resort to pot culture. With many beginners in fern growing it is considered necessary to have a rockery to grow these plants upon, but why the majority of ferns should be considered to require rock-work it has never been our fate to discover. Such a situation is, we admit, absolutely necessary for the well-being of some few species, but too much weight is often given to the necessity of a good rockery for starting the cultivation of ferns and hardy plants. A well-made and properly planted rockery certainly adds greatly to the pleasure

of a garden, but the majority of small rockeries which have come under our notice have been neither pretty to look at nor suitable for plant life.

The best spot for the construction of an open-air fernery is one with a broken and uneven surface, where there exists a certain amount of shade, protection from wind, and partial exposure to the sun, and if there is a stream of water running through it, so much the better; but there are few amateurs who have such a spot whereon to construct it. These conditions, therefore, cannot be laid down as necessary, but the best must be made of what exists.

The most sheltered spot available should be selected, with partial shade, if possible, but not underneath large trees, as the drip from them is ruinous to the health of most ferns. An elevated site is preferable, because it ensures good drainage, and an uneven surface affords the greatest diversity, and admits of a more artistic arrangement than a flat surface. If such a spot does not exist naturally in the garden, a mound should be thrown up. The base of this should be formed with old bricks, rough stones, or any material that will readily carry away superfluous moisture; over this the soil may be placed, the surface may be diversified, and the soil held in position by masses of stone or rock, if convenient, or by the use of rough burrs, logs, and butts of trees, which should be partially buried. The protruding ends of these may stand in such a manner as to afford some shade to the fronds of the more delicate species, whilst their bases will serve to keep the roots moist and cool during the hottest summer weather. Such a mound may thus be raised to any height, and the outline formed in any shape; the less formality the greater will be the effect, and an unsightly corner may be thus converted into the most effective and pleasing part of the garden. In like manner a blank and unsightly wall may be clothed with verdure by fixing burrs with cement over its surface in the form of pockets, in which ferns when planted will thrive admirably: the only requisites in this operation are to make the pockets with a hole in the bottom to carry away water, and sufficiently large to receive soil for the maintenance of a plant.

The mixture of soil for the fernery should consist of rough peat, loam, leaf-mould, and coarse sand, in about equal parts; this will form a good compost for the ground-work, and in it the majority of the species will thrive, but in planting the most vigorous growing kinds a little extra loam should be placed round them, whilst the more delicate ones will require an addition of sandy peat. The limestone-loving ferns must be accommodated with that article, or the best substitute that can be found in the shape of old mortar or the like.

In planting the fernery care must be taken to properly regulate the plants according to their heights; the tall-growing species must be so disposed that their fronds do not hide the beauties of their dwarfer relatives and neighbours, and those particular kinds which carry their fronds through the winter months should so be distributed amongst the deciduous ones, that the whole may have a furnished and interesting appearance both winter and summer. Little more need be added with respect to the management of the open-air fernery. During the summer, if the weather is dry, the ferns must be kept well watered at their roots, but this should be done in a careful manner, avoiding the too common practice of pouring or dashing the water over the fronds, which is fatal to the uniformity of the plants, and serves no good purpose. In the autumn carefully extract all weeds, and instead of clearing away the fallen leaves, cover them neatly with a thin layer of mould; this not only gives a neat and tidy appearance, but is in other ways preferable to the usual practice of forking between the plants, which we consider very detrimental to the roots.

Pot Culture.

The cultivation of ferns in pots enables many to indulge their taste for these plants where neither room nor convenience exists for constructing a fernery in the garden, or even where no garden is at their disposal. The size of the pots in which these plants should be grown must be determined by circumstances. If the space required for their accommodation is of no object, there need be no restriction; but where space is limited, it becomes a matter for serious consideration, and every effort must be made to produce the best possible results from the means at command. Even those so restricted need not despair, as a very creditable and enjoyable collection of ferns may be grown in a comparatively small area.

The soil necessary for growing ferns in pots must be the same as that previously recommended; it will, however, require to be chopped or broken into much smaller pieces, for convenience sake, or it would be impossible to get it into small pots. A sieve should not be used to obtain fine soil, as, although some plant-growers evince a great partiality for sifted mould, it is undoubtedly a great mistake, and we object to its use for anything but seed sowing, and in transplanting young plants from the seed-pans.

Hardy ferns cease to grow in early autumn, continue at rest during the winter months, and will not have commenced growing before the month of April. Early in March, just before the life begins to stir within the crown, will therefore be the best time to repot or top-dress them with new soil. It is sound practice to turn every plant out of its old pot carefully, and if it should not require transplanting into a pot of a larger size, renew or make perfect the old drainage, shake some of the old soil away, and replace with fresh. In this operation, or in repotting, carefully avoid breaking or cutting the roots. We are aware that many consider it quite consistent with good culture, but it is a fallacious argument, as the plant is thus deprived of its support just at the very time of bursting into growth, when all the nourishment its roots can supply is required for the proper development of the fronds.

In repotting avoid giving much extra room, as where very large pots are used the quantity of soil is apt to become sour before the roots are able to occupy it, and when once it has got into this state, not only will the fern roots avoid it, but it extends its baneful influence to that portion already full of roots, and kills them—a fact which soon becomes apparent by the sickly colour of the fronds. The soil being ready, see that the fresh pots are clean and dry. The first operation is draining; this requires a certain amount of care, as very much depends upon the manner in which it is done. Any rough material will answer for this purpose, but broken pots—technically known by the name of crocks and potsherds—are the most convenient and most frequently used. The hole in the bottom of the pot should be first covered with a large crock, with the hollow side downwards, as, placed in this position, the surplus water is most rapidly carried away; above this, for pots of medium size, place about an inch of potsherds broken rather small, but for large pots, where there is a larger quantity of mould to drain, about two inches will be necessary, over the drainage some rough pieces of turf should be laid, to prevent the fine soil from being carried down with the water into the drainage material. After this sufficient of the prepared compost should be put into the pot to bring the crown of the plant up to within about an inch of the rim; this space, or even a little more, should be left available for water. Fill the sides round with soil, pressing it moderately firm, until at last the plant is left with the crown in the centre, and erect; give a moderate watering to settle the new soil, and the operation is complete.

Those ferns having creeping surface rhizomes, such as *Davallia*, *Polypodium*, *Trichomanes*,

Hymenophyllum, &c., want very little repotting. They do, indeed, require from time to time additional surface to spread over, but after firmly establishing themselves upon a log of wood, piece of sandstone, or other congenial surface, they become almost, or quite, independent of their base. As we have previously stated, ferns require an abundant supply of water; in fact, at no season of the year must they be allowed to feel the effect of drought, if they are expected to keep in vigorous health and increase in size. In a state of nature many species may indeed, nay, certainly do, suffer considerably from this cause; but the object of a cultivator should be to represent nature in her best form. This is the work the true gardener sets himself to do, and the success which attends these efforts is truly astounding, as our gardens and plant-houses amply testify.

In taking leave of this portion of the subject, we shall simply add that during summer water must be freely given, and during the winter and resting season sufficient must be allowed them to keep the roots of the ferns from perishing.

Those of our fern-loving readers who are the possessors of a frame or pit have it in their power to indulge their taste for the beautiful to a far greater extent than those not possessing such valuable accessories, because many ferns placed under glass retain their fronds through the winter months. When possible, winter the pot-plants in the frame, protecting them from frost until the spring, when they may be again placed in the open air. Those not possessed of a frame should remove the pots to a sheltered corner and plunge them up to their rims in order to prevent frost injuring the roots. The refuse from cocoa-fibre is perhaps the very best material to use; it is light, warm, and very clean. During severe frosts and on sunny days the tops of the plants should be covered with some light material, such as dry bracken, or anything that is convenient. It may appear strange that we advise the covering of the plants on sunny days, but it is of the greatest importance to do this, in order to prevent undue excitement; for plants may be excited into growth by warm sun during the end of February and beginning of March, which is long before all danger from frosts is over, and it is both better and easier to retard growth by excluding the sun's rays, than to try to protect the plants afterwards.

Wardian Case Culture.

We have already remarked that amongst the ferns of Europe there are some few species from the warm and sunny south which cannot withstand unprotected the severities of an English winter. This difficulty, however, may be easily overcome by the use of glass or Wardian cases, popularly so called in honour of their inventor, Mr. N. B. Ward, who many years ago began the culture of such plants as *Trichomanes* and *Hymenophyllum* in them. Great success attended these first efforts, which led to various improvements, until at the present day they may be obtained of any size or shape, and, when filled with a well grown collection, few objects are more attractive in a dwelling-house.

Like many more important discoveries, the discovery of the Wardian case was due to what is often called an "accident." Mr. Ward had tried in vain to realise what he tells us was "the earliest object of [his] ambition—to possess an old wall covered with ferns and mosses." His rockery, however, "surrounded by numerous manufactories and enveloped in their smoke," was not a success, and the attempt was given up in despair. "I was led," he says, "to reflect a little more deeply upon the subject in consequence of a simple incident which occurred in the summer of 1829. I had buried the chrysalis of a sphinx in some moist mould contained in a wide-mouthed glass bottle, covered with a lid. In watching the bottle from day to day, I

observed that the moisture, which during the heat of the day arose from the mould, became condensed on the internal surface of the glass, and returned whence it came, thus keeping the mould always in the same degree of humidity. About a week prior to the final change of the insect, a seedling fern and a grass made their appearance on the surface of the mould. I could not but be struck with the circumstance of one of that very tribe of plants, which I had for years fruitlessly attempted to cultivate, coming up *sponte sua* in such a situation; and asked myself seriously what were the conditions necessary for its growth. To this the answer was—firstly, an atmosphere free from soot; secondly, light; thirdly, heat; fourthly, moisture; and lastly, change of air." These conditions, with a little management, were found to be supplied by an adaptation of the simple bottle; and from this the Wardian case, which has proved so important an adjunct to the transferring of plants from one country to another.

Filmy Ferns, as the various species of *Trichomanes*, *Hymenophyllum*, and *Leptopteris* are called, require to be grown in a case by themselves, as their delicate, membranous, and pellucid fronds quickly suffer from the amount of air which is necessary for the well-being of a mixed collection of other kinds. The size of case, height of stand, and all such minor details, must be decided upon by the amateur, as so much will depend upon the situation it is to occupy, and the individual taste. The operation of filling the box should be performed in a manner exactly similar to that already recommended for potting; first a layer of drainage, to the depth of about an inch, should be placed over the bottom, to be covered with some rough turfy peat, or what is better, where procurable, a thin layer of living Sphagnum or bog-moss, which does not rot like other mosses; above this put the soil, which should be composed of peat, loam, broken sandstone, and sharp sand, in about equal parts: blocks of limestone and sandstone, in sizes proportionate to the case, should be partially imbedded in the soil, which will serve to diversify the surface, and at the same time afford suitable positions for those species with creeping surface rhizomes.

After the soil is placed in the box the planting must commence. Limestone-loving ferns must be duly studied, and also those with surface rhizomes, whilst *Selaginella helvetica* will form a green and dwarf covering to the whole groundwork; but above all things avoid the too prevalent evil—overcrowding. The planting having been properly finished, the soil must be watered, sufficient being given to settle the whole without saturation, after which the case should be kept closed for a few days, or until the plants begin to show signs of growing and becoming established, when a moderate amount of air must be given every day. On exceptionally hot and dry days the ventilators will be best kept nearly or quite closed until evening. Thus managed the ferns will not require a large quantity of water; indeed, nothing is more detrimental to health than keeping them too wet, therefore the skill of the possessor must be exercised in preserving the happy medium.

A west or north-west window affords a good position for the fern-case, and if the sun's rays should at any time appear too powerful, some light shading material will readily obviate all danger from burning.

It is the custom with many who grow ferns in Wardian cases to replant and renew the soil every spring. With this, however, we cannot agree; we look upon it as destroying the happy arrangement which nature has brought about by the mixture of growth, and unless the soil has become sour, or the plants over-growing each other, we would advise them to be disturbed as little as possible. Therefore, in order to avoid the necessity of disturbing the case annually, it is necessary to observe two rules at starting: 1st, Water carefully; always give enough to well saturate the soil, but leaving no surplus to cause sourness; this can only

be obtained by practice. 2nd, Take into consideration the habit of each species in first planting, so that each may have sufficient space to develop its beauties without crowding out its neighbour in the struggle for life.

Propagation.

This is an interesting operation with all plants, and with ferns especially so, as there are several ways of effecting an increase in numbers. Some species produce small plants upon the upper side of the fronds. In this case the frond must be pegged down upon the surface of the pot, or any other similarly prepared surface, when the little plants will soon take root, and become independent members of the fern world. Others produce bulbils at the apex of their fronds, and these, when detached and properly cared for, rapidly assume the proportions of handsome plants. Again, others have creeping rhizomes and tufted growths; both forms are readily increased by divisions. It is, however, to raising these plants from spores that the greatest interest is attached, and that the greatest amount of trouble and care is necessary.

In setting about this, the first necessity is a fertile frond; this should be secured before the spore cases have opened. Wrap it carefully in a large envelope, and place in a warm position for a few days; by this time the cases will have burst, and the spores should at once be sown. By this method the operator secures the spores; but in many instances the fronds are left on the plant until the spores have all floated away, and only spore cases are sown, which are just as capable of producing a crop of ferns as empty pods of peas would be of producing a crop of that vegetable.

The pots for sowing the spores in should be well drained, and filled to within about two inches of the rim with rather stiff loam, which has been previously baked, the whole pressed down firm, and thoroughly soaked with water. After the water has passed away the spores must be carefully dusted upon the surface, and a piece of glass or a bell-glass placed over them. Nothing more will be necessary but to keep the soil in as near the same state of moisture as possible until the spores germinate.

Baked soil is preferable for raising ferns, on account of that process killing all seeds, worms, or anything obnoxious which would escape detection, small worms being specially troublesome amongst young ferns. It may be a matter of surprise that we recommend stiff loam for these plants in their most delicate stage or period of life; this, however, is the teaching of experience. We have tried various soils for this purpose in the course of our practice, and have invariably had the greatest success and returns from pure loam. This probably arises from the fact of its preserving a more uniform degree of moisture than any lighter kinds; but the young ferns do not like stiff loam long, and as soon as they begin to make little fronds they are best transplanted into the compost already recommended for the mature plants.

There is a great deal of uncertainty respecting the length of time the spores of different species take to germinate; some commence to grow in a few days, others require weeks, whilst some will remain dormant for twelve months. It is best to arrange, if possible, that the spores do not begin to germinate late in the autumn, as they are very apt to damp off through the winter months. If the young plants are very much crowded, as in all probability they will be, remove them with a sharp-pointed stick in little clumps, and transplant them into other pots where they will have room to spread. If this is not done, the probability is that more than half their numbers will perish. This thinning should be repeated as occasion may require until they make fronds and are sufficiently large to be placed singly in small pots. Up

to this time the young plants require great care and attention in the matter of water and air, but after a few fronds are developed, they will conform to the ordinary treatment.

Fern spores germinate most rapidly in a close, moist, and warm atmosphere, and those wishing to raise them without such convenience will find a Wardian case or a close cool frame the next best resource. But under these conditions very few other than species from temperate regions will be likely to germinate, and they will remain dormant a much longer time than when sown in heat.

The ferns of temperate regions appear to be well-nigh exempt from the insect pests their tropical relatives are subject to; occasionally, however, they suffer from the attacks of thrips, which, feeding upon the cuticle, very soon render the plant unsightly; this is a sure sign the plant is suffering in health, most probably from being in a situation both too hot and dry. Again, brown scale shows itself at times, but this is usually when the ferns are grown in a vinery with other plants to which the parasites really belong. In summer also the young fronds take the fancy of the green fly, but this is not of frequent occurrence. The scale must be carefully picked off when seen, and a little fumigation with tobacco will soon induce the other pests to desert.

Besides insects, however, there are other enemies to hardy ferns, to which the genus *Zonites* contributes several members, *Z. alliaria*, *Z. cellaria*, and *Z. purus* being the most destructive. These small snails, combined with several of the slugs, such as *Limax flava*, *L. agrestis*, *L. variegatus*, and some others, must be sharply looked after, in the open-ground fernery especially, or they will commit sad havoc amongst the choice and rare kinds. Hand-picking in the early morning and in the evening will materially assist in clearing out these marauders, whilst some tender lettuce leaves will entice others from their lurking-places, where otherwise they might elude the most vigilant observer.

ECONOMIC PROPERTIES.

When we state that the economic properties of ferns are for the most part "conspicuous by their absence," we may seem to lay ourselves open to a charge of plagiarism; as it may be thought that we are imitating the old author who, having headed a chapter "Of the Snakes of Iceland," began and ended it with the concise statement, "There are *no* snakes in Iceland." But although it cannot be asserted that the useful properties of this group of plants are of such importance as to entitle the ferns to consideration on this ground, and although no one species stands out prominently as of value to mankind either from its medical or economic qualities, we shall nevertheless find—as, indeed, is only to be expected in a group including so large a number of species—that some of them have attained at any rate a local reputation, and have been employed in various ways for the benefit of mankind. Like the peacock in the old fable, whose beauty compensated for the harshness of its voice, the elegance and gracefulness of ferns is quite sufficient to entitle them to a high place in our regard; and it may be remarked that the members of one of the most popular groups of cultivated plants, the *Orchidaceæ*, with all their quaint variety of form and richness of colour, are equally remarkable for the absence of any markedly useful qualities. It would, indeed, demand no very great effort of the imagination, no very daring flight of fancy to suppose that the law of compensation works to some extent in the vegetable world; at any rate it is certain that while such important groups of plants as the Cross-bearers (*Cruciferæ*), Umbellifers (*Umbelliferæ*), and Grasses (*Gramineæ*), from which we obtain so many of our most important vegetables, and to the last-named of which we are indebted for all

the various cereals which go to make up the staff of life—are, for the most part, in no way remarkable for the elegant form or beautiful colouring of their blossoms, we find, on the other hand, that some of the most handsome families—such as the *Liliaceæ*, with all its wealth of lilies, hyacinths, and allied plants, the *Bignoniaceæ*, with its beautiful showy-flowered climbers, which form so prominent an object in the tropical forests of the Eastern Hemisphere, and the before-mentioned *Orchidaceæ*—are comparatively destitute of economic properties. It would, of course, be easy to point out instances in which beauty of form was combined in the same family with great economic importance—as, for example, in the noble tribe of palms: but to descend from the general to the particular, from the vegetable world at large to the small section of it with which we are more especially concerned, we shall find that the uses to which ferns have been applied, if not of notable importance in any special case, are very varied. Our British species, indeed, include among their number many of those to which real or fancied qualities and uses have been attributed; and when we come to consider each of these in the descriptive portion of our book, we shall find that numerous, if not important, qualities have been ascribed to them. In the case of the Bracken (*Pteris aquilina*), for example, we shall find that it is, or has been, employed in all kinds of ways—economic, medicinal, and superstitious. The rhizome and the young fronds have been eaten; alkali is obtained from its ashes; it has been used in common with so many other ferns as an anthelmintic, and in many other ways more or less connected with medical practice; while the "receipt of fern-seed," by which men were wont to "walk invisible," is or has been—for it must be confessed that such superstitious beliefs are becoming very rapidly things of the past, although, like errors and fictions of greater moment, they certainly die hard—very generally believed in; although nowadays most people would be found to agree with Chamberlain (*Henry IV.*, Part II., act ii., scene 1) that "you are more indebted to the night than to fern-seed for walking invisible."

There is, indeed, a good deal of that kind of fiction for which the name "folk-lore" is nowadays found a convenient title, which is more or less intimately connected with ferns; but as this is more especially the case with reference to some of the commonest European species, the discussion of the subject may for the most part be more suitably referred to under the plants with which the traditions are more especially concerned—notably the Bracken, the Male Fern, the Flowering Fern, and the Moonwort.

We hardly know enough of the popular history of ferns in extra-European countries to say whether as much tradition or folk-lore attaches to them; and records of this kind of popular fiction are somewhat rare. We learn, however, that in New Zealand a species of *Asplenium* (*A. lucidum*) is regarded by the natives with reverence, and considered by them as a sacred plant. Dr. George Bennett tells us that it is used by the Tohunga or priest when he is praying over a sick person and endeavouring to avert the anger of the gods, to whose influence the illness of the individual is attributed; he waves a frond of this fern over the patient, and should it happen to break, it is regarded as a fatal omen. When the Tohunga consults the gods, previous to engaging in any war enterprise, he also waves a frond of this fern whilst he offers up prayers to the spirits; if it breaks, it is supposed that the gods are adverse to their engaging in war, and the enterprise is abandoned. It is also used by the natives as a badge of mourning: when a wife mourns for her husband, she sits wailing in her hut, with a frond of this fern bound as a fillet round her head; and a husband performs the same ceremony when he loses his wife. They are careful not to burn the plant. It is also employed when a chief has his hair cut: after the operation is

performed, he holds a frond in his hand; meanwhile the priest prays over him, taking the frond and shaking it; after which it is dipped in water and shaken over the chief; if it breaks, it is regarded as a sign that he will not live long; if one of the leaflets should break off, it is regarded as an omen that one of his family will soon die; but should the frond remain entire during the ceremony, it is considered as an indication of health, success, and long life.

Our common Male Fern (*Aspidium Filix-mas*) has really some claims to be considered of importance from an economic point of view, inasmuch as it finds a place in the British Pharmacopœia. There seems to be no doubt that this fern has been very efficaciously employed in the treatment of tape-worm, a use for which it has been in repute since the days of Dioscorides. From time to time the Male Fern has been the principal ingredient in certain important medicines which had attained great celebrity as vermifuges; and, as we shall see further on, the secret of these medicines has been purchased at a high price by more than one European sovereign, presumably with the intention of promulgating so wonderful a remedy among their subjects. The Polypody (*Polypodium vulgare*) was formerly employed as a purgative, and also in cases of coughs and pectoral affections; and in country places is, or was until lately, used as a remedy in cases of whooping-cough. In the curious old names Miltwaste and Tentwort, for *Ceterach officinarum* and *Asplenium Ruta-muraria* respectively, may be found indications of the disorders in which they were supposed to be efficacious. The former was thought to be a cure for the "swelling of the spleen," to which we also owe the common name Spleenwort, now usually applied to the Aspleniums: while the latter was so called from its employment in cases of rickets—a disease formerly known as "the taint." For this complaint the Royal Fern (*Osmunda regalis*) is still a popular remedy in some parts of Cumberland. In Westmeath the Hart's Tongue (*Scolopendrium vulgare*) is employed as a popular remedy for burns. The Adder's Tongue (*Ophioglossum vulgatum*) was collected until quite recently for use in making a healing ointment called Adder's Spear Ointment—a practice which probably still lingers in country districts, where herbs are frequently employed as remedial agents, and it must be admitted sometimes with signal success. Indeed, a little inquiry in a rural district will usually bring to light some herb-remedy which has been handed down from a remote period, and still holds its own among a rural population. We were much struck a few years since at finding an ointment made from the Clown's Woundwort (*Stachys palustris*) employed by a village woman in Buckinghamshire with very satisfactory results. Gerard, who gave the plant its English name, tells us he did so because of "a clownish answer" which he received from "a very poore man," who had cut his leg to the bone and healed it with this plant. Gerard tells us he "offered to heale the same for charitie, which he refused, saying that I coulde not heale it so well as himselfe." The Comfrey (*Symphytum officinale*) is another common British plant which undoubtedly possesses the healing and consolidating properties to which it owes its old names of Consound, Knitback, Bruisewort, and others. Gerard, indeed, says that the roots "are so glutenative that they will sodder or glew together meat that is chopt in pieces seething in a pot;" but whether this be the case or not, it is certain that some fifty years since a Mr. Rootsey published an account of a workman who had broken his leg, and who, after four years' confinement to his room, was healed by the application of Comfrey as a poultice; splinters of bone were brought away, and in a few weeks he was able to walk. Mr. Oswald Cockayne, in the interesting preface to his "Saxon Leechdoms," gives another instance of the beneficial employment of Comfrey. He says, "Perhaps herbs

are more really effectual than we shall easily believe. The locksman at Teddington told me that he had broken the bone of his little finger, and for two months it was grinding and grunding, so that he felt sometimes quite wrong in himself. One day he saw Dr. —— go by, and told him. He said, 'You see that there Comfrey; take a piece of the root, and clean it, and put it to your finger, and wrap it up.' The man did so, and in four days his finger was well. This story struck me the more since the Comfrey is the *confirma* of the Middle Ages and the *σύμφυτον* of the Greeks, both which names seem to attribute to the plant the same consolidating virtue." But it is time to return to our ferns, from which we seem somehow to have strayed.

A few other properties of our ferns will be considered when each species is described at length; but it must be admitted that when all is said that can be brought together regarding them, the useful qualities of the group are by no means conspicuous, and the same may be said of the extra-European species.

Even when useful properties exist, they are by no means striking. Speaking generally, we may say that the fronds of ferns, when they possess any distinct properties, are mucilaginous and slightly astringent, while the rhizomes are in many cases bitter, astringent, and rather acrid; both the rhizomes and stems of many species abound in starch. If active beneficial properties are absent in any marked degree, it is pleasant to find that there is an equal absence of noxious qualities; so far as is known, we have no example of a poisonous fern.

CERATOPTERIS THALICTROIDES.

1. *Ceratopteris thalictroides* (¼ nat. size).
2. *Under surface of barren pinna* (¾ nat. size).
3. *Section of part of fertile pinna* (4 times nat. size).
4. *Section of part of do. laid open* (4 times nat. size).

Besides the European species, we may enumerate a few which are employed in some way either in medicine or commerce. Beginning with such as are used as food, the soft mucilaginous pith of *Cyathea medullaris*, one of the large tree-ferns of New Zealand, was formerly eaten by the natives; it is of a reddish colour, and when baked acquires a pungent taste, somewhat resembling that of the radish. In New Caledonia another species of *Cyathea* (*C. Vieillardi*) is similarly employed, the mucilaginous matter being obtained by means of incisions made in the stem or at the base of the fronds. In New Zealand, indeed, ferns seem to be in some repute for their edible properties; the large, swollen, scaly rhizomes of *Marattia fraxinea*—a widely-distributed Old World fern of coarse habit, having large twice or three times pinnate fronds with fleshy stipes—are also eaten by the Maoris. The rhizomes of another New Zealand fern, *Pteris esculenta*—a fern nearly allied to, or perhaps only a form of, our common Bracken (*P. aquilina*), which, as we shall see, has itself been employed as food in more ways than one—serve as food to the natives, who roast them in ashes, peel them with their teeth, and eat them with meat as we do bread. This custom, however, like so many others of aboriginal growth, has become to a great extent obsolete. Forster speaks of the New Zealanders as pounding the previously roasted fern-roots between stones, in order to extract the nutritious matter, the woody portion being rejected as useless. In Nepaul the rhizomes of *Nephrolepis tuberosa* are similarly employed.

The succulent fronds of the curious little Water Fern (*Ceratopteris thalictroides*) are boiled and eaten as a vegetable by the poorer classes in the Indian Archipelago. This species, which is figured on the preceding page, is remarkable on account of its aquatic habit, in which respect it is quite exceptional among ferns. It is an annual species, found in wet places, or floating upon shallow, slowly-moving waters in the tropics of both hemispheres. It has much divided, succulent, membranous fronds, which are often proliferous; the sterile ones are leafy and less divided, with reticulated veins, the fertile fronds being taller and divided into very narrow segments. It has been grown in the Victoria tanks at Kew. Small as it is, this little fern has had at least as many names as a Spanish grandee, having been described by no less than twelve authors under as many generic and specific names.

The young shoots of a handsome tree-fern, *Angiopteris evecta*, are eaten in the Society Islands; the large rhizome is in great part composed of a mucilaginous matter, from which, when dried, a kind of flour is prepared. In the same islands the young fronds of *Helminthostachys zeylanica* are prepared and eaten in the same way as asparagus. The young fronds of *Alsophila lunulata*, the "Balabala" of the Fiji Islands, are eaten in times of scarcity; and the soft scales covering the stipes of the fronds are used for stuffing pillows and cushions by the white settlers in preference to feathers, because they do not become so heated, and are thus a real luxury in a sultry tropical night. In New South Wales the thick rhizome of *Blechnum cartilagineum* is much eaten by the natives; it is first roasted, and then beaten so as to break away the woody fibre; it is said to taste like a waxy potato.

The syrup "capillaire," which is a popular French pectoral remedy, is prepared from the Maidenhair (*Adiantum capillus-veneris*); the North American *Adiantum pedatum* possesses similar properties, which are less conspicuously displayed in the Wall Rue (*Asplenium Ruta-muraria*) and Black Maidenhair (*Asplenium Adiantum-nigrum*). To these we shall refer more particularly when we come to speak of the genus *Adiantum*. In Peru the rhizomes of two Polypodies (*Polypodium Calaguala* and *Polypodium crassifolium*), with those of *Acrostichum Huascaro*, are employed under the name of Calaguala as diaphoretics and astringents: febrifugal and anti-rheumatic virtues are also ascribed to them. The drug has been brought to Europe, although but rarely; and there is some doubt as to whether the ferns just mentioned have really produced the specimens imported under the name Calaguala. The fronds of *Aspidium fragrans*, which have a pleasant scent resembling that of raspberries, are much esteemed in Northern Asia as an anti-scorbutic, and in Mongolia are used as a substitute for tea. The hairs of a species of *Dicksonia* (*Cibotium*)—nearly allied to, and perhaps identical with, the *Dicksonia Baromets* which we have considered at some length when treating of the genus—have been employed as a styptic, and even find a place in the German Pharmacopœia; but their action seems to be purely mechanical, although some practitioners have tried the effect of an aqueous decoction of them in cases of internal hæmorrhage, and in some instances favourable reports have been issued. The drug is exposed for sale in the markets of Java under the name of Penghawar-Djambi, and is occasionally met with at the public drug sales in London. It is imported in the form of straight pieces of the lower part of the stem of the fern, about a foot in length and an inch in width; their most striking feature being the abundance of the long sparkling golden hairs with which they are thickly covered. It is chiefly sent to Java from Sumatra, but also from China, Borneo, and the Philippine Islands. This fern is not a native of Java, but the inner portion of the stems of an indigenous fern, *Balantium chrysotrichum*, are employed as a substitute for the true Penghawar-Djambi, under the name of Paku-Kidang. This substitution is said to have been first made by the Dutch in 1837, and it is this which has been

usually brought to Europe as a styptic. The Pulu of the Sandwich Islands consists of similar hairs of *Cibotium glaucum*, and allied species.

The bruised fronds of *Angiopteris evecta* are used in the Pacific Islands, with those of *Polypodium phymatodes*, for imparting an agreeable odour to cocoa-nut oil; and the oil thus prepared forms the basis of a liniment which is largely employed by the natives against rheumatic pains. An elegant and fragrant South African fern, *Mohria thurifraga*, is somewhat similarly employed, being used in the manufacture of an ointment which is found useful in burns and similar cases. The densely clothed rhizomes of a species of *Davallia* are used in China in medical practice; there are specimens in the herbarium of the British Museum from an apothecary's stall at Ningpo. *Nothochlæna piloselloides* has been used in India to subdue sponginess in the gums.

The trunks of some of the tree-ferns, such as the New Zealand *Cyathea medullaris*, and *Alsophila excelsa*, in Norfolk Island, are used in building; while the fronds of *Acrostichum aureum* are commonly employed for thatching in the coast districts of the Isthmus of Panama. In the Fiji Islands another *Alsophila*, *A. lunulata*, the "Balabala" of the natives, which attains the height of twenty-five feet, and forms an imposing feature in the landscape, is much used in building, the trunks being not only extremely durable, but also to a great extent fire-proof. Dr. Seemann states that the little sticks which the chiefs carry stuck under their turban, and with which they scratch their heads, are also made of Balabala. He says: "The trunks make excellent posts, lasting an incredibly long time, and possessing moreover the advantage of being almost fire-proof. After a house has been burnt down, they are almost the only trace that remains. It is also customary to make the ridge-pole of houses and temples of this tree-fern, and to surround it with the Wa-Kalou (holy creeper), a species of that curious genus of climbing ferns, *Lygodictyon*—partially, no doubt, from some superstitious notions, but partially also to keep out the wet. The trunk of the Balabala, cut into ornamental forms, is frequently observed around tombs, temples, bures, and churches, presenting a pretty effect." The tubes of the pipes of the Brazilian negroes are made from the stipes of *Mertensia dichotoma*, which they call "Samanbaya."

THE FERN HERBARIUM.

A Fern herbarium is, perhaps, more easy to make, and more satisfactory when made, than that of any other class of plants, except possibly Mosses. Some groups, indeed, such as the Fungi, it is almost impossible to preserve in any even approximately satisfactory manner; others, such as the Lichens, are readily preserved—indeed, they may be said to preserve themselves—but it can hardly be said that they form an attractive-looking collection, and moreover they are somewhat cumbrous, as they are not always readily to be removed from the rocks or stones upon which they grow. Then as to flowering plants: it is true that the professed botanist troubles himself very little about such trifles as colour, and even form is not greatly attended to by him, but the amateur may be pardoned if he regards a herbarium as partaking a little of the nature of a hay-stack, while the "things of beauty" of which it is composed can assuredly in no sense be regarded as "joys for ever." In spite of all efforts to the contrary, and of all the means proposed to avert the evil, the colour *will* fly from blue flowers; yellow ones—such as Primroses, Bird's-foot Trefoil, and the like—sooner or later assume a bright green hue, and such delicate pieces of colouring as the Spotted Orchis become of a uniform brown tint. Other objectionable peculiarities might be mentioned—

such, for instance, as the persistent growth of the Stonecrops in spite of the heaviest pressure, and the equally persistent shedding of their leaves if, as a last resource, boiling water is resorted to. Then there are plants with thick woody stems which are by no means elegant objects; and there are water plants which collapse when taken out of the water, and refuse to flatten themselves out again; some plants dry very quickly, and rot if allowed to remain too long in the press, others seem as if they never intended to dry at all; and so we might go on with a catalogue of grievances, all of which are more or less familiar to any one who has made a herbarium, especially if he has made up his mind that his herbarium should be not only useful, but also ornamental.

With ferns many of these difficulties are entirely avoided. Not only their natural grace of form, but also their natural beauty of colour, is preserved, and that almost without an effort. It is no wonder, indeed, that the fronds are pressed into service for all kinds of ornamental work, of which the latest manifestation seems to be the invention of a series of Christmas and birthday cards, which are bordered or otherwise embellished with the pinnules of ferns. The fronds should be collected on a dry day; some advocate drying them, as also other plants, in the field, but this method, although it has its advantages, always seemed to us open to criticism, for a very small amount of wind will effectually prevent any steady effort in this direction by the liberties which it takes with the drying-paper. But some ferns—notably the Lady Fern and the young stage of the Bracken, and indeed nearly all the species when young—will soon wither up if carried in the warm hand, so that it is best to take a tin box of some kind when going on a collecting expedition. It must be a long box, or the fronds will get bent, and once thus disfigured they will not soon recover their pristine elegance. When it is possible to exercise a choice in the matter, it is best to choose a dry bright day for collecting; if the fronds are wet when gathered they will require much more drying; and it should be remembered that, other things being equal, plants dried rapidly keep their colour better than others which are allowed to remain for any long time in the press. In the same way, it is best to take them straight from the collecting-box to the press, without first putting them in water—except, of course, when this is necessary to enable them to regain their shape. Plants can be left for two or three days, or even longer, in the box without taking any harm, if the box itself be kept in a cool place away from the light. A kind of thick, rough, bibulous paper is prepared for drying purposes, and is much used, especially by amateurs, but any old paper will do as well, such as newspapers—an old music-book makes a capital press; and newspapers do not require drying so often as the drying-paper, which absorbs the moisture so rapidly that care must be taken (when plants are many and the stock of paper is but small) to prevent its becoming so saturated as to damage the specimens and encourage the growth of mould. Newspapers, too, are not only less expensive, but also less cumbrous to carry about; and though old ones are preferable, even a recent newspaper may, on an emergency, be pressed into the service with satisfactory results. A press of the size of the paper is often used, consisting of two thin boards, between which the paper is placed, the whole being bound together by a couple of leather straps, and then put under a heavy weight, care being taken that the pressure is equal and not too great. There is, perhaps, less danger of injuring ferns by over-pressure than is the case with flowering plants, on account of the firmness of their texture; but it is only by experience that we can attain the "happy mean," and adjust our weight so that it shall be sufficient to insure a thorough even pressure throughout, neither so heavy as to run any risk of destroying the character of the frond, nor so light as to allow it to lie otherwise than completely flat.

In the selection of specimens for the herbarium some care is required, as it is important that each plant, so far as possible, should be represented in all its parts and in its various stages. Of the smaller ferns, such as the Asplcniums, Moonworts, Adder's-tongue, and the like, the whole plant should be shown; by this means it will, in many cases, be easy to secure upon one and the same specimen fronds in different stages of growth, some being arranged so as to show the upper and others the under surface, the mature fructification being always represented. Of larger species, such as the Male Fern, it will not be possible to take the whole plant; here a couple of representative and fully-developed fronds, showing the upper and under sides, must suffice. It will be impossible to show even a single entire frond of such ferns as the Bracken or Flowering Fern; a pair of pinnæ with the apex, or, in the latter case, the fertile portion of the frond, will however give a fair idea of the plant. Variations in the size and form of ferns, however caused, may well be represented in the herbarium; the common Hart's-tongue, for example, is strikingly different when it puts forth small, stunted, but mature fronds from the crevices of an old stone wall, from the same fern when it sends out long bright green fronds from some shady hedge-bank, or from the mossy border of some old well. Most ferns growing on or rather in walls are reduced to their very smallest proportions under such unfavourable circumstances; indeed, it is often a marvel how they manage to exist at all in a position so unsuitable to their full development. Then we often find, as in the Hart's-tongue, curiously curled, or forked, or variously divided fronds, some of which become permanent, and are reproduced from spores; or variations in the toothing of the margins, such as are noticeable in some of the more striking forms of the common Polypody; these, too, must find a place in our collection, which will in this manner be made very instructive, and far more interesting than would be the case were we content with a solitary example of the ordinary typical state of the fern. When it is possible to secure a seedling, or very young state of a fern, it is quite worth while to do so; in the Bracken, for instance, as we shall see later on, the young state is so different in appearance from the mature plant that it has even been described as a distinct species. But undeveloped and barren specimens have led to many mistakes in identification; any one who has had experience in naming collections of ferns knows only too well the kind of specimens with which well-meaning amateurs torture their friends—the small seedlings of Male Fern which they attempt to transform into Cystopteris, or the immature Shield Fern, which "must surely be the true Holly Fern, it is so very like the pictures of that plant." He who is wise will be careful before he commits himself to naming ferns of which the characteristic fructification is not developed. "By their fruits ye shall know them" is a text which the botanist will do well to bear in mind when he is appealed to, to determine some doubtful flower or fern. The rhizome, or underground stem, of some species should be carefully dug up and represented in the herbarium—as, for example, in the case of the Marsh Fern (*Aspidium Thelypteris*), of which the long creeping rhizome is very characteristic.

The size of the specimens we select for our fern collection must, of course, be regulated by that of the paper upon which we intend to mount them. In Continental herbaria, indeed, plants are less frequently mounted than placed loose in a folded sheet of paper, but our English custom is to mount them in some way upon sheets of stiff paper. In the British Museum Herbarium the great fern collection is laid down upon paper measuring twenty-one inches by thirteen, this being an especially large size, intended to allow of a more satisfactory representation of the larger species than is possible when smaller sheets are used; but it will generally be found that sheets sixteen inches by eleven or so are amply sufficient for all

practical purposes. We may, if we please, either attach our specimen firmly to the paper by gumming it all over on the under side, as is done in the British Museum—the gum used being a mixture of tragacanth and gum arabic in equal proportions—or we may fasten it to the sheet by means of gummed strips of paper (which, by the way, will be needed in the former case for the ends of the stems); the advantage of this latter system is, of course, that the specimen so fastened can, when necessary, be transferred from one sheet to another without injury. Some have adopted the plan of sewing the fern to the paper; the appearance of specimens so arranged is very neat, but the process is rather tedious, and not unattended with danger to the specimen, so that we do not recommend it for adoption.

The sheets being thus duly prepared, the next question is—how to arrange them. First, however, the specimens must be labelled, each label supplying the name of the fern, with the locality where it was found and the date when it was collected, adding also the collector's name and any other information relative to the specimen which may be of special interest. The plan which is adopted by many botanists of writing all necessary information upon the sheet itself is a very good one; some, however, prefer a uniform series of labels, and the following form will be found simple and useful for the purpose:—

HERB. JOHN SMITH.

Pteris aquilina, **L.**

Bracken.

LOC.—Hampstead Heath, Middlesex.

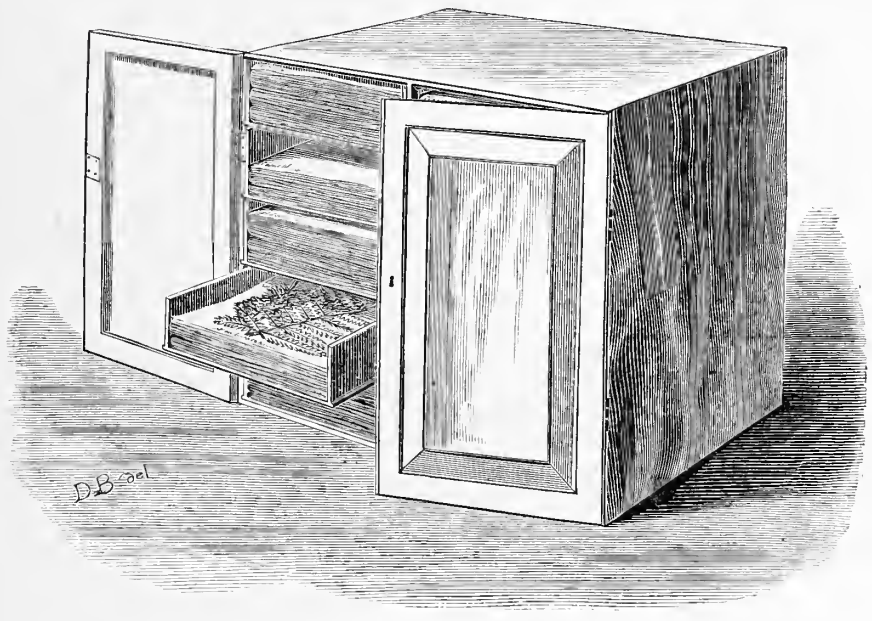
DATE.—June 12, 1876.

COLL.—John Smith.

For purposes of ready reference the sheets should be arranged in stiff covers of somewhat stouter paper than that upon which the specimens are mounted. The name of the genus may well be written in the bottom left-hand corner; in the centre may be noted a reference to the manual or list by which the ferns are arranged, while the names of the species may be written in the right-hand corner. Should the ferns be represented by more than one sheet, it may be convenient to enclose each species in a cover of thinner paper, writing the name in the right-hand corner. The herbarium must, of course, be kept in a dry place, as damp favours the growth of mould. If there is any fear of the attacks of insects, it is well to wash the specimens over with a solution of corrosive sublimate; the solution in use at the Kew Herbarium is composed of one pound of corrosive sublimate and the same quantity of carbolic acid to four gallons of methylated spirit; this is found very efficacious, but its smell is somewhat unpleasant. At the British Museum it is found that camphor kept in each cabinet, and frequently renewed, is sufficient to prevent the appearance of insects in the herbarium.

Last of all comes the question—Where and how shall we keep our ferns when they are in a condition to be consulted; when collecting, and naming, and drying, and mounting are

all happily past, and there is nothing more to be done save to have them ready to our hand in some easily accessible place? Most people will prefer to keep the specimens in a cabinet which may form no unattractive object in a room; and for this purpose nothing more suitable can be suggested than the kind in use in the Botanical Department of the British Museum, of which a figure is subjoined. Each shelf in these cabinets is a separate drawer, which, with its contents, can be taken out and replaced at will. If it is only intended to represent our British or European ferns, one such cabinet will be more than sufficient to contain all the specimens necessary. A half-cube, indeed, would suffice for the ordinary requirements of such a collection. Mahogany is a suitable and handsome material for the cabinets, but of course deal is much more economical. It is of this latter wood that the cabinets used in the



A FERN CABINET.

Kew Herbarium are made; in these the height is proportionately greater, and the shelves are not movable.

Such are the principal points to be attended to in connection with the formation of the most satisfactory of all Herbaria—a collection of dried ferns.

THE BIBLIOGRAPHY OF EUROPEAN FERNS.

The literature especially devoted to ferns is both varied and extensive. The popularity of the tribe has caused a demand for plainly-written handbooks upon the subject, and it must be admitted that the supply has proved at least adequate to this demand. It would appear that it is almost exclusively in England, or, at any rate, among English-speaking races, that ferns have attracted popular attention, and that the cultivation of the hardy species more especially has become a "hobby"—at least, so we should judge from the number of books treating of British ferns exclusively. No parallel to this is found in either France or Germany, or in any Continental country; indeed, so far as our knowledge of fern literature goes, such works are conspicuous by their absence. It would seem, however, that in the United States ferns are

becoming, or have become, popular. A handy little book, by Mr. John Williamson, on the "Ferns of Kentucky" was published in 1878, and claims to be the first popular handbook on the native ferns of America. From its preface we gather that fern-collecting has become an American institution, for Mr. Williamson says—"Who would think now of going to the country to spend a few days, or even one day, without first inquiring whether ferns are to be found in the locality?" We are not aware of any descriptive work having exactly the same limits as that upon which we are now engaged; there exists no complete descriptive catalogue of the plants of the whole of Europe. Indeed, it may be stated that we have not even a complete list of European plants, although this want is in a fair way to be supplied by the publication (commenced in 1878) of Prof. Nyman's "Conspectus Floræ Europææ," which will contain a full enumeration, with synonymy and geographical distribution, of all the species occurring in Europe. With regard to ferns, however, the nearest approach to a volume confined to the European species is offered by Dr. Milde's "Filices Europæ et Atlantidis, Asiæ Minoris et Sibiriæ," published in 1867. This is in every respect an admirable book; but—as will be seen from its title—it is more comprehensive than the present work, and that not only in the geographical range of which it takes cognisance, but also the plants which it includes; for, besides the true ferns, it takes in the Horsetails (*Equiseta*) and Club-mosses (*Lycopodiaceæ*). It is written entirely in Latin, and is purely technical in its phraseology and details, so that it would not be of practical value except to the scientific botanist; but it is a most accurate and trustworthy work, the author having apparently had access to specimens gathered by the principal European collectors, as well as an extensive experience of the ferns themselves in a growing state. The synonymy is worked out with great care and completeness; figures of each species are cited, while the geographical distribution has received special attention. A large number of forms and varieties are described for the first time in Dr. Milde's pages, and the work is one which is absolutely essential to any one desiring to make a thorough acquaintance with the ferns of Europe. The following practical hint as to the examination of dried fronds we translate freely for the benefit of our readers:—"I have used the following mode of examining dried ferns, which I would recommend to all who are beginning the study: I have placed a fragment of a pinna well furnished with sori in warm water until it became soft, and in a manner revived. The indusia as well as their covering, and also that of the blade can then be very readily perceived, as also the nervation."

It would obviously be impossible, even if it were desirable, to attempt to give in a work such as the present anything like an epitome of what has been written upon ferns in general; but it may be worth while to glance briefly at a few of the more important of those which have been published in this country, and are thus readily accessible to English readers, as well as at the best of the books which have been written upon British ferns in particular; and to give a few details regarding some of the authors upon the subject, especially as so large a proportion of the ferns of Europe is found in these islands.

The first book specially devoted to British ferns was James Bolton's handsomely printed "Filices Britannicæ: an History of the British Proper Ferns," which appeared in two parts—the first, printed at Leeds, in 1785; the second, at Huddersfield, in 1790. These form a quarto volume, containing eighty-one pages of letterpress, and forty-six coloured plates, which are fairly accurate, although rather feeble and scarcely giving an adequate notion of the plants represented. One of the most interesting features of the book is the account which it gives of the discovery of the Killarney Fern (*Trichomanes radicans*) at Bellbank, near Bingley, where Bolton

"saw it in plenty in the year 1758," and again, though sparingly, in 1782. His figure of "this phenomenon of a plant," as he calls it, is taken from one of these specimens collected in this locality, of which we shall have more to say in a description of the Killarney Fern.

Coming to a more recent period, we may select for notice some of the works of Sir William Jackson Hooker. This illustrious botanist was not only one of the most voluminous writers on ferns in general, but he also published, in 1861, a very handsome work, entitled "The British Ferns," devoted especially to the British species, with coloured plates by Fitch. As would have been expected from the attention which Sir William Hooker was known to have bestowed upon the Fern tribe, this is a thoroughly satisfactory work; it is, however, less complete than many others in its mode of treatment—the variations of the different species being almost unnoticed. A beautiful quarto volume on exotic ferns, entitled "Filices Exoticæ," had been issued by the same author and artist in 1859. Sir William Hooker's name will be handed down to posterity as that of the founder of the Herbarium at Kew, while it was under his management that the Royal Gardens there attained their present position. He was a man of great energy and industry, as the catalogue of his published works amply demonstrates—especially when it is remembered that his duties in connection with the gardens must have left him but little time for private work. "Rising early and going to bed late, and rarely going into society," says one who knew him, "the whole of his mornings and evenings were devoted to botany." We will not attempt a complete enumeration of Sir William's works on Ferns, but three seem to demand a word of notice. The first of these, the "Genera Filicum," was published in 1842; it is illustrated by Francis Bauer and Walter Fitch, and is a magnificent work, although the plates hardly show the wonderful delicacy of handling manifest in the former artist's original drawings, which, with many other treasures of botanical art from the same pencil, are now preserved in the Department of Botany in the British Museum. It contains a hundred and twenty plates showing portions of the fronds (both of the natural size and magnified) of a hundred and thirty-five genera, illustrating the technical characters upon which each is based. The second work to which we wish to refer is the "Species Filicum." This must always take rank as Sir William Hooker's *magnum opus;* it occupied him for nearly twenty years of his life, the first volume having appeared in 1846, and the fifth and concluding volume in 1864. It is a magnificent work, containing full and elaborate descriptions of all the ferns then known, with the exception of the Royal Ferns (*Osmundaceæ*) and the Adder's-tongues and Moonworts (*Ophioglossaceæ*); giving details as to their geographical range and distribution, and a copious synonomy. Two thousand four hundred species are thus described, more than five hundred of these being figured in the plates which accompany the volumes. At the conclusion of this work Sir William Hooker projected and commenced the publication of the "Synopsis Filicum," containing brief diagnoses of all the species known at the period of publication. Only the first part of this handbook had appeared when Sir William's active career was terminated by his death, which took place in August, 1865, he having just completed his eightieth year. A memorial tablet, enclosing a cast in Wedgwood ware of a medallion of Sir William Hooker, was erected in Kew Church near the grave of the famous botanist; and the panels which surround the medallion are appropriately decorated with ferns, the fronds having been modelled with much grace and delicacy.

The work of the "Synopsis" was promptly taken in hand by Mr. John Gilbert Baker, of the Royal Herbarium, Kew, and carried out in a manner well worthy of its projector. Completed in 1868, it contained descriptions of two thousand two hundred and thirty-five species. In an Appendix to this work, published in 1874, about four hundred more

were added, and the number has since been very materially increased by the exertions of recent collectors. Of course the view of species taken in the "Synopsis" is a very broad one, many forms which are regarded as distinct by other writers upon ferns being considered as varieties or synonyms of other species by Hooker and Baker—not always without a protest from those whose knowledge of the plants is derived rather from growing examples than herbarium specimens. Thus the veteran pteriologist, Mr. John Smith, speaking of Mr. Baker's important memoir on the ferns of Brazil, published as part of the "Flora Brasiliensis" in 1870, says: "On taking into consideration the extensive territory of Brazil, with its various climates favourable to the growth of ferns, from those growing at elevations that may be termed sub-arctic to others luxuriating in the lower hot valleys and rocky or forest ravines, the number of three hundred and eighty species [Mr. Baker enumerates three hundred and eighty-seven as Brazilian] may be considered small; but here again comes the question, What is a species? and judging from Mr. Baker's view, it would appear that many plants, originally described as species, which successive authors have acknowledged to be distinct, are, nevertheless, in many cases regarded as synonyms; thus ferns long accepted by previous pteriologists cease to be so. When I say long accepted, I go upon the evidence of Link, Kunze, Schott, Mettenius, and myself, who have had for many years under their observation living examples of species all well recognised as being different from one another in some important characters seen only in the living state; but Mr. Baker, with herbarium specimens, makes no scruple of lumping many of such under one specific name. For instance, under *Polypodium lycopodioides* there are no less than twenty-two synonyms, and under *P. brasiliensis* eighteen."* If we want an illustration of the widely differing views as to the limits of species, we may find it in the genera *Hymenophyllum* and *Trichomanes*. Dr. Van den Bosch, treating of the *Hymenophylleæ* of Java† alone, makes no less than twenty-four genera out of the two just named, under which he describes four hundred and fifty species; while, on the other hand, Hooker and Baker, in the "Synopsis Filicum" (1868), admit only a hundred and forty-nine species of these two genera as existing in the whole world. It must be allowed that botanists who take their descriptions from dried and often fragmentary specimens of plants have a natural tendency to the multiplication of species; this often, however, produces a reaction which leads to an opposite extreme, an over-caution against too low an estimate of what is required to constitute a species. There can be little doubt but that errors on both sides are frequent enough, especially among certain groups of flowering plants. The roses and brambles, for instance, afford a good illustration of what is termed in scientific slang "splitting," our common dog-rose (*Rosa canina*) being divided by "critical" botanists into very numerous species, while those into which our common blackberry (*Rubus fruticosus*) has been "split up" may be reckoned by hundreds. As in most other matters, a middle course is probably safest—and it is the one which we have adopted in the present work; we have not, for example, been able to follow Hooker and Baker in uniting the two Filmy Ferns (*Hymenophyllum tunbridgense* and *H. Wilsoni*) under one species, nor have we placed together the Oak Polypody (*Polypodium Dryopteris*) and the Limestone Polypody (*P. Robertianum*). Although most writers on ferns would consider that Mr. Smith had too great a tendency to multiply genera, there is much force in his remark as to the differences between certain species being readily recognisable in living examples, although less apparent in herbarium specimens. Every practical field botanist is aware that there are certain points connected with the habit, mode of growth, and general appearance of some species of flowering plants which are at once observable in the field, although they

* "Historia Filicum," pp. 59, 60. † "Hymenophyllaceæ Javanicæ."

are not noticeable when the specimens are dried and placed in the herbarium. But even if we take the lowest estimate of the species of ferns, it must be admitted that our knowledge of them has made gigantic strides since the time of Linnæus; only about one hundred and ninety species being known to that author, as contrasted with the two thousand six hundred and fifty described in the last edition of the "Synopsis Filicum," to which a considerable number may already be added.

It would not be fair to conclude this notice of Sir William Hooker without referring rather more in detail to one whose name we have more than once had occasion to mention, and who was associated with him for very many years, and to whose energy and perseverance the living collections of ferns at Kew are largely indebted. We allude to Mr. John Smith, whose connection with Kew Gardens lasted nearly half a century, and whose devotion to pteriology equalled, if it did not exceed, that of his chief. Mr. Smith went to Kew in 1822, at which time he found not more than forty species of ferns in cultivation there; and when he left the Royal Gardens, in 1864, the collection boasted nearly a thousand species, from all parts of the world. In one of the works on ferns* which Mr. Smith has published since his retirement, he has given some interesting details as to the advance of fern cultivation in this country. With regard to the introduction of living ferns, only eighty-three were known to be in cultivation in England up to 1813, upwards of one-half of these being West Indian species. *Adiantum pedatum* was one of the earliest introduced, having been brought from Virginia, by John Tradescant the younger, about 1628. Francis Masson, one of the earliest collectors sent out from Kew, despatched home several species from the Cape and Madeira in 1775-9. The first introductions from Australia were made by Mr. George Caley, in 1808, among these being the now well-known Stag's-horn Fern (*Platycerium alcicorne*), *Doodia aspera*, and *Davallia pyxidata*. The first colonial garden from which ferns were received at Kew was that of Ceylon, from which place Mr. Alexander Moon, when director, sent home a collection, among which was *Niphobolus costatus*. Jamaica has supplied more ferns to Kew than any other part of the western hemisphere, a fact largely due to the activity of Mr. Nathaniel Wilson, who was director of the botanic garden there. The West Indian islands have, indeed, contributed a very large proportion of the tropical ferns now in cultivation, comparatively few having been received from the American continent. The ferns of the Cape region are those least fully represented at Kew, although South Africa is extremely rich in plants of this order. Sir William Hooker makes ample acknowledgment of the assistance which Mr. Smith rendered in bringing the collection of living ferns at Kew to the high state of perfection which it has attained. In the preface to his "Synopsis Filicum" he says: "The formation of this fine collection is mainly due to the exertions and ability of Mr. John Smith, who for forty-three years held an important position among the officers of the Royal Gardens. His knowledge of ferns, and his writings upon them, justly entitle him to rank among the most distinguished pteriologists of the present day." Mr. Smith has written copiously upon ferns, the most useful of his books being the one already referred to, "Ferns, British and Foreign," which has passed into a second edition. This contains chapters upon the organography and classification of ferns, with an enumeration of the genera under which the species are grouped. The genera only are described, the species being arranged in groups marked by one or more distinctive features, with details of geographical distribution, and numerous references to figures and descriptions. There are a large number of figures illustrating the genera, and the

* "Ferns, British and Foreign; their History, Organography, Classification, and Enumeration."

book is well suited to those who wish to gain some idea of the characters which distinguish the principal groups of ferns without going very deeply into the subject. His later work, "Historia Filicum," although more detailed, and exhibiting a vast amount of labour, is not likely to be so generally useful as the one already noticed: but the introductory chapters contain much instructive matter which will well repay perusal, embracing, as they do, sketches of the methods of classification adopted by the leading pteriologists, as well as much of personal reminiscence. Mr. Smith's own arrangement he considers to be the most natural yet put forward; and he bases his opinion on the not unreasonable ground that it is founded upon results of the daily study of living ferns, and is therefore more likely to be correct than those which are based mainly upon the examination of the specimens preserved in herbaria. He very truly remarks that it is impossible to ascertain the habit of ferns from herbarium specimens, as only small examples can be preserved. "The great botanists of the present day," he says, "content themselves with describing plants from dried specimens, many of which are often small and imperfect, and fail to convey the true nature of the plant in its living state."* Mr. Smith adds point to his remarks by stating that Sir William Hooker "made less use than might have been expected" of the fine collection, then amounting to about one-half of the known species of ferns, which was then in cultivation in the Royal Gardens at Kew. It can hardly be necessary to point out the importance of describing plants from living specimens whenever this can be done; but from the very nature of things this cannot always, or nearly always, be the case. For example, Mr. Bentham, the veteran English botanist, and Sir Joseph Hooker have been engaged for many years upon their great work, the "Genera Plantarum," which is now completed so far as the dicotyledonous plants are concerned, and of which the monocotyledonous are in a forward state of preparation. Of the many thousands of genera therein described comparatively few could ever have been seen by the authors in a living state, even had they desired so to study them. In the herbarium, dried specimens of plants from the ends of the world can be brought together and placed side by side, their affinities and relationships traced, and their differences ascertained; and since such points as colour are of little or no scientific importance, comparatively speaking, the botanist can draw up his descriptions and identify his plants with perhaps less trouble and greater convenience than any other naturalist. If we take up one of the numerous colonial floras which have been issued or are in course of publication in connection with the Kew herbarium, at the expense of the government, we shall find that the descriptions are for by far the greater part based upon dried specimens—often very imperfect ones—which have been collected by travellers or explorers or missionaries, and have found a resting-place in one or other of the great centres of botanical work and research which are scattered throughout the countries of the world, two of the most important of which—the National Herbarium at the British Museum, now transferred to the new building at South Kensington, and the Herbarium of the Royal Gardens, Kew—belong to our own country. In those comparatively rare cases in which a traveller or explorer is also a botanist, it will be found that his collections are enriched by copious notes, taken probably at or just after the time when the specimens were collected; and such notes as these render the work of description comparatively easy, supplementing the specimens, as they do, with details respecting the life-history of the plant which cannot be ascertained from dried and often fragmentary examples. A good illustration of what can be done in this way is offered by the splendid collections of the late Dr. Frederick Welwitsch, of which an extensive and fully representative set is in the

* "Historia Filicum," p. 72.

possession of the British Museum as the result of a lawsuit which some may remember to have taken place a few years back. Dr. Welwitsch's notes, copies of which are attached to the British Museum specimens—the originals being in the possession of the Portuguese Government—show how much can be done by a botanical collector in the way of making work easy for those who elaborate the material which he has obtained.

One of the most popular and useful works upon British ferns exclusively is the late Edward Newman's "History of British Ferns," of which the first edition appeared in 1844, while the fifth, or people's edition—a most handy little volume—was published only two or three years since, not long before the death of its lamented author. No one probably has done more for the study or the cultivation of ferns than Edward Newman; he not only induced people to go and collect the plants in a living state, but he did much to promulgate the use of the "Wardian case," which he was among the first to adopt. Of this method of cultivation, which has so greatly facilitated the growth of ferns, especially of certain genera—such as *Trichomanes* and *Hymenophyllum*—which are not easily grown, we have spoken more at length at page xxi. The preface to the first edition tells us that "it was while wandering among the Welsh mountains, in the autumn of 1837," that Mr. Newman "first felt any desire to know the names of ferns;" and the difficulty which he experienced in working out and naming the specimens he collected by the aid of Withering and Smith so surprised him, that he set to work upon a volume which should render the task lighter to others than he had found it for himself. It would be impossible to over-estimate the impulse given to the study and cultivation of ferns by Mr. Newman's book, its descriptions and figures being possessed of a clearness and accuracy which have materially lessened the labours of his successors. The introduction to the "People's Edition" is very interesting reading: and the work done by Newman in the matter was really so very great that we may excuse him if he seems a little over-conscious of the result of his labours. He says: "It is a great satisfaction to me to believe that the study, originated by myself, has been a source of profit to others . . . By introducing this new study, I have afforded pleasure to thousands and pain to none; wherever I go there are ferneries in the open garden, in the greenhouse or the dwelling-house, and 'Newman's Ferns,' albeit sometimes under other names, has become a household book." Mr. Newman died on the 12th of June, 1876, lamented by a large number of sympathetic friends. He may fairly claim to have originated the popular literature specially devoted to ferns, and his own contribution to it is, as we have already said, by no means one of the least important.

The most comprehensive work upon British ferns—the usefulness of which is only limited by its expense, which is considerable—is the octavo edition of "The Nature-printed British Ferns," by Mr. Thomas Moore, curator of the Chelsea Botanic Garden. The plates are the same as those employed in the magnificent folio which preceded this work; and the letterpress may be said to exhaust the subject. Beginning with a comprehensive introduction, the genera and species are described with a detail and fulness which are to be found in no other work upon the subject. The geographical distribution of each, both British and extra-British, is carefully worked out; all the countries producing each fern being enumerated, with, in many instances, definite localities; so that up to the date of the volumes (1859) it may be said to be in every respect complete. The synonymy given is very copious, and contains references to all the authors by whom the ferns have been described. A special feature of the book is to be found in the prominence which it gives to the varieties which each fern presents; these are often very numerous. Of the Hart's Tongue (*Scolopendrium vulgare*) alone, as many as a hundred and fifty-five are enumerated and described. Many of these are represented in the plates (a hundred

and fourteen in number) which accompany the work. These plates are executed by the process known as nature-printing—an invention which was first brought into use in 1853 by Alois Auer, an Austrian state printer, although it is claimed by Denmark to have been invented more than twenty years previously by Peter Kyle, a goldsmith of Copenhagen. The process is simple enough: the object from which the impression is desired to be taken being placed between two smooth-polished plates, one of copper, the other of lead, these are then drawn through a pair of rollers, under great pressure, and, on being separated, it is found that a perfect impression of the object has been made on the leaden plate. When only a few impressions are required, this may be used as an engraved plate; but, on account of its softness, it is usual to obtain a facsimile of it in copper by electrotype, which is used as the printing plate. In England the art was taken up by Mr. Henry Bradbury, who produced by it not only the illustrations to the work now under notice, but also "The Nature-printed Seaweeds"—a very beautiful book. It is obvious that no figures can be more strictly accurate than those thus obtained from the objects themselves; but it of course results that the representation is that of an individual, and thus does not convey that idea of a species as a whole which is given by the drawing of a botanical artist. There is a rigidity, too, about the ferns to which we are more especially referring in these remarks which is scarcely in harmony with subjects which owe so much to the grace and elegance of their general outline. We have to acknowledge much help and many useful suggestions which we have derived from the pages of "The Nature-printed Ferns," especially with reference to some of the more interesting and distinct variations of certain species.

But this is far from being Mr. Moore's only contribution to the literature of British ferns; indeed, he has written many separate works upon them, all being thoroughly good and trustworthy. The only one to which we will refer, however, on the present occasion, is the exceedingly compendious and handy little volume entitled "British Ferns and their Allies," which is an abridgment of another work by the same author—"The Popular History of British Ferns." It is intended as an introduction to the study, and contains full descriptions of all the species, with a figure of each, and references to the more important varieties. The exceedingly low price at which it is issued brings it within the reach of all; other fern-books have been issued at the same charge (one shilling), but they are not to be compared with this for extent of information or practical utility. Mr. Moore's most important contribution to the general literature of ferns unfortunately remains incomplete; this is the "Index Filicum," of which the first part appeared in 1857. It contains a synopsis of the characters and arrangement of the tribes and genera, each genus being illustrated by a woodcut showing its characteristic features, and a list of the species known; the synonymy is very copiously given, as is also the geographical distribution. Although, as has been said, imperfect, it is, so far as it goes, a most useful work, and it is much to be regretted that its publication has been suspended. Speaking of the geographical distribution of ferns reminds us of Lyell's admirable little volume, "The Geographical Handbook of all known Ferns," published in 1870, to which we have already referred at page xv. In this is brought together all the most recent information up to the date of publication regarding the geographical distribution and detailed localities of ferns, the localities being grouped primarily under the great divisions of the globe, and secondarily under divisions of somewhat less extent, as we have already shown at the page above cited. For British county distribution of ferns Mr. H. C. Watson's works, especially his invaluable "Compendium of the Cybele Britannica," should be consulted; more detailed localities will be found in Mr. Moore's "Nature-printed Ferns" above mentioned.

Miss Anne Pratt's book, "The Ferns of Great Britain," deserves a reference, although it is hardly as useful or thorough as the one just noticed. It contains good coloured figures of the species, with full and pleasantly-written descriptions, in which is brought together a good deal of information regarding ferns in general.

GEOLOGICAL DISTRIBUTION OF FERNS.

The story of plant life on the globe, as far as materials have been discovered which can be referred to their place in the vegetable kingdom, begins with this group of plants. The presence of immense quantities of carbon in the oldest stratified rocks testify to the existence of plants long anterior to the period when the strata were deposited in which definite remains have been found. And, indeed, the active life of innumerable plants had been necessary from the time that animals appeared, in order to supply their necessary food, and to consume the poisonous carbonic acid gas which they continually give off. But no recognisable remains have been preserved to testify to the kind of plants that played this important part in the primeval economy of our planet. Doubtful impressions have been detected in Silurian rocks, and these, with the exception of some remarkable Algæ, belong to the ferns, or their allies the club-mosses.

It is in the Devonian rocks that the first fairly recognisable plant remains occur. And here the predominant forms are ferns. Associated with them are found some horse-tails, and several species of club-mosses.

Some of the ferns have been preserved so completely that it is not difficult to determine with certainty their true place in the Order. The description of one species may be given at some length, as it is a typical Palæozoic fern, and a characteristic fossil of the Devonian period. The plant referred to is found in considerable abundance in the yellow shales of Kiltorcan, in the south of Ireland, and less frequently in beds of the same age in the south of Scotland. Edward Forbes, who first described it, gave it the name of *Cyclopteris hibernica.* It has been since separated, as the type of a new genus, and is called *Palæopteris hibernica* of Schimper. All the parts of the plant have been found. The frond is ovate-lanceolate in outline, somewhat truncate at the base. The stipes was of considerable length, and clothed with a dense mass of thin scales at its somewhat enlarged base. The well-defined termination of the stipes indicates that it was articulated to the stem, and the root-like fossil found in the shales is, there can be little doubt, the creeping stem or rhizome. The frond is bipinnate, and the pinnæ are linear, obtuse, and almost sessile. The pinnules are numerous, overlapping, and of an obovate or oblong-obovate form, somewhat cuneate at the base, which is decurrent on the rachis. The veins are numerous, uniform, and repeatedly dichotomous from the base: they run out to the margin forming a delicate venation. Single large pinnules of the same form occur on either side of the main rachis in the spaces between the pinnæ. The fructification is borne on the altered pinnæ of the lower part of the frond. The fertile pinnules are reduced to a central midrib, with short hair-like veins, which are the pedicels of the cup-shaped indusia. These are ovate, oblong cups, divided about a third down from the apex into two lips. The pedicel or vein passes into the cup as a free central receptacle, but does not extend beyond the lips of the cup. Occasionally the receptacle is found to be broad or thick, as if it were covered with sporangia, but the preservation of the fossils is not sufficiently perfect to exhibit the forms of the individual sporangia. There is nothing in these characters which would justify this fern being separated from the genus *Hymenophyllum.* The fronds attained no doubt to a much greater

size and were of a firmer texture than the filmy ferns with which we are familiar; but there is a New Zealand fern (*Loxsoma*) which has large, much-divided, coriaceous fronds, not unlike the Devonian plant, and yet is a true hymenophyllaceous fern. The uniform flabellate veins of the fossil occur in some filmy ferns, especially among those with simple fronds; and the reduction of the pinnule to pedicellate veins in the fertile part of the frond is precisely what is met with in the fertile frond of the genus *Feea*, from Central America, which is reduced to a slender rachis, with a series of short pedicels on either side, each supporting a trichomanoid cup. Several fossils belonging to the same genus have been observed in rocks of Devonian age in North America, and a few species pass up into our Coal measures. Associated with *Palæopteris* in the Devonian rocks are the remains of another hymenophyllaceous fern, with venation and cutting of the frond more closely resembling the majority of the existing species of this group.

The rocks of the Carboniferous period contain the most abundant materials for determining the nature of the plants which, in these remote ages, lived on the surface of the earth. Beds of coal are found in all parts of the world. These are the remains of forests which grew on the localities where the coal is found. The plants had for their soil the clay on which the beds of coal now rest, and their dead remains were covered by the clay sediment brought down by rivers into great lakes which, through changes in the level of the land, had submerged the low level tracts on which the forests grew. The under- and over-clays have, so to speak, hermetically sealed the enclosed plant remains. Whatever metamorphic changes were taking place within the beds, nothing could escape through the investing clays. The hydro-carbons fixed by the living plants of the Coal period—the "bottled sunshine"—have been preserved intact, but the individuality of the plants has been lost in the compact substance into which they are now converted. Happily, however, there occur in some beds of coal rounded masses of crystallised carbonate of lime, which, though only a trouble to the miner, are of the greatest service to the botanist. The lime has crystallised in these incombustible masses before the plants forming the coal had lost their form and structure. When cut by the lapidary into slices, to permit of microscopic examination, these nodules supply materials for forming an accurate estimate of the plants which formed the coal. In the under-clay the roots are still to be found, while leaves, branches, and fruits, floated down on the running water into the still lakes, are spread out on the old surfaces of the over-clay, and are there so preserved as to show the form and external markings with remarkable minuteness of detail. The examination of these various materials have made it certain that coal is entirely composed of the altered remains of ferns, and their near allies the club-mosses and horse-tails. It is true that Gymnosperms, not far removed from our yew, were then important elements in the flora of the world; their remains, however, do not occur in the coal itself, but are found under conditions which show that they have been carried from higher grounds. The club-mosses of the Palæozoic period were represented by arborescent Sigillarias and Lepidodendrons, and the horse-tails by tree-like Calamites. Though differing greatly in size they agreed with living Lycopods and Equisetums in all essential characters.

The ferns of the Carboniferous period are represented by some three hundred forms, so distinct that they have been described as separate species, and received technical names. Having only fragments of fronds to deal with, it is certain that the diversity of form, and the modifications in the venation in accommodation to their diverse forms, have led to the establishment of more species in our books than existed in connection with the known materials in nature. Yet, after the most liberal deductions have been made, there remains a great variety. They have been classified from the character of their venation, as the fructification has been observed in only a few cases. It is not possible, on account of the imperfect materials for classification, to give them

definite places in the Order, seeing that the groups of living ferns depend upon the fructification, the venation being of very subordinate importance. Four leading types of venation have been recognised in the carboniferous ferns, and these constitute the four genera, or groups of genera, into which they are placed. These are—I. *Neuropteris*, containing the ferns in which there are numerous equal slender veins, dichotomously branching; II. *Sphenopteris*, having a midrib at the base of the pinnule, which either disappears altogether in the upper part, or is divided into uniform slender veins; III. *Pecopteris*, including the ferns which have a distinct midrib passing through the pinnule to its apex, and giving off on either side the secondary veins; and IV. *Dictyopteris*, containing eight or ten specific forms in which the veins are reticulated. These main divisions are again subdivided, but the smaller groups, based on the outline of the frond or the size and number of its divisions, cannot be recognised of generic value.

The affinities of some of the carboniferous ferns with living plants have been more accurately determined in a few cases where some trace of the fructification has been preserved. The fronds of *Pecopteris arborescens* (Brongn.) frequently exhibit the impressions of the masses of sporangia. These are borne on the secondary veins in a single row on each side of the midrib. They form small rounded masses like the sori of *Alsophila*, but as the individual sporangia are not distinguishable, they may have been covered with an indusium like that of *Cyathea*. In other ferns an arrangement of the sporangia like what we have in *Gleichenia* has been observed; in others again, ovoid sporangia crowned with a complete cap-shaped ring have been found, almost identical with the sporangia of *Anemia*, and arranged on the supporting pinnule in the same manner. And lastly, the cup-shaped involucres of the Filmy Fern, like those already described in *Palæopteris*, have been noticed. An interesting confirmation of the presence of ferns belonging to the *Hymenophylleæ* is obtained from the discovery of shed sporangia belonging to this group in the microscopic preparations made from nodules obtained from the coal at Oldham. These minute bodies are so well preserved that they exhibit the structure of the sporangium and its contents in as perfect condition as they are found in a recent plant. The elastic ring is oblique, and the pedicel is short and thick, as in the sporangia of the living species.

The ferns are one of the least varying types of vegetable life. In the earliest ferns, where materials exist that enable an estimate to be made of their affinities, one is able to determine their places with such certainty and precision that they might be included in some existing genera. There existed, however, in the Carboniferous period, and survived through the newer Permian, a type of fern-stem which is now extinct. In the existing tree-ferns, as in some of the tree-ferns of the Coal period, the stem consists of a continuous vascular cylinder surrounding a pith or cellular axis, and pierced regularly with openings which connect the cellular tissue of the axis with that of the leaf, and give off from their everted margins the vascular bundles that go to the leaf. In the extinct type the vascular bundles which go to the leaves were formed free and complete in the cellular axis, and passed out entire, without touching the permanent tissues of the stem, through continuous longitudinal slits. These stems were generally surrounded with fleshy aërial roots, which have been well preserved in some specimens found in our English coal-fields, but more beautifully in silicified specimens from the Coal measures of Saxony and Bohemia. The stems of living tree-ferns, and those of the same type found in carboniferous rocks (*Caulopteris*), are analogous in the arrangement of their parts to what is found in the first year's growth of a dicotyledon. In both there is a parenchymatous medulla, surrounded by a continuous vascular cylinder, which is perforated in a regular manner by meshes, for the passage out of the vascular elements to the appendages. The stems of the extinct group *Stemmatopteris* have a structure analogous to

that which is found in the stems of Monocotyledons; for in both we have the vascular bundles which go to the appendages existing in the parenchymatous axis, and passing out independently of any closed cylinder. The permanent vascular plates of the circumference of the stem in the extinct forms are without any analogue in the monocotyledonous stems.

The proportion of ferns to the other groups of plants is very different in the Secondary rocks to what we have found in those of Palæozoic age. The relative paucity of other plants in the older rocks may be due to the want of favourable conditions for their preservation. No phanerogamous plants have yet been discovered in the Coal measures in the localities where they grew. They are known either by stems or fruits which have been transported by running water. No foliage has yet been detected. In the Triassic rocks we find foliage as well as wood and fruits, and these evidences of Gymnosperms together with the remains of Monocotyledons increase, while the number of ferns decrease. About forty species have been described from the Trias, several of which were arborescent. Their arborescent allies of the Coal period belonging to Lycopods and Equisetums have given place to forms more nearly approaching those of the present day.

In the Oolite the ferns increase in number, being represented by about one hundred and fifty species. Among these are found forms whose affinities with existing species cannot be determined, like the petiolate, flabelliform, and divided fronds from the Yorkshire Oolites, placed in the genus *Baiera;* or the coriaceous cycad-like fronds of *Nilssonia* from the same beds, the position of which among ferns has been established by the discovery of fruiting specimens showing small round sori scattered over the back of the frond; or, still more, the Liassic group of plants placed in the genus *Thinnfeldia*, which Ettingshausen referred to *Coniferæ* because of their resemblance to the Australian genus *Phyllocladus*, while Schenk considered them to be Cycadean and allied to the abnormal genus *Stangeria*, from Natal.

The Cretaceous beds do not supply much evidence of the land flora of the period when they were being deposited. A dozen species of ferns have been described from Greenland in beds which are of Lower Cretaceous age, and about fifty species from the richly fossiliferous beds near Aix-la-Chapelle, that are considered to be on the horizon of the Upper Greensand. The ferns at least suggest a newer formation, being very closely related to, if they are not in many cases identical with, species found in the Eocene beds of the south of England.

The ferns found in Tertiary strata agree very closely with existing generic types; and though it may not be always possible to refer them with certainty to a particular genus, from the absence of the fructification, no characteristics have been observed which would justify their separation into distinct genera, at least on the grounds on which genera are established among recent ferns. The Tertiary strata of the south of England have yielded a considerable number of species. They have their affinities with ferns of subtropical regions, and testify like the other plants and animals of these rocks to a much warmer temperature than we now enjoy. The only form found in Tertiary rocks that is related to a species now living in Britain is the stem of a Royal fern found on the beach at Herne Bay, and derived no doubt from the Eocene beds there. The stem was beautifully preserved, exhibiting the most minute details of its structure, which agrees with the stem of *Osmunda regalis*, though the plant was most probably considerably larger.

STRUTHIOPTERIS GERMANICA (*Willd.*)

(½ NATURAL SIZE.)

2. UPPER SURFACE OF FERTILE PINNA. 3. UNDER SURFACE OF FERTILE PINNA. 4. UNDER SURFACE OF STERILE PINNA

(NATURAL SIZE.)

EUROPEAN FERNS.

ONOCLEA.

THIS is a small though handsome genus, containing only three species, natives of cold or temperate regions. *O. sensibilis*, the type of the genus, is a common North American fern, which is found also in Northern Asia, Mandschuria, and Japan; it is frequently met with in cultivation, having been known in this country as long ago as 1699, when it was grown by Bobart in the Oxford Botanic Garden. It has been erroneously recorded as a British plant, being said to grow in North Yorkshire and near Warrington, Cheshire (see "Phytologist," i. 492). The note announcing its discovery stated that in the latter locality it grew plentifully and very luxuriantly in an old stone quarry, having been first found there about 1839. There is a Warrington specimen in the British Herbarium of the Botanical Department of the British Museum, communicated by the late Mr. Borrer, but it is there described—no doubt with greater accuracy—as "naturalised in boggy ground, near the site of a former garden." This attempt to raise the number of our indigenous species has been paralleled, as our readers will remember, by the pseudo-discovery of the Elk's-horn Fern (*Platycerium alcicorne*) upon Cader Idris. *O. sensibilis*, the "Sensitive Fern" of American authors, is a handsome plant, the leafy, pinnate, barren fronds being much taller than the fertile ones, the latter being twice pinnate. The barren fronds vary from four inches to three feet in height, and are so thin and delicate in texture that it is said that they will wither even while growing if drawn once or twice through the hand; hence the specific name *sensibilis*. With this plant are now associated two other species, better known under the name of *Struthiopteris*, and differing chiefly from it in the simply pinnate fertile fronds, and in having the veins of the barren fronds all free. One of these, *O. orientalis*, is a native of Sikkim, Assam, and Japan; the second, *O. germanica*, we shall now proceed to consider somewhat at length.

ONOCLEA STRUTHIOPTERIS, *Hoffm.*

This is the largest and handsomest of the ferns of Europe, and, indeed, has some pretensions to be considered a tree-fern. This results from the caudex forming an upright thick trunk, which, however, never attains to any height, reaching at most to three-quarters of a foot: still,

in nature and construction it is precisely like the large stems of the tree-ferns of tropical and sub-tropical countries. From beneath the surface of the ground the caudex gives off stolons, which run for seven or eight feet, and propagate the plant.

The fronds are of two kinds—barren and fertile, the latter bearing the sori. The barren fronds are very numerous, and form a magnificent vase-shaped crown of foliage of very regular arrangement. They are of large size, sometimes attaining a length of as much as five feet, though usually about three feet, and are elegantly curved outwards. The petiole is short, and is dilated at the base, where it joins the stem, and there covered with nearly black scales, which are not torn or lacerated; on section, the petiole presents two oblong curved vascular bundles.

The general form of the frond is broadly oblong, gradually diminishing in width at the base, and abruptly narrowed at the apex; it is divided into very numerous pinnæ. These are all sessile; the lower ones are small and distant, usually turned downwards, and at the very base of the petiole become brown and scale-like; the main pinnæ are four or five inches long, narrow, slightly curved towards the apex of the frond, and tapering to the point; they are very numerous, and vary considerably in proximity to one another, being usually just in contact but not unfrequently so closely placed that they overlap. Each pinna is simply cut into numerous, simple, oblong, blunt segments, which are not again divided or toothed. The general appearance of the whole frond is not unlike that of the common Male Fern, but it is a paler and brighter green. The venation of the segments of the pinna is remarkable in being quite simple, not forked or reticulated.

The fertile or sporiferous fronds are few in number, usually from three to six; they appear in the centre of the tuft in the autumn, and are not mature till September and October. Their height is not more than eighteen inches or two feet, and they are erect and straight, with a stout, stiff rachis, broader and flatter than in the barren fronds, deeply channelled in the lower portion. The pinnæ are very numerous, and crowded closely together; in fact, the whole frond is a much contracted form of the barren ones. The large pinnæ are about one-and-a-half to two inches long, but the upper and lower ones much shorter; all are sessile and directed upwards, and are dark brown in colour. In outline they are narrow linear, obtuse at the apex, and with a rather knotted appearance, each knot corresponding with a segment; in substance they are nearly cylindrical, the margin being rolled in underneath and covering over the sori. The venation is simple, the central vein of each segment giving off several undivided veinlets on each side, and upon the middle of every one of these is borne a sorus. The sori are round and confluent into a mass, the receptacles very thick and cylindrical. It was long considered that no indusium was present; but this integument is now known to occur as an exceedingly delicate membrane over each sorus, separating it from its neighbour. The spores are oval and yellow. Occasionally fronds are met with intermediate between the barren and fertile condition, bearing a few sori as contracted though still herbaceous pinnæ.

There is little variation in this fine fern, and no forms are sufficiently distinct to have received separate names. The plant itself has, however, been very unfortunate in this respect. It is the *Osmunda Struthiopteris* of Linnæus, who thus placed it in a genus where it is impossible to retain it. The German botanist, Hoffmann, transferred it to the genus *Onoclea* as *O. Struthiopteris;* in cultivation it is generally known by Wildenow's name for it, *Struthiopteris germanica*. The separate genus *Struthiopteris* is distinguished from *Onoclea* by the simple venation of the barren fronds. The plant has several more names.

This species has an extensive range in the northern hemisphere, extending round the globe in the cold latitudes of Europe, Asia, and America. It grows in shady places, moist meadows, and the sides of streams. In Europe the preference of this species for cold climates is very evident. It grows in Lapland within the Arctic circle, in Norway, Sweden, Denmark, Prussia, the Baltic provinces, Northern and Central Russia abundantly, and Poland. In Central and Southern Europe it is much less frequent, though it occurs in Baden, the Vosges, Piedmont, North Italy, South Tyrol, Bohemia, and some other places. In Western Europe it is unknown, and it is not found in France, the British Isles, or the Spanish Peninsula. In the East it extends as far south as the Crimea and the Caucasus. In Asia it is found in Siberia, the Ural and Altai and Baïkal regions, and in Kamptschatka; whilst in America its range extends throughout Canada and the Northern United States. The American plant has been called *S. pennsylvanica*, Willd., but it differs in no respect from the Old World species.

The Ostrich Fern—the name by which this species is often called in books, being a mere translation of the scientific name *Struthiopteris*—was introduced to cultivation in this country in 1760, by Peter Collinson, who had it in his garden at Mill Hill; but it is much less frequently met with in our gardens than its merits deserve. It is very easily grown, as it will do well either in shady or exposed situations, preferring a deep, moist, sandy soil. It may be effectively employed on the borders of streams or waterfalls. This species is readily propagated by means of its creeping stolons, and is quite hardy. *Onoclea sensibilis*, to which reference has already been made in our notice of the genus, is also a very hardy plant, and one which is equally worthy of cultivation with the European species. It is indeed somewhat remarkable, considering how popular ferns have become, that more prominence has not been given to the hardy out-door species. Such plants as those now under consideration are easy to establish, and when once settled, require scarcely any further attention; and there seems no reason why they should not be met with in our gardens as frequently as the common Male Fern.

WOODSIA.

THE genus Woodsia, although not a large one, about fourteen species being enumerated, is of wide distribution. Besides the three natives of Europe, of which we have to speak at length, one species is confined to Natal, two are peculiar to Northern India, one is limited to the Caucasus, and the remainder are for the most part South American. They are in the main small plants, similar in habit to the European species, but the fronds of *W. guatemalensis* are sometimes as much as a foot-and-a-half in length. The genus was established by Robert Brown in 1813, and was named by him in compliment to Joseph Woods, a well-known British botanist.

WOODSIA HYPERBOREA, *Brown.*

This is one of the smallest rock species. It possesses a densely-tufted caudex, or stock, very short, thickly set with the brown, persistent, erect bases of the fallen fronds, and giving off many long filamentous black roots. The fronds are few and of small size, varying in length from one-and-a-half inches to as much as five inches in luxuriant specimens; the stipes is rather stout for the size of the frond, stiff, reddish, and shining, and sparsely provided with small, scattered, elongated or hair-like yellowish-brown paleæ. At a point rather more than half an inch from the base is a joint in the stipes, at which point the frond when withered breaks away, leaving the lower part of the stipes attached to the caudex; this remains for a long period, and the numerous stiff, abruptly-broken-off stumps give a characteristic appearance to the plant. The frond is narrow and oblong, sometimes almost linear, in outline, and somewhat suddenly narrows into the rather blunt point; the pinnæ are few in number, small, one-fourth to three-eighths of an inch in length, sessile, often distantly placed and never overlapping, generally somewhat bluntly ovate-triangular in outline, but deeply cut into a few short, obtuse, rounded lobes or segments, which are in the lowest pinnæ faintly crenate at the base. In colour the fronds are pale bright green, often with a rusty or yellowish tint. There are usually some scattered hairs on the back and margins.

The sori are copiously produced, and are at first quite distinct from one another, but they often become afterwards confluent, and then appear to cover the whole back of the frond. Under a lens the sporangia appear to be mixed up with, and partially covered by, long curved hairs, and it is not until the former are carefully removed that a close examination can show that the origin of the hairs is really the margin of the indusium. This membrane occupies here the unusual position of being quite beneath the sorus; it is small and completely concealed by the sporangia, but its margin is produced into numerous long, pointed, faintly-partitioned hair-like processes, which spread out all round and curve up round the margin of the sorus overlapping the sporangia. These capillary processes are so like the ordinary hairs on the surface of the frond that their different nature was for a long while unsuspected, and only made clear by the lucid exposition of Brown and the beautiful drawings of Francis Bauer.* The sporangia themselves are shortly stalked, and are not supported on any common receptacle; they present no special peculiarity.

* "Transactions of the Linnean Society" for 1816 (vol. xi.).

WOODSIA GLABELLA 2 WOODSIA ILVENSIS 3. WOODSIA HYPERBOREA

(NATURAL SIZE.)

A PINNA, UPPER AND UNDER SURFACE B PINNA, UNDER SURFACE C. PINNA, UPPER AND UNDER SURFACE

(3½ TIMES THEIR NATURAL SIZES.)

This little fern, as its specific name *hyperborea* expresses, is truly northern in its range. This is, however, very wide, extending round the boreal world in Europe, Asia, and America. In Europe it is especially found in the highest latitudes, and when it occurs further south it is only at lofty elevations. It is frequent throughout Norway, the northern part of Sweden, Lapland, Finland, and North Russia, growing in the crevices of exposed granitic and basaltic rocks. It does not occur in calcareous districts. In the mountain ranges of Europe the Woodsia is a scarce species, though locally abundant in a few spots. In the Alps it occurs in several places, as on Mont Cenis, Mont St. Gothard, Zermatt, the Upper Engadine, &c.; in the Tyrol it is found in abundance at the Seiser Alp and in the Oetzthal; and in the Pyrenees in two spots, one on the Maladetta. There are also isolated localities in Carinthia and Silesia, and the plant also grows in the mountains of Corsica and Sardinia.

In the British Isles this is one of our rarest species, and there are but three localities. One of these was known so long ago as about 1680—the moist rocks of Clogwyn y Garnedd, facing the east on one of the highest points of Snowdon, North Wales. There it was first discovered by Mr. Lhwyd (from whom there is a specimen in Buddle's herbarium in the British Museum), and it still grows there. Mr. Newman refers Lhwyd's plant to the next species; but so far as can be judged from the specimen just alluded to, which is imperfect, it is *W. hyperborea*. The other two localities are in Scotland—on Ben Lawers, Perthshire, and in Glen Isla, in the Clova Mountains of Forfarshire. The similarity of the fronds to the leaves of the common Red-Rattle (*Pedicularis sylvatica*) has often been noticed, and the resemblance is embodied in the original name given to the Snowdon plant by Lhwyd.

Beyond the boundaries of Europe, *W. hyperborea* grows in the Ural Mountains, in the Songarian district, the Amur and Manschuria, and extends as far as Mongolia and Northern China. These Asiatic forms have been named as distinct species by Russian botanists (*W. pilosella*, Rupr., *W. asplenioides*, Rupr., and *W. subcordata*, Turcz). There is also a southward extension of the range of the plant in the Himalaya Mountains. In America the species is confined to high northern latitudes, only occurring in Canada as far as the Saskatchawan, and not reaching southwards into the United States. It has been doubtfully recorded for Iceland, but does not occur in Greenland.

WOODSIA ILVENSIS, *Brown.*

Whether there are sufficient grounds to justify the position of this as a distinct species from *W. hyperborea* is a question upon which the best authorities are not in accord. It is certainly difficult at times to decide to which a given specimen may belong, and intermediates seem to occur, but usually the two are readily separable. Brown, who founded the genus, though he followed the general opinion in keeping the two species, expresses himself as more inclined to consider them varieties of one; Milde combines them, and calls *W. hyperborea* (Brown) by the name var. *arvonica*, whilst *W. ilvensis* (Brown) is called var. *rufidula*, these being old specific names restored. On the other hand, Sir J. E. Smith thought them quite distinct species, and they are retained as such in Hooker and Baker's "Synopsis Filicum." Mr. H. C. Watson reports a circumstance which, if correct, would settle the question—that a portion of a plant of true *W. hyperborea*, sent from the Botanic Garden at Edinburgh to Professor Arnott, ultimately turned out to be *W. ilvensis*.

The present species is, on the whole, a decidedly larger plant than *W. hyperborea* (some of the American specimens are very much so), the fronds frequently measuring eight inches

in length, or even more; the stipes and fronds are usually more densely provided with paleæ, and are indeed sometimes quite shaggy from their abundance. In outline, the fronds are broader in the middle and lower part (more lanceolate) than in the last species, and the pinnæ are usually considerably longer and divided into oblong or oval longer segments. In other respects the two species are similar.

The localities of this fern are quite similar to those of *W. hyperborea*, but it is more frequently met with, and has a wider distribution. In Great Britain, for instance, we have seven or eight stations for it. Besides the three given under the last species—all of which produce this also—the plant occurs in several places near Moffat, Dumfriesshire, and on the border of that county and Peebles; it also extends into England, being found on the rocks at Falcon Clints, in Teesdale, Durham (a locality remarkable for its Alpine flora at a low elevation), and in Westmoreland. In Wales, it was recently discovered on Cader Idris, by Mr. James Backhouse.

In Northern Europe this fern is frequent through the Scandinavian peninsula, and extends into the Arctic regions, reaching Nova Zemlia and Iceland. It belts the polar regions, occurring in Greenland and Labrador, the northern parts of Canada, reaching to Unalashka, Alaska, and, crossing into Kamptschatka, extends through Siberia and Russia. In more temperate regions it has a wide distribution in the mountain districts of Europe, Asia, and America. It does not seem to occur, however, in the Swiss Alps, nor in the Pyrenees, but is found in Tyrol and Hungary; and there are stations for it in Bohemia, Silesia, Hesse, and other parts of Germany. Eastward it reaches the Crimea, Southern Russia and the Caucasus, and further into the central Asiatic regions of Siberia and Dahuria, and reaches Japan. On the American continent it is frequent in Canada and the United States as far south as Carolina, especially along the chain of the Rocky Mountains.

WOODSIA GLABELLA, *Brown.*

This elegant little species was first distinguished from its congeners in 1823, the specimens originally examined being collected by Dr. Richardson in North-Western Canada, near the Great Bear Lake, in Captain Franklin's expedition. It is well distinguished from the species already described by its smaller size, the completely smooth fronds, without hairs or paleæ, and the shape of the pinnæ, as described below. The stipes is bare to the base, where, however, are many orange-coloured paleæ—very long, and cut into a few long filiform teeth at the margin. The length of the fronds varies from one and a-half to four inches, being usually about three inches; their outline is narrow, decidedly linear-oblong or slightly lanceolate, and tapering to the apex; the pinnæ are small—scarcely over a quarter of an inch in length—sessile, and distantly placed, especially in the lower portion; their form varies, the lower ones are as broad as long, rounded in their circumference, and deeply and irregularly cut into a few wedge-shaped segments, dentate at the top; those in the remainder of the frond are ovate or oblong-ovate, more or less acute, and have their segments oblong or oval. The sori are abundantly produced, and are quite similar to those described in the other species, the hair-processes of the indusium, however, being not quite so long.

W. glabella is a very rare species in Europe, and its few localities are widely scattered. We have seen specimens from the Alten Valley, in Lapland, and from several localities in Southern Tyrol. In this latter region it is found chiefly on dolomitic rock, as on the Seiser

Alp, at Windisch-matrei, and at Weisenstein, near Sexten. Another locality in Carinthia completes the short list of European stations for this scarce little fern.

Out of Europe the plant is found to extend eastward through the Ural and Baikal districts of Siberia, and as far as Kamptschatka; whilst on the American continent there are several localities known in Canada, in the Rocky Mountains, and the plant is recorded from Labrador, and from Disco, Greenland.

The species of Woodsia are not very frequently met with in cultivation, although they are grown with little difficulty if properly treated. The drainage of the pots must be fully provided for, the soil being a mixture of fibrous peat and silver sand, with a small portion of loam. They succeed best in a northern aspect, and require plenty of water during the growing period.

WOODSIA ALPINA AND WOODSIA ILVENSIS.

DICKSONIA.

THE genus Dicksonia is most fully represented in tropical America and Polynesia ; one species (*D. punctilobula*), however, extends as far north as the United States and Canada, several others being abundantly scattered through the warm southern parts of the temperate zone. There are from thirty to thirty-five species, varying greatly in size and in the cutting of the fronds, some—such as *D. antaretica*, a native of New Zealand and Australia, frequently seen in our greenhouses—being tree-like in habit, having stems from ten to forty feet in height, while others have creeping rootstocks. One of the tree species, *D. arborescens*, was introduced to English cultivation in 1786 from St. Helena, to which island it is peculiar; like many other of the indigenous plants of that island, however, it is now dying out there. The genus is technically distinguished by having the sori situated at or just within the margin of the pinnule, at the apex of a vein ; in about half the species the involucre is distinctly two-valved, while in the remainder it is cup-shaped or but very indistinctly two-valved : the stalked sporangia split transversely, and have an incomplete vertical ring.

The fronds are, in some of the larger species, such as *D. antaretica*, as much as two or three yards in length and two feet or more across ; but their more usual dimensions are from one to two feet long and from six inches to a foot broad. In some species, such as *D. moluccana*, from Java, the stems are thickly furnished with strong hooked prickles ; in others they are densely clothed at the base with a thick coat of yellow-brown, often shining, hairs ; the stems of *D. Sellowiana*, from tropical America, are so densely clad with long fulvous hairs, changing to brown or blackish, that Mr. Spruce says they "precisely resemble the thighs of the howling monkey."

The so-called "Tartarian" or "Scythian lamb," about which strange stories were told by early travellers, is the long caudex of a plant of this genus (*D. Barometz*) : this is covered with long silky hairs, which look like wool when old ; and by judicious manipulation the natives of Southern China (where the fern grows) convert it into a rough resemblance to a lamb, the caudex being inverted, and supported on the bases of four of the lower fronds. The true history of the "lamb" was not known until 1725, when Dr. Breyne, of Dantzig, published a description of it as it really existed. In a curious folio volume, published in 1791, entitled "Museum Britannicum, or a display in thirty-two plates, in antiquities and natural curiosities, in that noble and magnificent cabinet the British Museum," by John and Andrew von Rymsdyk, there is a striking figure of a specimen which is still to be seen in the public gallery of the Department of Botany in that institution. The authors, although speaking of it as a "zoophye," state, accurately enough, that "it is nothing but the root of a plant much like fern;" but they quote, as "very singular and amusing," the following description of it from "Les Voyages de Jean Struys," which, as it shows the notions which were formerly entertained concerning this "strange plant-animal," we here quote. "This surprising fruit has the figure of a lamb, with the feet, head, and tail of this animal distinctly formed : whence it is called, in the language of the country, *Bonnarez* or *Boranez:* each of which Muscovite names signifies little lamb. His skin is covered with a down very white, and as fine as silk ; the Tartars and Muscovites

1 DICKSONIA CULCITA.

(1/8 NATURAL SIZE)

esteem it very much, and the greater part keep it carefully in their houses, where this author has seen many. It grows on a stalk of about three feet in height; the place by which it holds is a sort of navel, on which it turns and bows itself towards the herbs which serve it for nourishment, dying and withering away as soon as these herbs fail. Wolves love it and greedily devour it, because of its resemblance to a lamb. All this description contains nothing hitherto incredible; but what the author adds, that this plant has really bones, blood,

SCYTHIAN LAMB.

The three figures on the left of the cut are adapted from old representations of the "Lamb"; while the actual rhizome with fronds springing from it is shown on the right.

and flesh, whence it is called in the country by a Greek name Zophyte, that is, a plant-animal."

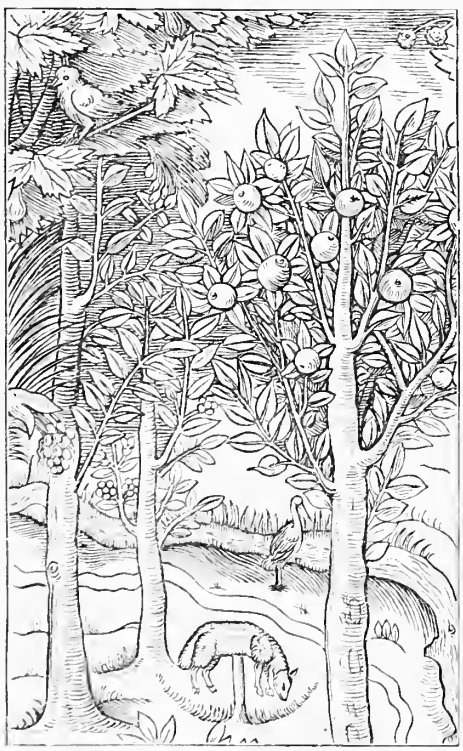
Those who are interested in learning further particulars of the history of the "Scythian Lamb," and of the fictions and traditions which were associated with it, will find abundant material in Breyn's "Dissertatiuncula de Agno Vegetabili Scythico, Borametz vulgo dicto," published in the "Philosophical Transactions" (vol. xxxiii., pp. 353—360). The treatise is accompanied by a striking representation of the object described, of which the upper figure

in the accompanying cut is a much reduced copy. The plant was introduced into cultivation in England about fifty years ago by the late Mr. John Reeves; the living specimens transmitted by him bore fruit in the Birmingham Botanic Garden, and were shortly afterwards described by Mr. John Smith under the name of *Cibotium Barometz*—the genus *Cibotium* being now more usually united with Dicksonia.

It is not surprising that so remarkable a plant should have received the honours of poetical treatment. Darwin, in the "Botanic Garden," thus summarises its traditional history:—

> "Cradled in snow and fann'd by arctic air,
> Shines, gentle Barometz! thy golden hair;
> Rooted in earth each cloven hoof descends,
> And round and round her flexile neck she bends;
> Crops the gray coral moss and hoary thyme,
> Or laps with rosy tongue the melting rime;
> Eyes with mute tenderness her distant dam,
> Or seems to bleat, a vegetable lamb."

The Sieur du Bartas, at an earlier period, likewise honoured the plant with a description in which its paradoxical nature is forcibly brought out. Having depicted the amazement of our first parents when such a prodigy of nature first presented itself to their astonished gaze, he piously continues:—



SCYTHIAN LAMB (*copied from the title-page of Parkinson's "Paradisus,"* 1629).

> "O merveilleux effect de la dextre divine!
> La plante a chair et sang, l'animal a raeine;
> La plante comme en rond, de soy mesmes se meust;
> L'animal a des pieds, et si mareher ne peut;
> La plante est sans rameaux, sans fruit, et sans feuillage;
> La plante a belles dents, payst son ventre affamé
> Du fourrage voysin; l'animal est sémé."

Judging from specimens brought to this country, it is difficult to imagine that the resemblance can ever have been considered a striking one.

The silky hairs covering the base of the stem of this, or of a closely allied species, have been used as a styptic in Germany, being imported from Sumatra. The similar hairs of other species of Dicksonia, natives of the Sandwich Islands, are exported, to the extent of many thousands of pounds annually, under the name of Pulu, and are employed in the stuffing of mattresses, cushions, &c.; and the hairs of *D. Culci'a* are used in like manner in Madeira. Not more than two or three ounces of hair are yielded by each plant, and it is reckoned that about four years must elapse before another gathering can be obtained.

DICKSONIA CULCITA, *L'Heritier.*

This is a large and handsome fern, though, compared with some other species of the genus, it is quite of humble stature. The caudex, indeed, is small, only three or four inches high, rooting, with the end deflexed, and thus gives none of the tree-like character so characteristic of some of the congeners of the plant. It is, however, remarkable in being quite without the ordinary paleæ or scales, but instead is very thickly and densely cushioned, especially at the apex, with a mass of long, golden-orange, shining hairs, which are over an inch long, and under the microscope are seen to be jointed. The fronds are of large size, attaining a length of four to six feet, and arching outwards, they are supported on a long stipes, which is perfectly smooth and devoid of paleæ or hairs, shining and pale brown; in form the stipes is bluntly angular, and so much channelled along the upper surface as to be thin and crescent-shaped in section, when a single curved bundle of vessels is seen. The form of the frond is rather broadly triangular, but drawn out at the apex; it is much divided, quadri-pinnate, coriaceous, dark green, and perfectly smooth. The primary pinnæ are wide-spreading and ovate-acuminate in outline, the secondary ones rather ovate-oblong, and frequently much attenuated at the point; whilst the ultimate divisions are oblong, rather obtuse, oblique, and deeply pinnatisect; the segments (at least, the lower ones and those without sori) bluntly dentate, with a few thick teeth. The venation is simply forked.

It is, however, the sori that are particularly noticeable, as they are usually produced in great abundance. They are large, nearly one-quarter of an inch in diameter, sub-globose, and each one occupies nearly the whole segment, which then, instead of being toothed, is dilated, and with a rounded deflexed margin. Their structure is peculiar, and differs from that of all the other European ferns. The very large, thick, brown indusium is attached by a semi-lunar base below the sorus, and at first is united by its upper edge to the deflexed margin of the segment, so that the whole forms a thick marginal case, rounded, but flattened on the top. Afterwards this separates, and the indusium exhibits an entire semi-circular free margin, or lip, whilst an upper lip is formed by the margin of the segment; at length the lower lip becomes separated also at the sides and deflexed. The sporangia are small, very numerous, on long stalks, bright yellow, and mixed with many brown barren filaments (paraphyses); they open by a transverse chink, and possess a complete oblique annulus.

A special interest attaches to this fern from its being the only member of the great tropical group of the *Cyatheaceæ* which reaches Europe. Its footing, indeed, on this continent is but slight, consisting of, as far as known, but a single locality in Southern Spain, discovered in 1869. This is near Algeciras, the little town which faces Gibraltar across the bay.

The head-quarters of *D. Culcita* are, apparently, in the Azores Islands, where it is very abundant in the woods, especially at an elevation of from 2,000 to 3,000 feet. There are specimens in the British Museum from S. Miguel, collected by Masson so far back as 1778. In Madeira the plant is not now common, being chiefly found near S. Vincent and on the north-west side of the island. When we add Teneriffe to its localities, we have traced the whole range of this species, which will be thus seen to be a marked member of that peculiar Atlantic flora of which a few species reach our western shores. The fern does not occur in the Canary Isles; and the species from the mountains of Central America and the West Indies, often referred to *D. Culcita*, is an allied species—*D. conifolia*, Hook.

Another name for this fern is *Balantium Culcita*, Kaulf.

TRICHOMANES.

WE possess but a single species of this genus; but it is one of the most interesting, as well as one of the most beautiful of our British ferns, forming the solitary European representative of a large group of from eighty to a hundred species which are abundant in the moist, shady, tropical woods of the Eastern and Western hemispheres. Like the Filmy Ferns, to which they are closely allied, the Bristle Ferns vary a good deal in habit, the fronds being simple, pinnate, or decompound, but agreeing in their membranous pellucid texture. One of the most remarkable of the entire-fronded species is *T. reniforme*, a plant confined to New Zealand; in this the fronds are rigid and erect, two to four inches broad, and somewhat kidney-shaped, the numerous involucres being crowded along their edges. Another singular species belonging to this section has been discovered by Hildebrandt in the Comoro Islands, and named *T. Hildebrandtii;* in this the circular fronds, about the size of a florin, are closely pressed to the trunks of the trees on which it grows, and resemble a liver-moss on a large scale. In a few species, natives of tropical and South America, the sterile and fertile fronds are very different in appearance, the latter consisting of a narrow distichous spike; but they are usually uniform, varying in length from two or three lines to eighteen inches or more. *T. Barklianum*, a Mauritian species, is the smallest known fern, with the exception of the Malayan *Hymenophyllum parvifolium*, which is about the same size; it is calculated that it would take upwards of fifty fronds of these species to cover a square inch. Another Mauritian species, *T. giganteum*, is among the largest of the genus, having quadri-pinnatifid fronds from a foot to a foot-and-a-half or more in length, and about half as broad. *T. pinnatum*, a tropical American species, is a dimorphic plant, the fronds in the normal state being pinnate, and often rooting and proliferous at the apex; in other specimens, however, they are long and narrow, about an inch broad throughout, and fringed with the fructification. *T. membranaceum*, which is also tropical American, has scarcely stalked, roundish, broad, irregular membranous fronds, which are fringed at the margin with a double row of peltate scales; in habit it resembles the Peacock's-tail Seaweed (*Padina pavonia*). In several species the fronds are so finely divided as to present a feather-like appearance; while in *T. lucens* and its allies the rachis is densely covered with brown hairs.

TRICHOMANES RADICANS, *Sw.*

This is known as the Killarney Fern. It has a long, black, tough, branched, wiry rhizome, having a tomentose or woolly appearance, which is due to the presence of very small-jointed brown bristly paleæ, and in large and old specimens extending several yards in length. From this arise, at very long intervals, the pendulous fronds; these are of a pellucid membranous, but firm, texture, which, as Mr. Newman observes, "particularly resembles some of the marine Algæ;" they are supported on a long, round, smooth stipes, with a narrow membranous wing running down each side. The leafy portion of the frond is usually about four to six inches in length, but may be smaller, or even reach a foot long; in outline it is usually ovate-oblong and acute, and it is elegantly bi- or tri-pinnatisect. The pinnæ are alternate, the lower being

from one to three inches long, somewhat ovoid in shape, the upper ones becoming gradually smaller; they are deeply cut into oval or oblong pinnules, which are themselves cut into linear bluntish teeth. A dark firm vein runs through each of these divisions, and is the more conspicuous on account of the pale transparent green of the foliaceous portion of the frond; so striking indeed is it, that the frond has been described as consisting of a series of three or four times branched rigid veins, bordered throughout by a thin pellucid wing. These veins end at the apex of the segments, when the fronds are barren; but in fruit-bearing specimens they are produced beyond it into a bristle-like point, to the appearance of which the name "Bristle-fern" is due. This forms a receptacle, upon the base of which is situated the small roundish cluster of sporangia; this is surrounded by a cup-shaped involucre, formed by the indusium and frond-segment, which are very similar in texture; the cup is open at the top, which is very slightly two-lobed. The bristle-like receptacle projects a variable distance beyond the edges of the cup, as shown in the figure at the end of this article. The sporangia are sessile, pear-shaped, and provided with a complete transverse ring. The spores are pale, somewhat greenish in the centre, and very minutely granulated. The fronds in the Irish plant are three years in arriving at maturity; when growing in a moist situation, they will remain beautifully green for many years, provided that the fruit be not matured; in the latter case, however, the fronds change colour and begin to wither away as soon as the spores have been shed. Mr. Andrews, who studied the plant in its native Irish localities, is of opinion that the fructification is only matured in warm dry seasons, and that even then it is comparatively rare, the sporangia being duly formed, but failing to attain sufficient ripeness and elasticity to discharge the spores. In Madeira the fronds are stated to be fertile in their second year, and in Mexico they bear fruit the first year of their existence.

It was at one time thought that we possessed in Ireland a second species of *Trichomanes*, for which the name *T. Andrewsii* was proposed by Mr. Newman, in commemoration of its discoverer, Mr. Andrews; this, in its most characteristic state, differs from *T. radicans* in having narrower and proportionately longer fronds, a scarcely tomentose rhizome, and receptacles produced very much beyond the involucres. But however different in extreme examples, it has been found that these characters are not of permanent value, intermediate specimens between the two forms being readily found. *T. Andrewsii* was originally found at Glouin Caragh, Co. Kerry, and subsequently at Killarney.

The Killarney Fern has been reported of late years from various localities in England. Whether it is to be regarded as an introduced plant is perhaps open to question, but there can be no doubt that it grew in Yorkshire less than a century ago, and that it had then been known to grow there more than fifty years. In the third edition of Ray's "Synopsis" (1724), this fern is mentioned as having been found by Dr. Richardson "at Belbank, scarce half a mile from Bingley, at the head of a remarkable spring, and nowhere else that he knows of." There is no ground for the supposition that some other plant was mistaken for the *Trichomanes*, inasmuch as there is a specimen in one of the volumes of the Sloane Herbarium (vol. cccii., p. 66), in the British Museum, with a ticket appended in Dr. Richardson's handwriting:—"This beautyfull capilary I lately found in the moist and shady rocks nigh Bingley." In the large herbarium of British plants contained in the collection of the British Museum there is also another specimen from the same locality collected by Hudson; and the following detailed account of the occurrence of the plant at Bingley is given in Bolton's "Filices":—"First discovered by Dr. Richardson in a little dark cavern under a dripping rock, a little below the

spring of Elm Cragg Well, in Bell Bank, scarce half a mile from Bingley. In this place I saw it in plenty in the year 1758: afterwards, some alterations being made about the well, for the convenience of the proprietor, the cavern was destroyed, the plant perished, and was lost to Great Britain till the year 1782, at which time being engaged in this work, and passionately desirous to see the plant again in its growing state, after several researches in Bell Bank, I found a root under a dripping rock, to the left side of the current, and about fifteen yards above the cistern. From this root I have sent specimens to one or two of my friends, and have in my possession the best of them, from which this figure and description were taken." In the same year (1782) the *Trichomanes* was found at Bell Bank by Mr. Teesdale;* since which time it does not appear to have been observed there, although there is a specimen in the British Museum which is said to have been collected in Yorkshire in 1871. In 1867, the *Trichomanes* was found by Mr. Everard im Thurm, on a rock overhanging the water about a quarter of a mile below the fall at St. Knighton's Kieve, on the northern coast of Cornwall, about two miles from Tintagel Castle, and the same distance from Boscastle; only one patch was seen, and the fronds were of small size, not much over two inches in height. The possibility of its introduction to this locality is suggested; and the same suspicion attaches to the Rydal district of Westmoreland, where it was found on wet rocks in one of the fells by Mr. Walter Crouch about 1863. About this period it was recorded from the Snowdon district of Caernarvonshire, where it was found by two or three botanists, who prudently abstained from describing the exact spot. It has been stated that the fern was introduced into this district from Ireland by a Snowdon guide; but there seems no doubt whatever that it had been known to occur there about thirty years before this date, in two distinct localities, and that the original discoverers of it, who carefully concealed their knowledge, were satisfied as to its genuine nativity. The Killarney Fern was also found in the Isle of Arran by a local fern-collector; and it has been recorded, but apparently in error, from Derbyshire and Caermarthenshire.

Although generally known as the Killarney Fern, the *Trichomanes* extends through a considerable portion of the south and south-west of Ireland, occurring on wet shady rocks in several localities in Kerry and Cork, as well as in the counties of Waterford, Limerick, Wicklow, and Tipperary: it was discovered at the Turk Waterfall, Killarney, in October, 1805, by Mr. J. T. Mackay; but in this locality it is almost, if not quite, extinct. The natives of the Killarney district are in the habit of offering to tourists specimens of *Hymenophyllum Wilsoni* as the "Killarney Fern;" and the superficial resemblance is sufficient to mislead those who are not acquainted with the true plant. It ranges in elevation from the sea-level to about 1,000 feet on Carrigeena, on the northern border of county Cork. Its distribution on the continent of Europe is extremely limited; indeed, it is only known to occur in the shady woods of Gallecia, in Spain: Willkomm and Lange indicate it as found also in Portugal, but we find no other reference to it as occurring there. Its strongly "Atlantic" type is shown in this distribution, and by its occurrence in the Azores, Madeira, and Teneriffe. But if we take the somewhat broad view of the species adopted in the "Synopsis Filicum," we find it has a further very wide distribution: in Africa it is recorded from Angola and Fernando Po, as well as from Johanna Island; in Asia it occurs in the Himalayas, Japan, and Polynesia; and in tropical America it extends from Alabama, Mexico, and the West Indian Islands southward to Rio Janeiro.

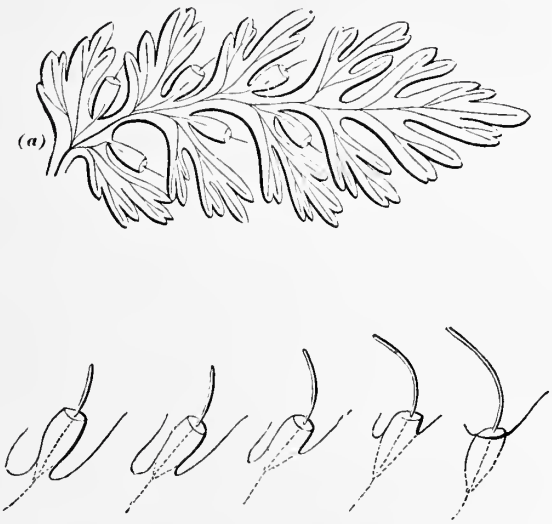
The plant is more correctly called *T. speciosum*, Willd. It has also been named *T. alatum*,

* See "Transactions of the Linnean Society," v. 75.

Hook; and *T. brevisetum*, Brown. It was regarded as merely a variety of the Tunbridge Fern by the older English botanists, who knew only the small Yorkshire specimens.

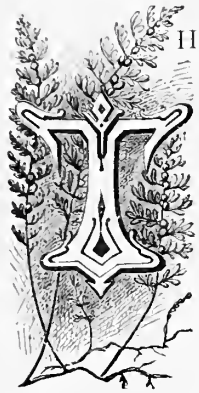
This species has been very popular in cultivation since the introduction of the Wardian case; a moist atmosphere, with shade and warmth, seem to satisfy all its requirements; and it will grow and flourish in a common earthen pot, if this is covered with a bell-glass and allowed to stand in water. It was formerly, however, extremely difficult to grow successfully; and Mr. Ward tells us that Fischer, the superintendent of the Petersburg Botanic Gardens, "when he saw the plant growing in one of my cases, took off his hat, made a low bow to it, and said, 'You have been my master all the days of my life.'" It will grow well in rough peat and sphagnum moss, or on a lump of sandstone, and is apparently capable of enduring a very low temperature. Mr. Backhouse says that, with him, "though frozen into a mass of ice, which encrusted and buried it many inches deep for many weeks, it thawed out as fresh and fine as any one could desire." The late Dr. Moore, of the Glasnevin Botanic Gardens, Dublin, was remarkably successful in growing the Killarney Fern, as well as the British species of Hymenophyllum; the walls of a small greenhouse were literally carpeted with these plants, and their appearance was extremely beautiful.

The name *Trichomanes* was not originally applied to the ferns with which it is now associated, but to an *Asplenium*, which is still known as *Asplenium Trichomanes*, so that the name and its meaning may be more appropriately considered when we come to speak of the last-named plant.



(*a*) PINNULE OF TRICHOMANES RADICANS, MAGNIFIED; (*b*) INVOLUCRE SHOWING VARYING LENGTH OF RECEPTACLE.

HYMENOPHYLLUM.



THIS is a large genus of ferns, including about eighty species of delicate plants, two only of which are found in Europe, the remainder being distributed through the temperate and tropical portions of the globe. They grow usually in moist places, upon rocks, or on the trunks of trees, often forming dense masses netted together by the branched thread-like rhizomes. They vary a good deal in size: some, such as *H. parvifolium*, a native of Moulmein, being minute plants, with stems only a line long, and tiny fronds scarcely more than twice that length; others, as *H. sericeum*, from tropical America, have long narrow fronds, which are sometimes as much as two feet long, although a foot is their more general size. The fronds are occasionally simple, as in the case of the very distinct *H. cruentum*, a Chilian plant with reddish fronds three or four inches long and an inch or more broad in their lower portion; but they are more usually either simply or twice or thrice pinnatifid. About half the species are smooth and free from hairs, the remainder being more or less ciliated, or hairy upon the surface. Some beautiful species are in cultivation, such as *H. sericeum* already mentioned; *H. caudiculatum*, a Brazilian species with broad fronds, the ends of which are lengthened out into tail-like points; *H. multifidum*, from New Zealand and the islands of the Pacific, having finely-divided fronds about six inches long and nearly as broad; and many more, chiefly from New Zealand and the West Indies. The Filmy Ferns are somewhat difficult to cultivate; a very damp atmosphere is absolutely essential to them, and the amateur will find the Wardian case the most suitable treatment. Some succeed best upon logs of wood or tree-ferns, while others will grow well in a mixture of bog-moss and fibrous peat, with lumps of sandstone, the drainage being carefully attended to, as the water must not be allowed to stagnate.

A very natural group (the *Hymenophyllæ*) is formed by the two genera *Hymenophyllum* and *Trichomanes*, the species resembling each other greatly in form and habit, as well as in the pellucid membranous texture of the fronds. They are technically distinguished from all other ferns by the sori being borne at the margin instead of at the back of the fronds, the spore-cases being contained in deep urn-shaped cavities, and clustered round hair-like receptacles, which are the ends of the veins of the fronds. In *Hymenophyllum* the indusium is more or less deeply two-lipped or two-valved, while in *Trichomanes* it is entire; and this constitutes one principal technical difference between the two genera, the other being that the receptacles in *Hymenophyllum* are short, and included within the indusium; while in *Trichomanes* they are continued beyond it, being often elongated and filiform, or bristle-like, in appearance.

HYMENOPHYLLUM TUNBRIDGENSE, *Linn.*

This and the next species are the smallest of our British ferns, and from their inconspicuous olive-green hue and insignificant size, are frequently overlooked. They grow in dense masses, the slender black wiry filiform creeping rhizomes forming a matted network, from which arise the short membranous fronds. In the present species these are about one and a half to three inches long, and have a delicate cylindrical stipes; they are ovate-lanceolate in outline, acuminate, deeply pinnatisect, a narrow wing of membrane connecting the pinnæ into one

1. TRICHOMANES RADICANS (THE KILLARNEY FERN.) 2. HYMENOPHYLLUM TUNBRIDGENSE (TUNBRIDGE FERN)
3. HYMENOPHYLLUM WILSONI. (WILSON'S FERN.)

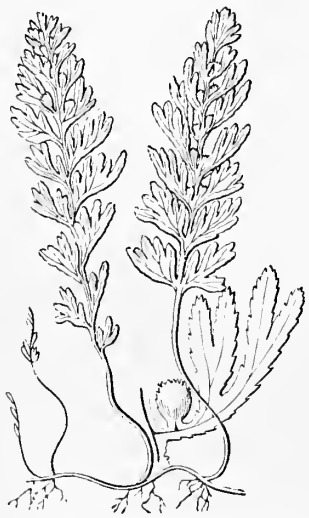
(NATURAL SIZE.)

1A. PINNULE WITH FRUIT. 2A. PINNULE WITH FRUIT. 3A. PINNULE WITH FRUIT (FOUR TIMES NATURAL SIZE.)

frond; each segment is short and pinnatifid, and spreads vertically; the alternate segments are narrow, obtuse, and distantly but conspicuously serrate. No stomata occur on the fronds of this or the other species. The fructification is usually produced in the upper half of the frond, the sori, which have two nearly round short compressed valves or segments conspicuously serrate on their upper margin (indusium), being borne usually at the apex of the first vein on the upper side at the base of each pinna. The fronds are all annual, and more elegant than those of *H. unilaterale*.

The Tunbridge Fern likes shade, warmth, and shelter; it may be grown readily under a bell glass, especially if two small apertures be provided towards the top. It occurs naturally on moist rocks or old tree-trunks amongst mosses, which it much resembles; when growing on the perpendicular surfaces of shaded rocks, the fronds are often nearly pendulous, which is also the case with the next species.

H. tunbridgense, as understood by English authors, is a fern of limited range, occurring in Britain, France, Belgium, the Pyrenees, Saxony, the Tyrol, Italy, and Corsica; but the authors of the "Synopsis Filicum" include under the same name several plants which have been regarded as distinct by various authors, and the range is thus extended to South Africa, Mauritius, Madeira, the Azores, the Auckland Islands, New South Wales, Jamaica, Venezuela, Chili, and New Zealand, and this without including *H. Wilsoni*, which is regarded in the "Synopsis" as a variety of *H. tunbridgense*. In Britain it occurs, or has occurred, in the counties of Cornwall, Devon, Somerset, Sussex, Kent, Glamorgan, Merioneth, Westmoreland, Cumberland, Northumberland, Dumfries, Renfrew, Peebles, Stirling, Argyle, and Dumbarton, finding its north limit in Mull and the islands of the Clyde, and ascending to twelve hundred feet. In Ireland it is abundant in some of the western districts, especially in Kerry and Cork, but rare in the east centre and north of the island. From the greater part of central Europe, and all the north and east of the Continent and Asia, it is quite absent.



HYMENOPHYLLUM TUNBRIDGENSE.

The name *tunbridgense* commemorates the original discovery of the species near Tunbridge Wells, in Kent, some years before 1682, in which latter year it was found by Ray in Westmoreland: it is not now to be found in the neighbourhood of Tunbridge.

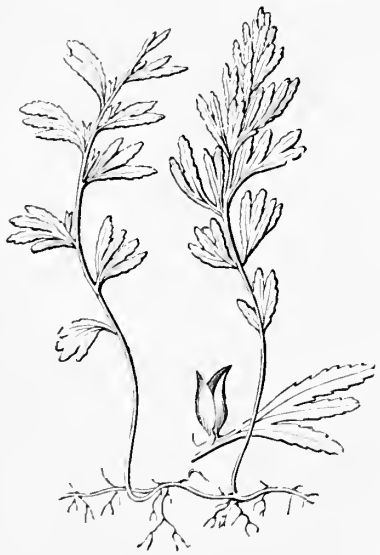
HYMENOPHYLLUM WILSONI, *Hook.*

This has a general resemblance in appearance and habit to the last species, with which it was for a long time confounded: the two are certainly nearly allied, but there are differences between them which a practised eye can readily detect, and which seem sufficiently constant, at any rate so far as British plants are concerned. *H. Wilsoni* is a larger and less elegant plant than *H. tunbridgense*, and is also more rigid and more coarsely reticulated. The fronds are not annual, but grow on year after year for several seasons, reaching, it is stated, as much as ten inches in length, though this must be of rare occurrence, but about six inches is a not unfrequent size. They differ in colour from those of *H. tunbridgense*, being of a darker green; Mr. Wilson describes the hue of the last-named species as "glossy green." The pinnæ have a strongly recurved habit. The sporangia, which are more or less stalked, are usually solitary on each pinna, but

occupy the same position as in the last species; next the rachis they are more conspicuous than those of *H. tunbridgense;* the valves or segments are ovate, and their margins are quite entire. The habit of *H. Wilsoni* is more erect; it affects somewhat different situations, and often occurs on bleak and exposed rocks.

In geographical range it is a more northern plant than *H. tunbridgense*, but the two species are sometimes found growing intermixed. In England it is recorded for Cornwall and Devon, Stafford, Salop, and most of the Welsh counties, Lancashire, Yorkshire, and the northern counties; it is pretty generally distributed through Scotland, finding its north limit in the Orkney and Shetland Isles. In Ireland it is much more frequent than the last, occurring in hilly districts in all parts of the country. Its Continental distribution is much more restricted than that of *H. tunbridgense*, the Faroe Islands and Norway being the only extra-British localities in Europe for the plant. Beyond the continent of Europe, however, it is recorded by different writers under different names from South Africa, the island of Bourbon, Madeira, and the Azores, the Fiji group, New Zealand and Australia, Chili, Guatemala, the Andes of Peru, and Brazil. Like the last it is absent from Asia.

The plant is more generally known under the name of *H. unilaterale*, Bory. Its name, *Wilsoni*, was given it by the late Sir William J. Hooker, in compliment to the late William Wilson, of Warrington, an assiduous British botanist, who added several species to the British flora, and whose "Bryologia Britannica" will long remain the standard work upon British mosses. He died in 1871, and his unequalled collection of mosses now forms part of the treasures of the Botanical Department of the British Museum. In the Supplement to "English Botany" (Tab. 2686), the plant is figured and described by Mr. Wilson, who says: "So very different in aspect is this truly distinct species from the far more elegant *H. tunbridgense*, that no botanist who has had the good fortune to see them luxuriantly growing in company in the rocky woods which border the wildly-sequestered Upper Lake of Killarney, would hesitate to pronounce them two species. It was there that, in the summer of 1829, I first became acquainted with the true *H. tunbridgense*, and had at once the gratification of clearing up any doubts concerning the spurious kind, with which, as the common *Hymenophyllum* of North Wales, Cumberland, and Perthshire, I had long been imperfectly familiar, and also of unexpectedly adding another fern to the British flora. Hudson, who probably had seen and gathered both kinds, does not notice this species as a variety; but various botanists of modern times have suspected, though they did not ascertain nor promulgate, the existence of two British species. . . . So constantly has this species been confounded with *H. tunbridgense*, that it is perhaps impossible to fix any certain reference to the works of Ray, or of any later author: it appears also to have been wholly unobserved on the Continent."



HYMENOPHYLLUM WILSONI.

Vincent Brooks Day & Son Lith.

DAVALLIA CANARIENSIS S.M. (THE HARE'S FOOT FERN.)

ONE THIRD NATURAL SIZE.

1. UPPER SIDE OF A PORTION OF A FROND IN FRUIT. TWICE NATURAL SIZE. 2. YOUNG SORUS UNDER SURFACE. (8 TIMES NAT. SIZE.)
3. OLD SORUS UNDER SURFACE. (8 TIMES NATURAL SIZE. 4. OLD SORUS UPPER SURFACE. (8 TIMES NATURAL SIZE.

DAVALLIA.

THIS is a large and handsome genus, having its head-quarters in the tropics of the Old World, and containing about a hundred species. As might be expected among so many, we find a great diversity in form and size—some of the species, indeed, differing so extensively from each other in habit, that were it not for the technical character, it would be impossible to trace the connection between them. A large number resemble the Hare's-foot Fern (*D. canariensis*), which is the solitary European representative of the genus, in general appearance. One small group contains species remarkable on account of their climbing habits, the fronds being several feet long, and the rachis in two West Indian species (*D. aculeata* and *D. uncinella*) being clothed with scattered prickles, and somewhat bramble-like in habit. The former of these attracted the attention of Plumier, who, writing in 1703, speaks of it as having a stem no larger than a writing-pen, but extending in every direction by means of long branches, which are as hard as wood and quite black and woolly. The whole plant resembles a bramble rather than a fern, in consequence of its spiny character. It occupies considerable space, climbing over the forest-trees near which it grows. In Hispaniola, Plumier speaks of having seen a whole field entirely covered with it, "in a place which the buccaneers call 'spiny bottom.' The same buccaneers call the plant the French Fern."

Another section, which is often regarded as a separate genus under the name *Humata*, and is very distinct in habit, is dimorphic, that is to say, the fronds are of two kinds, barren and fertile, and very different in appearance, the barren ones being sometimes entire; *D. parallela* at first sight almost exactly resembles the common Polypody (*Polypodium vulgare*); these are natives for the most part of the Malay Peninsula. *D. elegans* has long pinnate fronds, which are sometimes two feet in length, the sori being borne upon the edges of the pinnæ; *D. parvula*, on the other hand, is, as its name implies, of very small size, the fronds being less than an inch in length—produced at short intervals along the slender rhizome; in cultivation it will do well upon a block of wood, or upon the stem of a tree fern. Some species have fronds so finely divided that when mounted on paper they resemble most delicate lace; of these, a Fijian species, *D. fæniculacea*, having, as its name implies, fennel-like leaves, is perhaps the most striking.

The species of *Davallia* are not difficult to cultivate; they grow well in a compost of fitrous peat and sand, to which about one-fifth of fresh turfy loam may be added; they require to be thoroughly well-drained, although they like plenty of water when growing. Besides *D. canariensis*, another species, *D. pyxidata*, which much resembles it, has long been in cultivation in England, having been introduced from Australia by George Caley in 1808. Many Davallias are now grown, the genus having lately been very popular; one of the handsomest is *D. Mooreana*, a native of Borneo, which has gracefully arching and much divided pale green fronds about four feet in length, and nearly as broad at the base; a specimen, recently described, produced at the same time about 150 fully developed fronds, having a spread of 8½ feet. Another recent introduction, *D. Tyermani*, is a native of West Tropical Africa, and is readily distinguished by its silvery rhizome and dark glossy fronds. One species (*D. Novæ-Zelandiæ*)

is, as its name denotes, a native of New Zealand, and is interesting as having secured a temporary footing among British plants. It was found, in 1874, growing on the lower stonework of a bridge over the river Swale, near Thirsk, Yorkshire, having probably been washed from some garden by a flood. (See "Journal of Botany, 1875," p. 78.)

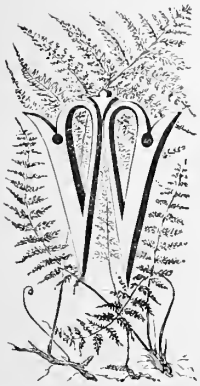
DAVALLIA CANARIENSIS, *Smith.*

This pretty species is now familiar as a cultivated plant, under the name of the Hare's-foot Fern; it has long been an inhabitant of our greenhouses, having been introduced to the Royal Gardens at Hampton Court before 1699. It is readily known by its remarkable rhizome or caudex, which is quite above ground, creeping for a considerable distance, and climbing on or over rocks, walls, and trees, and when grown in pots speedily extending over their edges. This creeping aerial caudex is not of great diameter, not exceeding indeed half an inch, and produces many short branches; it is cylindrical, and sends off roots from its under side; and owes its peculiar appearance to the very dense covering of scales or paleæ with which it is completely enveloped. These scales are of considerable length and closely overlap one another; they are lanceolate-linear, broad at the base but tapering to a long point, and delicate greyish orange in colour, paler at the edges; at the extremities of the rhizome they form a blunt rounded cushion, from which the plant gets its name. The fronds are given off singly at considerable intervals on the elongated caudex, the growing point of which is always much in advance of the youngest frond; they vary from 6 to 18 inches in height, of which the stipes occupies fully one-third. This latter is erect, stiff, rounded beneath, but deeply channelled along its upper surface, and articulated with the rhizome; the base is surrounded with the paleæ of the caudex, but no scales or hairs of any kind occur on itself. The general outline of the frond is triangular or deltoid, not much longer than broad, with the wide-spreading pinnæ gradually diminishing in length upwards, few in number and placed alternately. It is tri- or quadri-pinnatisect in division; the pinnules are deltoid-lanceolate, and the ultimate divisions are lanceolate or oval, and deeply cut into narrow segments; the texture is coriaceous, and the colour bright green. The sori are terminal, each being borne at the summit of a vein which is thickened below its origin, and divides into two branches which run along the margins of the sorus, and are carried out beyond it into the two teeth of the fertile segments which project one on either side of the sorus; the indusium is attached at the base and sides so as to form half a cup, the semi-circular upper margin being free. The spores are yellow, oblong, and worty.

This Fern, like *Dicksonia Culcita*, is one of that type of plants to which the name Atlantic is applied, and has very much the same area as that species. It is in Europe confined to Portugal and south-western Spain, occurring in the former country frequently about Lisbon, the Serra de Cintra, &c., and in the latter in Gallicia and Andalusia; in the latter province being particularly abundant about S. Roque, Algeciras, and the southernmost part of Spain—Tarifa. It grows especially over old stems of cork-oaks and olives, and shows a special liking for the neighbourhood of the sea. Beyond European bounds this species of *Davallia* has but a few localities. It is found in a few places on the opposite side of the Straits of Gibraltar, in Morocco near Tangiers; and it is a well-known fern in Madeira, the Cape Verde Islands, and Teneriffe. It does not grow in the Azorean group.

Linnæus called this fern by two names; it is his *Polypodium lusitanicum*, and also *Trichomanes canariense*.

CYSTOPTERIS.



WITH only one exception, the members of this small but elegant genus are reckoned among the ferns of Europe, and will therefore be considered in detail. The geographical distribution of the genus is thus exceptional among ferns, its head-quarters being found in the temperate zones of both hemispheres. *C. fragilis* is one of the most widely-distributed plants of the order; the others are more limited in their range. The extra-European species alluded to above is *Cystopteris bulbifera*, a very distinct plant, native of North America, extending from Canada southward to Virginia and North Carolina. It is the largest of the genus, the fronds being sometimes as much as a foot in length, and much narrowed at the apex; but its most characteristic feature, to which it owes its name, is to be found in the large fleshy bulblets which are formed beneath the frond in the axils of the upper pinnæ. These fall to the ground, and form new plants, which are about two years in coming to maturity; and the propagation of the species takes place to a great extent in this manner.

All the species of *Cystopteris* are well worthy of cultivation. They succeed best in rather stiff soil, care being taken that water is allowed to rest upon the crowns during the period of rest. They grow well also in cocoa-nut refuse mixed with a little loam, the pot—if grown as pot-plants—being about half filled with loose stones, so as to secure thorough drainage. As a rule, they do best in shady situations.

The name *Cystopteris* is formed of two Greek words, and signifies Bladder Fern, by which title the plants of the genus are often referred to in books; the allusion is to the hood-shaped indusium, which will be fully described hereafter.

CYSTOPTERIS FRAGILIS, *Bernh.*

This is a pretty fern, of no great size, but rather remarkable for the great variability in the form of its pinnæ. It possesses a small, short, prostrate caudex, bright-brown in colour, with numerous long roots, and set at the growing end with many thin ovate, acute orange scales toothed at the edges. The fronds are numerous, and are given off in close proximity, so as to appear to grow in tufts. The stipites are slender and remarkably brittle, to which peculiarity the plant owes its specific name, *fragilis;* they are brown, and nearly bare of paleæ, except at the very base, and are nearly as long as the leafy part of the frond; the whole is usually under one foot in length, and generally only about six inches. The light-green delicate fronds are oblong-lanceolate or elongated, the pinnæ being largest about the middle of the frond, and decreasing in length towards both ends. They are usually bi-pinnate, with the pinnæ ovate in outline, and consisting of oblong-ovate pinnules, which are again cut into oblong obtuse segments or teeth. The sori are dorsal, small and circular, arranged in a row along either side on the lateral veins of the pinnule, often, however, becoming confluent, and covering much of the frond; they possess a peculiar indusium, which, though it covers the whole sorus at first, afterwards becomes an ovate bract-like, somewhat hooded membrane attached beneath one side of it, and is at length torn and reflexed, and may even wholly

disappear. The sporangia are at first pale, but become brownish-black and shining: the spores are round or oblong, and covered with small prickly protuberances.

Such, at least, is the usual form of this plant, but any one who has examined many examples of it in a living state must be aware of its great variability. Hence has arisen the distinguishing of a great many varieties, several of which are described as species, and to this we owe the very formidable list of synonyms which we find in the "Nature-Printed British Ferns," and elsewhere. In this magnificent work, Mr. Moore groups the numerous named varieties in two divisions, excluding the typical form, and also the very distinct variety *Dickieana*, to which we shall refer later on. In the first group, *Angustatæ*, are placed the narrower pinnuled, often large and inciso-dentate forms, and of these he takes as the

CYSTOPTERIS FRAGILIS.

(*a*) Var. ANGUSTATA. (*b*) Var. ANTHRISCIFOLIA.

type the var. *augustata* of Smith, who considers this the same as the *Polypodium rhæticum* of Dickson and Bolton, though not of Linnæus. This form is apparently confined to Europe and is nowhere very common; the "Index Filicum" records it only from Scotland, Germany, and Italy. Our figure shows this plant (the upper specimen), and with it another narrow-pinnuled form, which has been called *C. anthriscifolia*, in which the lobes of the pinnules are notched at the apex; this, however, Mr. Moore does not distinguish from typical *fragilis*. In the second group, *Dentatæ*, are placed the blunter-pinnuled, less-toothed, or blunt-toothed forms, of which *C. dentata*, Sm.—a plant of wide distribution—may be taken as the type. This has small fronds, four to eight inches in length which are sometimes simply pinnatisect, the segments being bluntly toothed, broadly ovate, and less divided, having the sori near the edge. This is given in our upper figure below; the lower one representing a form which has been called *C. cynapifolia*, but which Mr. Moore does not separate from *C. fragilis*. A curious permanent monstrosity (var. *interrupta*) is figured in "Nature-Printed Ferns;" it was found in Westmoreland, by Mr. F. Clowes, and is remarkable for the long intervals between the pinnæ, the fronds thus gaining a curiously-elongated appearance.

CYSTOPTERIS FRAGILIS.
(*a*) Var. DENTATA.
(*b*) Var. CYNAPIFOLIA.

Two varieties are so distinct as to require special notice. The first of these, called by Mr. Moore var. *scupervirens*, is a native of Madeira, which is said to have been found both in Devonshire and Kent, some uncertainty, however, attaching to its claims to rank as a British plant. The striking differences presented by this form, which Mr. Moore thinks may be entitled to specific rank, are—its evergreen character, the plant continuing to grow, in a cool greenhouse, throughout the winter, all the other species being quite dormant: the toughness of the stipes as opposed to the brittleness noticeable in all the other forms, from which, as has been already remarked, the species takes its name; "the greater size of the anterior basal pinnules," and "the glandular hairy vestiture of the indusium, which is conspicuous in the fresh plant." This is the only form of *C. fragilis*—if, indeed, it be not a distinct species—which occurs in the Canary Islands; it is also recorded from Malaga. The other variety, a very remarkable form, is *C. Dickieana*, Sim, which has very broad, blunt pinnules, with rounded overlapping segments, and the general form of the frond oblong. This variety was discovered by Dr. Dickie in a damp cave near the sea near Aberdeen, and has not been gathered elsewhere in

Britain or abroad; it must be therefore regarded as an accidental, or extreme form of *C. dentata*. Milde refers it to the following species (*C. alpina*) as a variety.

The distribution of *Cystopteris fragilis* under one or the other of its forms is a very wide one, as it extends into the extreme arctic regions and up to great elevations, whilst it also grows in temperate climates almost down to the sea-level. It is found especially in the interstices of rocks and stones, and on the sides and tops of the rough walls of hilly districts, and in Great Britain and Ireland is very common in the north, fairly so in the west, and rarer or nearly absent in the southern and eastern counties of England. Throughout northern Europe it is very common, and its range extends north to Iceland and Nova Zembla. It is found in all European countries, but in the south and Mediterranean region it is restricted to mountainous districts; thus in the Sierra Nevada of Spain it attains 10,000 feet, and in Sicily it grows on Mount Etna at an elevation of 9,000 feet. The Fern is found in Cyprus, in the Lebanon, the Caucasus, Persia, most parts of the Russian Empire, Kamtschatka, North China to the Himalayas (where it ascends to 16,000 feet), and other parts of Asia. In South Africa it is frequent, extending north into Natal and Abyssinia. In the New World it extends over the greater part of the North American Continent, where it is very common, reaching far into the Arctic regions, and extending south to California and Mexico. In South America it grows along the whole length of the Andean chain, also in the West India islands, and it is found as far south as Chili. It also grows in Tasmania; and is thus as nearly cosmopolitan as any plant can well be.

CYSTOPTERIS ALPINA, *Desv.*

By many good botanists this is not considered specifically different from the last, *C. fragilis;* even Prof. Babington, in the last edition of his "Manual of British Botany," places it, "with much doubt" certainly, under that species. We, however, rather follow the opinion of Sir W. J. Hooker, who considered it a good species, and maintained it as such in the "Synopsis."

The caudex and form of the fronds do not differ much from the last, but the stipes is less brittle and juicy. The fronds are bipinnate or almost tripinnate; the ultimate divisions being deeply cut, very fine, narrow and linear, obtuse and slightly notched or cloven at the end, and from their number and close arrangement they give a crisped appearance, reminding one of the Parsley-Fern. A character requiring, however, minute examination, is relied upon by some botanists to distinguish this species from the last in the veinlet of the segments, which in this terminates in the notch just alluded to, whilst in *C. fragilis* the veins run to the termination of the teeth.

This species is a rare one, and has a distribution of limited extent, chiefly in Southern Europe and Asia Minor. It is found in the Pyrenees, near Gavarni, and is not unfrequent in the Swiss Alps; it also occurs in the Jura. There are several localities in Spain and in Italy, also in Styria and Dalmatia, and this range extends to Greece, the Cilician Taurus mountains and Syria. The Greek plant of Mount Taygetus at 5,000 feet, called *Aspidium taygetense*, appears to be referable to this species. Britain seems to lie rather beyond the natural boundary of this beautiful Alpine Fern, but *C. alpina* has had a place in our Floras. It grew for many years on one or more garden walls in the village of Low Leyton, Essex, where it seems to have been first recorded about 1788. In the early part of the century it was abundant there, and was certainly gathered there so recently as 1840 or 1841. In 1861 it was searched for in vain, and is probably now extinct in the locality where it could not have had any claim to be considered native, but had been no doubt introduced. The other British localities are all doubtful,

Vincent Brooks Day & Son, lith.

CYSTOPTERIS. (THE BLADDER FERN.)

1 CYSTOPTERIS FRAGILIS 2 CYSTOPTERIS SUDETICA 3 CYSTOPTERIS MONTANA 4 CYSTOPTERIS ALPINA

(NATURAL SIZE

1A 2A 3A 4A UNDER SIDE OF PINNULE IN FRUIT (FOUR TIMES NATURAL SIZE)

but Professor Babington gives "Teesdale, Mr. J. Backhouse" with certainty, which locality, so rich in rare plants, should be carefully examined for the plant. Mr. Backhouse is said to have gathered it there in 1872.

C. alpina is not, as here understood, very variable, and may always be readily known by its long narrow segments as described above.

CYSTOPTERIS SUDETICA, *A. Br. & Milde.*

This species of Bladder-Fern was only made known to botanists in 1855, and has been found as yet in but few localities. The frond is larger than that of *C. fragilis*, and though like it in texture, in form it more approaches the next, *C. montana*. Its rhizome is creeping and branched, set at the end with short ovate paleæ, which have the margins entire. The fronds are from twelve to fifteen inches in length, more than half of which length is occupied by the slender, smooth, delicate stipes, which has scarcely any scales upon it. The frond itself is triangular, the lowest pinnæ being the longest; it is about six inches in length and the same wide; the pinnæ are distant and wide-spreading, oblong-lanceolate, acute, and tapering to a slender point, and are divided into ovate distant pinnules, which are very deeply cut into oblong blunt or wedge-shaped segments with several small teeth at the end. The sori are small, few, and distant, close to the edge of the segments, and the indusium is densely glandular. The spores are minutely tubercled.

This species is a native of mountain woods at 6,000 feet elevation and lower, in several places in the Sudetes mountains of Moravia; it has also occurred in Transylvania, Galicia, and several parts of the Carpathian chain, and has been found in Eastern Siberia near Yakutzk. The plant varies like the rest of the genus in the width of the segments of the pinnules.

CYSTOPTERIS MONTANA, *Bernh.*

This rare and beautiful species is quite distinct from the rest of the genus to which it belongs, and indeed presents a strong similarity to *Polypodium Robertianum*. Its rhizome is long and creeping, nearly black, and covered with large yellowish paleæ in the younger portions, the fronds being given off at longish intervals. The stipites are slender, erect, rather wavy, longer than the fronds, and provided very sparingly, chiefly below, with scattered lax ovate acute scales. The fronds are distinctly triangular in outline, about four to six inches in length, and about the same in breadth at the base, the two lowest pinnæ are very much the longest, all are wide-spreading, and the frond rapidly tapers to an acute point; the pinnules are ovate-oblong, spreading, acute, or tapering, markedly alternate, and those on the lower side of the pinnæ, especially of the two basal pinnæ, are very much larger than those on the upper, so that the pinnæ are strongly lop-sided; the pinnules are again divided into tertiary leaflets, which are ovate and very deeply cleft nearly to the base into broadish pinnatifid segments, with two or three acute teeth at the end of each division. The sori are small, and arranged in two lines, one on either side of the tertiary divisions; the indusium is ovate acute, sometimes toothed near the top, and smooth, but in old specimens it often becomes shrivelled and reflexed, and requires careful examination for its detection.

There is not much variability in this beautiful species, the chief difference in plants from various localities being in their size. This is noticeable in the English, or rather Scotch specimens,

which seldom attain the dimensions given above, the frond being usually nearer three than four inches in diameter, and similar small specimens occur from other localities.

C. alpina is one of our rarest alpine species, and has only occurred in a few localities in the highest of our Scotch mountains. It was discovered on Ben Lawers, in 1836, by Mr. W. Wilson, and has been since collected in Glen Lyon, Glen Lochay, and a few other spots in the Breadalbane Mountains. We have also seen specimens from the head of Glen Callater, Braemar, in Aberdeenshire, and from Glen Islay in the Clova mountains in Forfarshire. Tracing the distribution abroad, we find this fern fairly abundant in the mountainous parts of Scandinavia, extending into Finmark; and it occurs in most of the mountain chains of Europe, the Pyrenees, the Swiss Alps, the Tyrol, the Carpathians, and the Apennines. It has also been found in France, in Dauphiné, and in the Jura, and shows a special predilection for calcareous rocks. In Eastern Europe it does not occur, nor is it met with in the whole Asiatic Continent, with the exception of Kamtschatka. It, however, puts in an appearance in North America in the Rocky Mountains, especially their eastern side, and is also found in Labrador. In all its localities *C. montana* may be considered to be a rare species.

CYSTOPTERIS MONTANA.

PTERIS.

ACCORDING to the authors of the "Synopsis Filicum," this very large genus contains 100 species, and is represented more or less fully in almost every part of the world. They are for the most part large ferns, varying a good deal in habit and in the divisions of the frond, the rhizome being creeping or partly erect. Several representatives of the genus have long been inhabitants of our greenhouses, but some of these are natives of Europe, which will be considered at length further on. It is remarkable that nearly all the variegated ferns in cultivation belong to this genus; the best known and most popular of them is the variety of *Pteris cretica* which is known in gardens as *albo-lineata*, in which a broad and strongly marked band of white runs up the centre of each pinna. A species of wide distribution in both hemispheres—*P. quadriaurita*—produces two very striking varieties, which have been figured and described as species: the first, *P. argyræa*, like the variety of *P. cretica* mentioned above, has a more or less distinctly marked band of white running down the centre of the frond; this is an East Indian plant: the other, *P. tricolor*, is one of the most striking of variegated plants, whether ferns or otherwise; the centre of each pinna is of a bright rosy-red, with a margin of white, both being set off by the bright shining green of the other portion of the frond; like the last, this is a native of the East Indies.

One of the most common extra-European garden species is *Pteris serrulata*, a common plant in China which has recently been detected in Japan and Natal. It was introduced in 1770 by Mr. James Gordon. It is from a foot and a half to two feet high, with ovate pellucid bipinnate fronds, the pinnæ (especially the terminal ones) being much elongated. This peculiarity is remarkably developed in a recently introduced variety known as *P. serrulata Leyi*, in which all the pinnæ are contracted into slender serrate tails. This is the species which has been already alluded to in our introduction as affording an example of non-sexual reproduction from the prothallium.

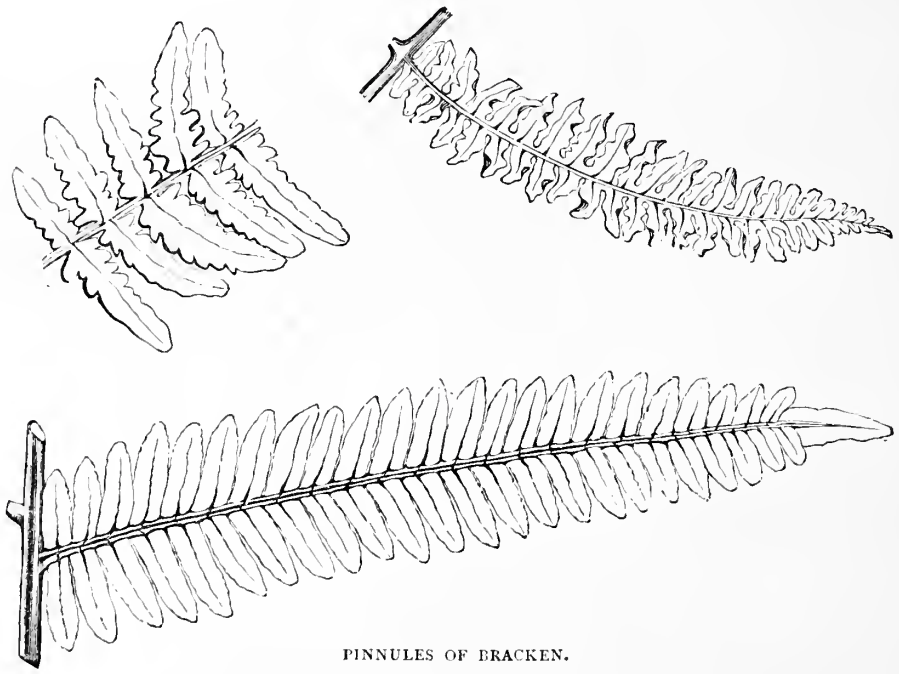
PTERIS AQUILINA, *Linn.* THE BRACKEN.

This is the commonest and most familiar of all Ferns, and attracts but little attention even from the lover of these plants, though its large size, remarkable structure, and bright fresh colour render it a very notable species.

The Bracken has a subterranean branching rhizome or caudex creeping for a long distance, and giving off irregularly numerous slender dark-coloured root fibres; it attains a diameter of nearly half an inch, is white within but externally brown, being densely covered with a fine close, velvety coat of short dark hairs; there are no scales or paleæ. The depth beneath the surface of the soil at which the rhizome runs is usually 3 or 4 inches, but it is said sometimes to "dip deeply and almost perpendicularly" to a depth of as many as 15 feet, and it grows with great rapidity. The fronds come off either rather closely or at longer intervals; when first appearing above ground they are remarkable in having the whole leafy portion bent over and pressed closely to the stipes. This latter is about half the length of the frond, and quite erect; it shows a remarkable difference between the portion beneath the ground connected with the caudex

and that in the air; the former is considerably swollen, rounded, and covered like the caudex with the same dark brown fine felt, but it tapers again at the very base; the upper part is quite smooth and shining, yellowish green or pale orange, flat above but much rounded beneath, and when mature rather sharply angular. The stipes is not articulated with the caudex, but after withering the lowest part remains attached to it.

On a section through the stipes, especially through the thickened lower portion, the familiar "eagle" or "oak-tree" is brought into view. This is formed by the fibro-vascular bundles, which are ten to twenty in number, being arranged in a singular way round the central dark mucilaginous portion. The fronds are among the largest of our native species, and, with the stipes, attain under favourable circumstances, 8 or over 10 ft. in height; 3 or 4 ft. is a more usual height, and when grown on very poor or rocky soil the whole frond is sometimes but a few inches high. The



PINNULES OF BRACKEN.

general form of the leafy portion is nearly triangular, especially in small specimens; in large ones the triangle is drawn out so as to be somewhat oblong, the two lowest pinnæ are, however, always much the longest; the composition is either bipinnate or tripinnate, and the rachis stiff, hard, shining, and deeply channelled on the upper surface. The pinnæ are very large, always opposite, ovate or oblong-ovate in outline, and distantly placed; their pinnules are alternate, closely placed, linear-oblong, but gradually tapering from the broad base, acute or drawn out into a long point. Each pinnule is divided into sessile, spreading, triangular-ovate, or oblong, or nearly linear segments, blunt at the end, and either quite entire at the edge, more or less wavy, or, the lower ones especially, further divided into blunt, oblong, or triangular lobes: these variations are shown in the above figures. The frond is smooth above, but covered beneath with fine white hairs; its texture is thick and leathery, and the colour bright pale green. The central vein in each segment is strongly marked; the lateral ones are faint and fine, and usually twice forked before reaching the margin, where they fall into a fine marginal vein which extends round the whole segment.

PTERIS AQUILINA. (L)

$\frac{1}{6}$ NATURAL SIZE

A. RHIZOME (NAT. SIZE) B. UNDER SIDE OF PINNULE SHOWING FRUCTIFICATION (NAT. SIZE) C. UPPER SIDE OF PINNULE (NAT. SIZE)

When the frond is fertile the margin of the segments is strongly and stiffly recurved, and the doubling back is continued by a delicate membranous curtain continuous with the edge of the segment; this is by some authors considered an indusium, by others as a portion of the frond, and it may be termed a false indusium. It covers the sporangia, which are arranged in a continuous line of sori along the whole length of the marginal vein above noticed, and it is worthy of particular remark that there is beneath the line of fructification a second membrane similar to, but shorter than, the first, and concealed by the sporangia; both membranes have a delicate fringe of hair-like processes. The lower one must be considered as a true indusium, and its presence distinguishes *P. aquilina* from the other species of the genus here described; it is said, however, to be sometimes absent. The spores are yellow, slightly granular, and tetrahedral-globose in shape. The peculiar double indusial membrane has led some botanists to make a separate genus of this plant, and it has been named *Eupteris* by Newman, and *Ornithopteris* by Agardh.

It is scarcely an exaggeration to say that the Bracken is found all over the world, for, with the exception of the extreme north and south, this is almost strictly the case. The Fern, however, puts on a rather different appearance in different parts of the globe, and the list of names which it has consequently received is very formidable; most of them are given in Hooker's "Species Filicum:" yet, considering the very great extent of its distribution, it cannot be considered a very variable species. The following are the varieties recognised by Hooker in the work above referred to:—1. *glabra*, with the fronds smooth or but slightly downy beneath. This is abundant in Europe, North America, and North Asia, and extends into South Africa, South China, Java, the Pacific Isles, and Brazil. 2. *lanuginosa*, with the fronds silky-tomentose beneath, and the pinnules more regularly pinnatifid: this is even more widely distributed, and is especially common in hot countries, as throughout tropical Africa, India, Penang, Sandwich Islands, Mauritius, Jamaica. 3. *caudata*, a West Indian and Central American form, with narrow linear segments, with the false involucres nearly meeting across the smooth back. 4. *esculenta*, which also has remote linear pinnules often running together, and decurrent, narrow, coriaceous, and smooth; the decurrent base usually forms a rounded lobe or short wing to the rachis; this is the common form in the Southern Hemisphere, and is often reckoned a separate species; it is abundant in Australia, New Zealand, and Norfolk Island, and is found in the Feejees, tropical America, the West Indies, and rarely in India.

In this country *P. aquilina* grows abundantly in all suitable spots, and forms a familiar feature of English scenery. For its due growth in luxuriance a fairly deep and light soil is necessary, and hence, probably, it is a rarer plant on chalky and limestone formations than in other districts. Heaths, borders of fields, and especially open places in woods or forest lands, are the favourite habitats of the Bracken. The range in altitude in this country has been found to agree very closely with corn cultivation, and *Pteris* is thus never an alpine plant. In no parts of the Scotch Highlands does it reach higher than 1,900 or 2,000 ft., and it has been employed by geographical botanists as a convenient test of elevation and boundary line between alpine and non-alpine vegetation.

Passing by slight varieties, a few words must be said about a puzzling little fern frequently met with in wet seasons in the chinks of brick walls and similar places, which has been mistaken for Maidenhair more than once. It is usually but a few inches high, very delicate in texture, with the frond slightly divided into wide segments, and never produces any fructification. This is nothing but the young "seedling" state of the Bracken, the spores of which have germinated in an unsuitable position; such little ferns are often seen on walls in cities; thus on the Tower

of London a few years back it was abundant, as recorded in the "Flora of Middlesex." The same form comes up frequently in hot-houses. Occasionally it develops into a large plant, while still retaining its juvenile characters, and then presents a very singular appearance; in this form it is sometimes met with in woods, where it attracts attention by its delicate texture. Specimens in the Herbarium of the British Museum, collected by Mr. T. Kirk at Coventry, grew profusely over the floor (composed of mortar) of a deep pit excavated for a swimming bath; in this situation the fronds attained four feet and upwards in length, but were unable to bear their own weight; they were barren and very delicate, transparent and pale green, with broad segments: the rhizomes were from six to ten inches long. It is certain that the recently published new Scotch species, *P. gracile*, Paterson,* is nothing but this, and its author has unfortunately added but one more to the already almost innumerable names for this species.

The only part of Europe where the Bracken is not found is the extreme north; in Lapland it does not extend beyond quite the southern part, and is there very rare.

The Bracken has, perhaps, more claims to be considered of economic value than any other species of Fern, and it has certainly been employed in a variety of ways. It has been proposed as an article of food; and the rhizomes of the closely-allied species or variety (*P. esculenta*) were formerly largely employed in New Zealand by the natives. The Rev. M. J. Berkeley obtained by peeling and scraping some of the rhizomes of our common Bracken a pulp, which, after careful washing and drying, was kneaded into a cake and baked, the result being a coarse but palatable food, somewhat resembling cassava-bread. In Siberia and Lapland—some say also in Normandy—it is sometimes mixed with bread or brewed in ale, one-third of the rhizomes going to two-thirds of malt in the latter case; and in the Canary Islands also a kind of bread is made from the rhizome. The green fronds in the young unexpanded state are in some parts of England used as food for pigs, and in some parts of Wales the dry fronds are chopped up in winter with straw and hay and given to horses. Mr. Benjamin Clarke suggests the employment of the very young fronds as a substitute for asparagus. They should be cut as soon as they first begin to appear above the ground, and as low down as may be; when quite blanched they must be boiled for an hour, or rather longer if at all tinged with green, the leafy part, if any be present, being in all cases rejected. A sufficient quantity of salt must be added to the water, so that the vegetable may gain a slightly saline taste. When at all green, the cooked fronds retain a somewhat harsh and herbaceous flavour, not unlike that of tea; but this is hardly perceptible in the blanched fronds. They are slightly astringent, and the proposition for thus employing them does not appear to have been at all generally taken up. Thunberg tells us that in Japan the young fronds form an article of diet, and that bundles of them are exposed for sale in the shops during the months of April and May. The rhizome is bruised, soaked in water, and boiled, and though quite black, is or was formerly eaten by the poorer Japanese.

In many parts of Great Britain the Bracken is in great request for litter for horses; and in some parts of Wales it is chopped up when dry and mixed with hay or straw, and then given to them as food. In Scotland it is often used for thatch, the stalks being the part most frequently employed, being bound down with ropes of heath or birch-bark. Its use in this manner in England dates very far back; in a statute of Edward the Third, dated 1349, it is enacted that every tiler or coverer with straw or fern shall receive threepence a day, their servants or knaves twopence a day, and their boys three-halfpence a day.

The ashes of the Bracken contain a large amount of alkali, which has been turned to useful account in the Western Isles of Scotland, and in some of the mountainous districts of

* "Clydesdale Flora," ed. 2.

Wales. The dried fern is burned in large heaps, and, sufficient water having been sprinkled on the ashes to make them adhere together, they are rolled into round balls about two inches in diameter. When quite dry, they are sold at from threepence to eightpence a dozen, being used in wash-houses to save soap. Having been heated to a red heat, they are taken out of the fire and thrown into a tub of water, which soon becomes a strong lye, and is then fit for use. This method of employing the Bracken is of considerable antiquity. Parkinson, writing in 1640, says, "They use in Warwickshire, above any other country in this land, insteed of sope to wash their clothes, to gather the female ferne (for that is most frequent with them) about midsomer, and to make it up into good big balls, which when they will use them they burne them in the fire, untill it become blewish, which being then layd by, will dissolve into powder of itselfe, like unto lime: foure of these balls being dissolved in warme water is sufficient to wash a whole bucke full of cloathes." The Bracken was called by the older writers the Female Fern, in Latin *Filix fœmina*, the Male Fern being that which still retains the title (*Aspidium Filix-mas*). The two are contrasted by Lyte, who says, "There be two kindes of fernes (as Dioscorides writeth) the male and the female."

The ashes of the Bracken have also been used by glassmakers. In some parts of Switzerland the alkali is obtained for commercial purposes. The fronds are cut about the end of June, when they have arrived at about half of their full development, as it is then that they contain most potash. They are allowed to become half dry, and a pit is then dug into which the fern is cast; it is then burnt very slowly, care being taken to prevent a flame. A good deal of attention is requisite to obtain satisfactory results, but this is a point upon which experience is needed, as no definite rules can be laid down. When the whole is burnt, the ashes are collected, and are sold either in that state, or after a further preparation by which the pure salt is obtained. The plant is also employed in various parts of the country for thatching or as fuel, and especially in packing fruit for the markets, a purpose for which it seems peculiarly suited. We find mention in Machyn's Diary (1552) of a man who was convicted of selling "potts of straberries, the whych the pott was not alff fulle, but fylled with forne," and one of its French names is *fougère à cerises*, in allusion to its use in packing cherries for the market; so that the employment of Bracken in this capacity is both ancient and extended. The rhizomes are said to be eaten in winter by swine in the New Forest; but they are considered poisonous to cattle in general, and in some parts of Scotland are suspected to be the cause of a disease in sheep known as the "trembles."

The Bracken was in old times extensively used in medical practice, although this is scarcely remarkable, as every plant was accredited with numerous "vertues" two hundred years or so since. Besides its use, in common with almost all other ferns, as an anthelmintic, it was considered to possess healing qualities; "the rootes," says Parkinson, "being bruised and boyled in oyle or hogs grease, maketh an oyntment very profitable to heale woundes, punctures, or prickles in any part." The following "vertue," from the same author, is somewhat amusing:—"The fume of ferne being burned driveth away serpents, gnats, and other noisome creatures, that in the fenny countries much molest both strangers and inhabitants that lye in bed in the night time with their faces uncovered." Langham, in his "Garden of Health" (1633) gives nineteen distinct "vertues" pertaining to fern, from which we select the following, as showing the varied uses to which our predecessors applied the plant:—"Nose bleeding, the roots staunch bloud, and heale the wound . . . . Chop a basket full of fearn and seeth it in a bag in the third part of a tun of water, and bathe therein to restore the strength of the sinews . . . . The leaves of both fearns put into bedstraw, driveth away punises [fleas], and all other such wormes . . . . The powder of brakes doth heale dangerous sores both of men, kine, swine, &c."

From an entry in the household book of the Earl of Northumberland (1511), it appears that "water of braks" was distilled every year for domestic use. At a much later period even, the odour of fern was considered beneficial; in a MS. upon the Natural History of Wiltshire, by John Aubrey, in the possession of the Royal Society, we read that "Dr. Theodore Mayern did prescribe to his patients that had hecticke feavers, to lay a stratum of ferne on their under-blanket, by which they found much benefit; the frescheur of the ferne was moderately cooling, and the sent of it is very gratefull to the braine." Gerard says that "it is reported that the roote of ferne cast into an hogshead of wine keepeth the same from sowring."

The Bracken is the plant usually intended under the name of "fern" in poetical works, as when Cowper speaks of

> "The common overgrown with fern, and rough
> With prickly gorse:"

and Burns refers to it by its other common name when he says,

> "Far dearer to me yon lone glen o' green breckan,
> Wi' the burn stealin' under the lang yellow broom."

Breckan would seem, however, to be a Scotch name for ferns in general: it scarcely applies to *Pteris aquilina* in Tannahill's lines

> "Round the sylvan fairy nooks
> Feathery breckans fringe the rocks."

The Bracken is also the fern with the seed of which the gift of invisibility, referred to by Shakespeare and other old writers, was especially connected. It seems likely that the notion arose in an application of the "doctrine of signatures," according to which plants were supposed to bear some resemblance to the disease or purpose for which they might be beneficially employed. As far back as the time of Pliny, it was thought that the fern produced neither flower nor seed; but as, in spite of this, it grew and multiplied, it was inferred that seed must be produced, although invisibly, and hence it came to be associated with the gift of invisibility. Locally, however, there are legends which suppose that the Bracken, in olden time, did produce blossoms; thus, in Lincolnshire, it is said that until the Nativity it bloomed like other plants, and that it formed part of the cattle-bedding in the stable at Bethlehem, associated with the Lady's Bedstraw. The latter plant put forth its blossoms in honour of the miraculous event, while the Bracken withheld them, and was hence condemned to lose them. In some parts of Shropshire it is said that the Bracken puts forth a small blue flower on Midsummer eve, which disappears with the first dawn of day; and the Russian peasants also believe that it blossoms at this time, and that the finding of the flowers brings luck. It was formerly believed in Scotland that this fern blossomed on St. John's eve, and that whoever got possession of the flower would be protected from all evil influences, and would obtain a revelation of hidden treasure.

Midsummer eve was the period at which it was generally supposed the mystic fern-seed could be collected, and the accompanying gift of invisibility ensured.

> "On St. John's mysterious night,
> Sacred to many a wizard spell,
> The time when first to human sight
> Confest the mystic fern-seed fell:
> Beside the sloe's black knotted thorn,
> What hour the Baptist stem was born—

That hour when heaven's breath is still—
I'll seek the shaggy fern-clad hill,
Where time has delved a dreary dell,
Befitting best a hermit's cell;
And watch, 'mid murmurs muttering stern,
The seed departing from the fern,
Ere wakeful demons can convey
The wonder-working charm away,
And tempt the blows from arm unseen,
Should thoughts unholy intervene."

Occasionally, however, though rarely, another date was selected; Mr. Kelly* tells us that in Swabia they say that fern-seed brought by the devil between eleven and twelve o'clock on Christmas night enables a man to do as much work as twenty or thirty ordinary men. In France it was formerly believed that internal disorders of all kinds would be cured if the patient wore on his person a girdle of ferns, gathered at midnight on St. John's eve, and so arranged as to form the mystic letters HVTY. The use of this girdle was condemned by a Synod held at Bordeaux in 1600; and a similar assembly at Ferrara in 1612 censured any one who should collect either ferns or fern-seed on the night preceding the day of St. John Baptist.

Turner, our earliest writer upon English plants, gives the evidence of a German contemporary to show that ferns really did produce seed on Midsummer eve, but there is an amusing air of mystery about his account. Premising that a "Christen Phisicion, named Hieronymus Tragus, doth not onlye saye that Ferne hath sede, but wrytith that he founde upon mydsomer even sede upon Brakes," he proceeds to translate his words as follows:—

"Although that all they that have writen of herbes have affyrmed and holden that the Brake hath nether sede nor frute: yet have I dyvers tymes proved the contrarye whiche thinge I will testefye here in this place for there sakes that be studentes in the knowledge of herbes. I have foure yeres together one after an other upon the vigill of saynt John the Baptiste (whiche we call in Englishe mydsomer even) soughte for this sede of Brakes upon the nyghte, and indede I founde it earlye in the mornynge before the daye brake; the sede was small blacke and lyke unto poppye. I gatherid it after this maner: I laide shetes and mollen leaves underneth the brakes whiche receyved the sede that was by shakynge and beatynge broughte oute of the branches and leaves. Manye brakes in some places had no sede at all, but in other places agayne a man shall fynde sede in everye brake, so that a man maye gather a hundred oute of one brake alone, but I went aboute this busynes, all figures, conjurynges, saunters, charmes, wytchcrafte, and sorseryes sett a syde, takynge wyth me two or three honest men to bere me companye. . . . . Sometyme when I soughte the sede I founde it and sometyme I founde it not. Sometyme I founde muche and sometyme lytle; but what shoulde be the cause of this diversyte or what nature meaneth in this thinge, surelye I can not tel."

That "figures, conjurynges," and the like, were associated with the gathering of fern-seed we gather from a very explicit account of the *modus operandi* formerly pursued in Staffordshire. Having arrived at a suitable spot, a circle was drawn round the would-be gatherer, in which the twelve signs of the zodiac were inscribed; twelve pewter plates, one within another, were then to be placed under the fern, and the following distich recited:—

"In the holy name of Jesus may I be freed
From every harm while gathering Fern-seed."

After this, silence was to be observed until one o'clock, nor must the circle be quitted; the seed will then be found in the twelfth plate, having passed through the eleven others.

In Surflet's "Countrie Farme" (1600) there is a passage which shows that fern-seed could be collected at home, without the necessity of exposure to the perils which sometimes attacked

* "Curiosities of Indo-European Tradition and Folk-lore," p. 193.

its would-be possessor. Surflet says it is ripe "in the end of July," and adds: "For to gather it you must cut the leafe neere unto the roote, and then hang them up in your house, spreading a linnen cloath under them, or else some faire, cleane white paper: I knowe well that the common sort doe verily thinke and averre, that this seede cannot be gathered but on the night of the wake of S. John in sommer, and that more is, not without great ceremonies and mumbling and muttering of many words betweene the teethe, which have power to drive away divels, which have the custodie of the same seede: but all this is nothing but fables."

In Russia the belief in the midsummer flowering of the fern is in full force, as may be seen in Prof. De Gubernatis's "Mythologie des Plantes." It is said that the man who finds the flower will acquire boundless wisdom; but the flower is only to be found for a single instant at midnight, and it is necessary to conquer the evil one himself before the blossom can be seen. This must be done in the following manner: on the appointed night he who dares to attempt the enterprise must select the particular fern which he desires to see flower, and must place near it the towel which he used on Easter-day. He must then, with a knife which he used on the same feast, trace a circle round the fern and round himself. At nine o'clock in the evening the devil will attempt to terrify the Christian, throwing at him stones, wood, and other heavy missiles; but the watcher is exhorted to remain calm and to show no symptom of terror, as the evil one has no power to enter the magic circle traced by the knife. At the hour of midnight, the fern blossoms, and the flower falls upon the towel, which the Christian must instantly seize and conceal in his bosom. The fortunate possessor, thanks to this possession, will know things present and things to come, and will be able to discover hidden treasures or lost cattle. In illustration of this belief a story is told in Russia of a countryman who had lost his oxen upon the eve of St. John. In prosecuting his search for them, he crossed a wood, and passed close to a fern at the very moment of its flowering, and the blossom fell into his shoes. He immediately became acquainted with the place where the cattle were hidden, and, going to it, recovered them, and took them with him. The fern-blossom still remaining in his shoes, he became aware of a certain place where a treasure was hidden, and told his wife that he would go and find it. "Change your shoes," said the good woman, seeing that his stockings were damp; he unfortunately followed this advice and took off his shoes; at the same moment the flower of the fern fell to the ground, and he forgot all about the discovery of the treasure! In another version of the same story it is stated that the devil, in order to deceive the peasant, offered to give his boots in exchange for the wretched shoes of the countryman; the latter consented to the bargain, and, giving up his shoes, lost all knowledge of the treasure he was about to seek.

It would be interesting to ascertain whether the gathering of fern-seed is still observed in any part of England. Brand says that at Launceston, in 1790, some rites connected with it were still in use, and also in Heston, in Middlesex, towards the close of the last century. The connection of fern-seed with Midsummer-day is to be found in the fact that June 24th is the day set apart by the Catholic Church for the commemoration of St. John the Baptist; a passage in Dr. Jackson's "Works" (1673) states, on the authority of "an ignorant soul," who "had been seduced by a teacher of unhallowed arts, to make a dangerous experiment," that "the angel did foretell John Baptist should be born at that very instant in which the fern-seed, at other times invisible, did fall." The danger of engaging in the collection of fern-seed was not trifling, if we accept as accurate the account of a person who went out for that purpose, and was assailed by the spirits, who "whisked by his ears like bullets," and struck him on his hat and on various parts of his body; while, worse than all, he found the box, in which he thought he had secured the

coveted treasure, quite empty on his return home. The gift of invisibility was sometimes conferred upon those who came into possession of fern-seed without any desire of their own. Thus Grimm tells as current in Westphalia a tale of a man who went out on Midsummer night to search for a foal which he had lost, and who, on his way, passed through a meadow just as the fern-seed was ripening, some of which fell into his shoes. When he went home and sat down, neither his wife nor any of his family noticed him, which he thought strange, and proceeded to say "I have not found the foal." On this, all those in the room started, for they heard the voice, but saw no one. His wife, thinking he had hidden himself, called to him, whereupon he placed himself in the middle of the room, saying "Here I am, right before you; what do you want?" This frightened them still more, for they had heard him stand up and walk, and yet saw nothing. At last, becoming aware that he was invisible, the thought struck him that he might have fern-seed in his shoes, and on taking them off he at once became visible to those around him.

Various traditions connected with ferns and fern-seed are to be found in different parts of Europe. Thus in Poland it is said that a thunder-storm will follow if ferns be gathered; in Thuringia it is said that whoever treads on it unawares will lose his senses, and be unable to tell where he is, and also that anyone carrying fern about with him will be pursued by serpents until he throws it away. In the north of Hungary it is supposed that whoever comes too near the flowers of fern will be overcome with sleep, and that spirits repulse all who dare to lay hands upon the plant. So much for the unfavourable aspect of ferns, to which we may add the opinion of the natives of our own "Black Country," who think it unlucky to gather or even to touch ferns, and call them the devil's brushes. A quaint letter to the High Sheriff of Staffordshire, from a British Museum MS. which was published in an early volume of "Notes and Queries," is worth reprinting here, as illustrating a curious seventeenth century belief, from which Charles I. was not free. It runs as follows:—

"Sir,—His Majesty taking notice of an opinion entertained in Staffordshire, that the burning of Ferne doth draw downe rain, and being desirous that the country and himself may enjoy fair weather as long as he remains in those parts, His Majesty hath commanded me to write unto you, to cause all burning of Ferne to bee forborne, until his Majesty be passed the country. Wherein not doubting but the consideration of their own interest, as well as that of his Ma^ties^, will invite the country to a ready observance of this his Ma^ties^ command, I rest,

"Your very loving friend,

"PEMBROKE AND MONTGOMERY.

"Belvoir, 1st. August, 1636."

It seems that in some parts of Scotland there is a generally received opinion that burning the heather will bring rain.

On the other hand there are some local beliefs in which the fern figures as a lucky plant. Mr. M. D. Conway says that in Bohemia the traveller will take fern-seed along with him for good luck; and here, as in the Tyrol, the seed is said to shine like fiery gold upon Midsummer night. In early times fern-seed was called "wish-seed," and he who held it would find hidden treasures which, where the seeds were scattered, would reveal themselves in veins of bluish flame in the earth. In Bohemia a cloth used in administering the Holy Communion should be laid under the fern, on which the seed will fall before sunrise. Other superstitions connected with the Male Fern and the Flowering Fern will be found in their place.

One or two proverbial sayings are associated with the Bracken in different parts of England, of which the following is perhaps the best known:—

"When the fern is as high as a spoon,
You may sleep for an hour at noon:
When the fern is as high as a ladle,
You may sleep as long as you're able:
When the fern begins to look red,
Then milk is good with brown bread."

If the rhizome of the Bracken be cut across, it will be seen to display dark irregular markings, which have been very differently interpreted. They have been supposed to represent a double-headed eagle, an interpretation which seems to have originated in Germany, and is of considerable antiquity; for we find in "The Pilgrimage of Pure Devotion," one of the colloquies of Erasmus, a reference to an imaginary likeness of a toad in the Crapaudine, or Toadstone, "even as we suppose when we cutte the fearne stalke there to be an eagle." Our old herbalists also mention the resemblance. It was in allusion to this likeness that Linnæus bestowed the name *aquilina* (from *aquila*, an eagle) upon the plant. Others detect in the markings a branching oak, which, according to some, commemorates the concealment of Charles II. in the oak after the battle of Worcester. A perfect representation was considered lucky; at least, so says a correspondent of "Notes and Queries" (1st series, vii. 152), who gives as a piece of Surrey folklore, "Cut a fern-root slant-wise, and you'll see a picture of an oak-tree: the more perfect the luckier chance for you." A more pious, though equally fanciful, tradition discovers the initials "J. C.," standing for Jesus Christ; an idea far-fetched and strange enough to the minds of the nineteenth century folks, but not unreasonable to those who in bygone times loved to trace such analogies between the kingdom of grace and the kingdom of nature. The letters were, however, sometimes interpreted as possessing a very different signification; in Sussex it is said that the initials of the name of a future husband or wife may be ascertained in this manner. In some parts of Scotland it is said to be the mark of "the deil's foot."

It is not often that the muse has honoured any member of the fern tribe with more than a passing reference; we have, therefore, no hesitation in including in our notice of the Bracken the following graceful lines, addressed to it by Miss Mary Isabella Tomkins:—

"As a coming screen grows the Bracken green,
Up springeth it fair and free,
Where in many a fold, grotesque and old,
Twineth the hawthorn tree;
A covert meet from the noontide heat,
For should you steal anear,
You may chance discern, 'neath the spreading fern,
The antlers of the deer.

It boasteth a name of mystic fame,
For who findeth its magic seed
A witching and weirdly gift may claim
To help him at his need:
Unseen, unknown, he may pass alone
Who owneth the fern-seed spell;
Like the viewless blast, he sweepeth past,
And walks invisible!

Have ye to learn, how the Eagle fern
Doth in its heart enshrine
An oak-tree like that which the hunter Herne
Haunted in days 'lang syne?'

An oak-tree small is repeated all
Complete in branch and root,
Like the tree whereunto King Charles did flee,
When press'd by hot pursuit.

To his son its shade gave but traitor aid
When, striving to be conceal'd,
On foot he fled, in fear and dread,
From Sedgemoor's fatal field;
In doubt mean was a peasant seen,
Wearing a priceless ring—
He whom the voice of the people's choice
So late had hailed their King.

O Eagle fern! when I thee discern,
When thy withered leaf I meet,
In places the careless foot might spurn,
The crowded mart or street,
Thou takest me back to thy birth-place fair,
Where thou wavest in thy pride,
And the form of the hare and the deer's close lair
Doth 'mid thy stems abide."

In reclaiming forest land, it is often necessary to destroy Bracken, and this may be efficaciously done by repeated mowings. Tusser ("Five Hundred Pointes of Good Husbandrie"), under "August's Husbandrie," writes:—

"Get downe with thy brakes, er an showers doo come,
That cattle the better may pasture have some.
In June and in August, as well doth appeere,
Is best to mowe brakes, of all times in the yeere."

When the early settlers established themselves in New Zealand, cultivation was much hindered by the great abundance of *Pteris esculenta*, which had been cherished by the natives for centuries as an article of food; it was found, however, that by sending cattle to browse upon the young leaves, the plants were trodden down and quickly perished, being succeeded by rich, wholesome grass. If mown down two or three times in the course of a summer, while the fronds are still young, the fern will soon be eradicated. If, on the other hand, it is desired to establish the Bracken in any locality, the rhizome should be taken up in lengths of two feet, or thereabouts, care being taken not to injure the roots, as the fibres are brittle and readily break off; the beginning of October is a good time for performing the operation.

Although so common a plant, *Pteris aquilina* has not an extensive popular nomenclature. It is most generally known as Brake or Bracken—the latter name varying to Breckon or Braikin—although, as we have already seen, this is sometimes used for ferns in general. Dr. Prior derives the word Brakes from the German word *brache* or *brach-feld*, uncultivated land, a term which was used "to replace the mediæval Latin *fractitius* or *ruptitius* ager, land that is breakable, or again open to tillage after a term of years, land that is not preserved as forest. The fern so called is named from its place of growth in the same way as whin, heath, bent, and brier." Bracken he considers a word introduced from Scandinavia, and identical with the Swedish *bräken*, which Rietz derives from *brăcka* (break). It is called the Eagle Brake, which was an Anglo-Saxon form of the name; and Mr. Cockayne quotes "wylde brake" as occurring in a MS. of the 12th century. This may be the plant intended in the

Anglo-Saxon "Herbarium Apulcii," under the name of fern: "For wounds, take a root of this wort, which is named filex, and by another name fern, pounded, lay it to the wound"; and again, in the "Leech-book" (i. 23), also edited by Mr. Cockayne: "For thigh ache, smoke the thighs thoroughly with fern."

The Bracken is called the Eagle Fern in books, with reference to the markings in the rhizome already described, and the Scotch name Ern-fern has a similar meaning, ern being a Scotch word for eagle. In Norfolk it is sometimes called the Oak Fern, again in allusion to the form which the markings of the rhizome have been supposed to exhibit. We have already pointed out the meaning of the name Female Fern as applied to the Bracken. Jamieson gives Shady-bracken as one of its Scotch titles. In Sussex it is sometimes called Adder-spit. It is known in French as *fougère porte-aigle*, *grande fougère femelle*, and *fougère à cerises*.

PTERIS ARGUTA, *Ait.*

We have here another fine species, which only reaches the south-western shores of Europe, and is unknown in the rest of the continent. *P. arguta* (which is sometimes called *P. palustris*, Poir.) is a fern with a creeping rhizome, covered at the end with copious, very narrow, long, shining, dark-brown paleæ. The stipites are stout, hard, and erect; quite smooth, cylindrical, without any scales or hairs, and of a bright orange-brown: they attain a length of one or two feet, and support a frond of about the same or rather greater length. This is of a thin almost membranous texture, and has a somewhat drooping habit; its outline is ovate, narrower or broader in different specimens, and very acute. The pinnæ are large, not very numerous, rather distant, nearly opposite, and directed forward; their usual form is lanceolate-oblong, drawn out and tapering at the point; they are sessile on the main rachis, or very nearly so, the lowest pair being sometimes shortly stalked. These pinnæ are simply pinnate, or perhaps we should rather say pinnatisect, the pinnules or segments being very broad-based, oblong-lanceolate, somewhat curved forward or falcate, acute at the end, and finely but sharply toothed along the edge; they are decurrent at the base, as is specially observable in the lowest one next the rachis, which usually runs down the latter for a short distance. The colour is a bright, clear, dark-green, the surface is quite smooth, and the lateral veins are simply forked, a branch running into each tooth. The lowest pinnæ are not unfrequently further divided, the pinnules, on the lower side especially, being large and long, and divided into tertiary divisions of similar form to those above described. The sori are placed on the edge of the segments, in a line of variable length, and never occupying the whole of the margin; it is usually the lower part that is soriferous, the upper portion being barren; at the parts where there is fructification the marginal teeth are absent. The sporangia are very numerous, and nearly covered by the membranous, greyish-brown false indusium, which has no teeth or hairs at the edge; there is no true inferior indusium, but numerous minute thread-like bodies mixed with the sporangia are supposed to represent it.

The head-quarters of this beautiful species are in the Atlantic Islands, especially Madeira, where it is abundant in wet shady ravines from nearly the sea-level up to 3,000 feet; in the Azorean Islands it is also common, and it grows in Teneriffe. As above remarked, the only certainly known locality on the Continent of Europe is in Portugal, where, in the Serra de Cintra, near Lisbon, it has long been known to occur rarely. The late Dr. Welwitsch collected specimens in this locality in 1848, but it has not been met with in other parts of the Spanish

Peninsula. We have met with a record of "Corfu" for this Fern, but do not know on whose authority it rests. Beyond Europe, it grows in Arabia and in many parts of tropical Africa (Abyssinia, Angola), and also reaching the Cape of Good Hope (*P. flabellata*, Thunb.). What is probably the same species also occurs in the West Indies, so that, though so rare in Europe, this species occurs over a wide extent of the globe.

P. arguta has long been met with in our greenhouses; it was introduced to cultivation in England in 1778, by Francis Masson.

PTERIS LONGIFOLIA, *Linn.*

In this species the caudex is short and tufted, and the fronds come off in close proximity; its extremity is covered with elongated, narrow, pale-brown scales, which also extend up the stipites of the fronds, though in no great number. The stipes is rather short, sometimes very remarkably so, and is channelled along its upper surface and sides; when young it is covered with narrow pale-coloured scales, but afterwards becomes nearly smooth. The whole length of the fronds varies considerably, but in European specimens does not much exceed two feet; their form is lanceolate, much tapered towards the base, and they are simply pinnate. The pinnæ are remarkably long and narrow, quite undivided, usually opposite or nearly so, sessile, and placed at a distance from one another; they are four to six inches long and much drawn out, their form being linear, but widest at the base, which is abruptly truncate or frequently cordate or eared; the frond ends in a single terminal pinna, which is usually longer than the rest. The veins are closely placed and free, terminating at the margin of the pinnæ, which is finely but sharply senate, with minute hard teeth. The sori are marginal, copiously produced, extending along nearly the whole border of the pinnæ, and covered with the quite entire reflexed false indusium.

This is a southern Fern, and its European localities are all in the Mediterranean basin. There are several in the south of Spain, as near Malaga and Granada, but it does not grow in other parts of Spain or in Portugal. In Italy, *P. longifolia* is found in Calabria and near Naples, and in Sicily there are several well-known localities. An outlying station is the island of Ischia, off the Neapolitan coast, where the Fern grows on the hot tufaceous rock of an extinct volcano, from which place there are specimens in the British Museum herbarium. Passing eastward, we find it in Dalmatia, Zante, and the Morea, and it further extends in this direction, out of Europe, to Lycia and Syria. Returning along the south shore of the Mediterranean, Egypt and Algeria produce the plant, and it is also found in the Canary Islands and the Cape Verdes, but does not reach the Azores. It grows in shady wet places on rocks and old walls.

Beyond these regions, however, *P. longifolia* is found in most of the hot countries of the world. It is abundant in tropical Asia, as throughout peninsular India (ascending to 4,000 feet in the Himalayas), Java, the Malay Archipelago, &c., and reaches to the Pacific Islands. In tropical Africa it has a wide distribution also, and grows in Madagascar and in Mauritius. It is less common in America, though abundant in the West Indian Islands; Mexico and Venezuela appear to be the only localities on the continent.

Out of the very numerous names—about twenty in number—which have been bestowed upon this species, we may mention two by which it is frequently known: *P. ensifolia*, Sw. and *P. vittata*, Linn. It is very frequently met with in cultivation, and is most easily grown;

indeed, its spores develope in such abundance, and so rapidly, that the plant sometimes becomes a positive nuisance in hothouses. It was introduced to English gardens in 1770, having been brought from the West Indies by Mr. James Gordon. There is an admirable folio plate of the European plant in a little known work by MM. Chaubard and Bory de St. Vincent, published in 1838, and entitled, "Nouvelle Flora du Péloponnèse et des Cyclades."

PTERIS CRETICA, *Linn.*

This is well known in cultivation, and is not a very variable plant. Its caudex is very short, so that the fronds are closely set and have a tufted appearance, and is sparingly clothed with small dark brown paleæ. The fronds are of no great size, varying from one to two feet, of which the stipes occupies about half; this is stiff, erect, and perfectly smooth, somewhat three-sided above, but rather dilated at the base, where it is darker in colour. The frond itself is wider than in the last species, *P. longifolia*, its outline being distinctly ovate, or even broader than long, abrupt at the base, and more or less acuminate at the apex. It is pinnate, but not so simply as the last, the lowest pair or pairs being again divided. In texture this Fern is thick and firm, and in colour a glossy bright green. The pinnæ are few in number, being, indeed, sometimes reduced to three—that is, one pair and the terminal one; but more often there are six to ten pairs; in form they are not unlike those of the last species, being distantly placed on the rachis, sessile, and very long, and tapering to a slender, much attenuated point; their base is also tapering, not truncate, and sometimes even decurrent down the rachis. As above noted, the lower pinnæ are compound, but they are so in a somewhat peculiar manner, appearing rather as if two or three pinnæ had coalesced; the separate segment or segments being usually nearly as large as the primary pinna, and similar to it in form and venation; this latter is free, the veinlets being branched close to their base. Though it can be scarcely said that the fertile and barren fronds of this species are always distinct, yet there are frequently fronds which produce no fructification. These possess broader pinnæ, more lanceolate in shape and shorter. In all the fronds the margin of the pinnæ is set with very sharp spinous teeth, especially developed towards the ends of the pinnæ, but where the margins are occupied by sori these teeth are not found. The line of sori is broad and continuous along the margin of the fertile pinnæ for about three-quarters of their length, the upper part only being without them. The reflexed false indusium is much narrower than in the last species, and covers but little of the sori; there is no rudiment of a true indusium.

Like the last species, this is a South European Fern, and is rather widely spread through the Mediterranean region. We have seen specimens from Corsica, where it seems abundant; but it does not appear to reach westwards to the Spanish Peninsula, nor does it grow in Southern France, though there is a locality at Mentone, close to the frontier of that country. In several parts of North Italy it is met with, the most northern locality being near Como, and in South Italy and Sicily it is more frequent. Sardinia and Crete (whence it takes its name) also produce this Fern, which extends its range to the Caucasus, Persia, and Arabia. It has been collected, too, further north, in the Ural district near Baku.

In Africa, *P. cretica* grows in Abyssinia and in the Cape Colony, and has been found in Bourbon. It is a frequent Fern in India, extending up to 6,000 feet in the Himalayas, and occurs in the Malayan Islands frequently, and in the Pacific ones also. It also reaches the southern part of North America and Mexico, and in South America it is found in Guatemala,

A. PTERIS LONGIFOLIA *(L.)* B. PTERIS ARGUTA. *(Ait)* C. PTERIS CRETICA. *(L.)*

($\frac{1}{10}$ NATURAL SIZE)

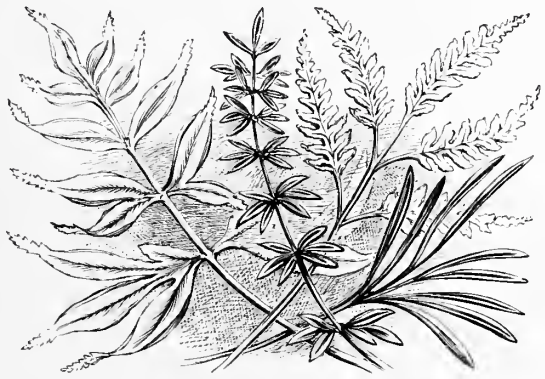
a. PORTION OF PINNULE (NAT. SIZE) a. PORTION OF BARREN PINNULE, UPPER SURFACE (NAT. SIZE) a. PORTION OF PINNULE (NAT. SIZE)

b. PORTION OF FERTILE PINNULE, UNDER SURFACE. (NAT. SIZE)

Entre Rios, &c. Considering its very wide dispersion, it does not present us with much variability. Its sharp spinous teeth are alluded to in several of the synonyms which it possesses: for instance, it is the *P. serraria* of Swartz, a very good name.

Although now so commonly met with, *Pteris cretica* was not introduced to our gardens at a very early period. The exact date of its introduction does not seem to be known, but there is a note attached to some of Mr. John Smith's specimens in the British Museum herbarium, stating that it was in Kew Gardens as early as 1822. Like the species last described, it increases very rapidly; it has grown spontaneously for a long time on the damp walls of the botanical houses at the Jardin des Plantes in Paris, and springs up in similar situations at Kew.

The variety *albo-lincata*, to which we have already alluded, is an extremely elegant plant, well characterised by the whole length of the centre of the frond being more or less irregularly taken up by a white streak, the remainder of the frond being dark green. Although now so frequently met with in cultivation, it is of comparatively recent introduction; it is figured in the "Botanical Magazine" for August, 1860, and is there stated to have been previously unrecorded. The variety is interesting as being one of those which is met with in a wild state, being found in Java and also, more recently, in Brazil. Like the typical form of the species, it increases readily from spores, and preserves its character. It is deservedly in request for bouquets, as it retains its freshness for a long time.



VARIETIES OF PTERIS.

ADIANTUM: THE MAIDENHAIR FERNS.

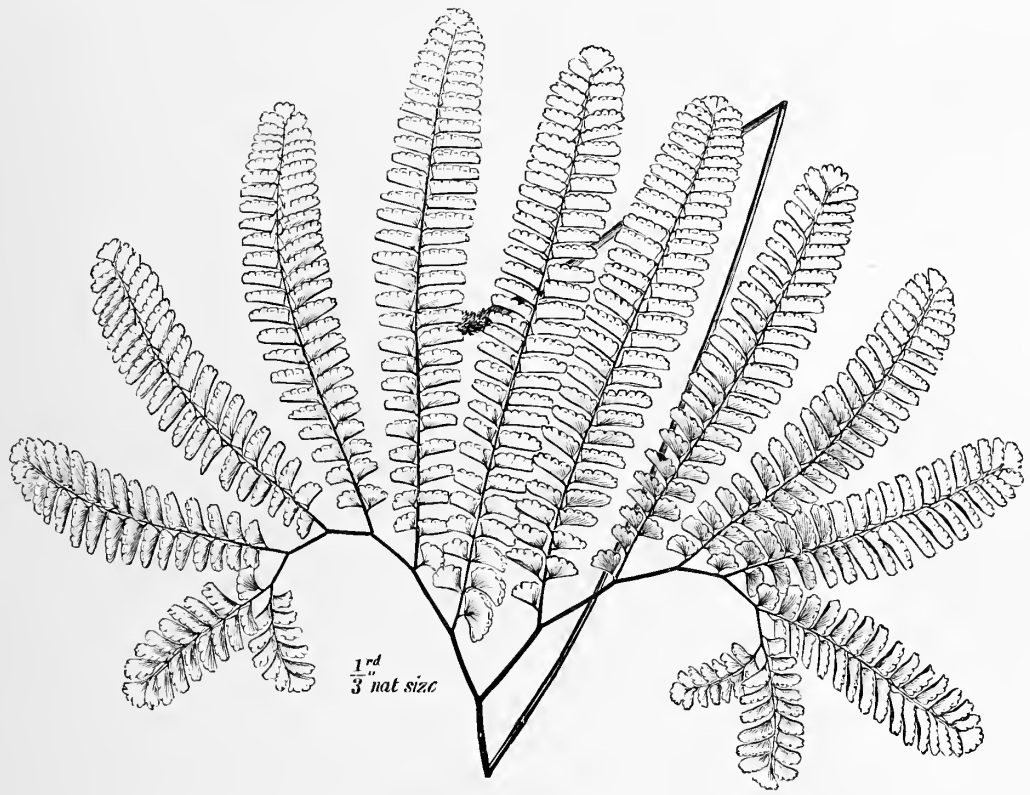
HE have now arrived at one of the most beautiful of the genera of European ferns—one which from its graceful habit is deservedly amongst the most popular in cultivation, and which is, therefore, very familiar even to those least acquainted with ferns in general. The head-quarters of the Maidenhair Ferns—of which about eighty or a hundred species are enumerated—is Tropical America; but they are widely spread over the tropical and temperate regions of both the Old and New Worlds, some of them being of very extended distribution, as, for instance, our European *A. Capillus-veneris* and also *A. æthiopicum*, of which we shall have occasion to speak more at length further on. Our common Maidenhair may be taken as the type of the genus, the elegantly-divided fronds, and the dark, slender, shining stipes being characteristic of many of the species; but a few of very different habit require a passing notice. Most distinct of these, so far as general appearance goes, are *A. reniforme* and *A. Parishii*, which differ from all the other species in having simple fronds. These are small, densely-tufted plants, the former about six inches high, the latter much shorter, with dark brown stipes and nearly round fronds, which are from two to four inches broad in *A. reniforme* and smaller in *A. Parishii*. The former is a native of Madeira and the Canaries, a form sometimes called *A. asarifolium* occurring in Mauritius and at Natal, while *A. Parishii* is a native of Moulmein and the Malay peninsula. *A. reniforme* was in cultivation in England so long ago as 1699, when it was grown at Oxford by Bobart.

A second well-marked group is that styled in the "Synopsis Filicum". *radicantes*, the plants of which are characterised by having a simply pinnate frond, the rachis of which is often elongated to some distance beyond the segments, and takes root at the apex. Of this group we have two in cultivation, *A. lunulatum* and *A. caudatum*. The former is a plant of wide distribution, extending from Hongkong and the Himalayas to the Polynesian Islands and Tropical Australia, and found in Madagascar and various parts of the African continent, as well as in Tropical America, from Mexico to Brazil; *A. caudatum* being confined to the Old World, where it extends through the Tropics and occurs in the Himalayas and Hongkong.

Yet another type of Maidenhair is that presented by *A. pedatum*, the most graceful of all North American ferns, which occurs also in Japan, Mandschuria, and in North Hindostan, where it ascends to an elevation of nine thousand feet. Specimens from Nootka Sound are in the British Museum Herbarium. In this and allied species we have a distinct stipes, which is dichotomously forked, the spreading gracefully recurved branches bearing on the outer side several slender pinnate divisions. This, as we shall see farther on, is one of the few ferns which have been employed in medicine, although it can hardly be said to manifest properties of great importance. One point connected with it is interesting to English fern-growers—it is the most hardy of all the Adiantums. Mr. E. J. Lowe says it will withstand a degree of cold which would be certain death to our indigenous Maidenhair; and adds that in 1854 he found that plants "lived out of doors with the temperature six degrees below zero of Fahrenheit's thermometer, whilst near them

the same cold killed all the plants of *A. Capillus-veneris.* The young fronds are delicate, and, coming up early, those first appearing are not unfrequently cut with spring frosts." It has been in cultivation in this country for a long period, having been introduced by the younger Tradescaut before 1640. From an old specimen in the British Museum Herbarium, collected in the "Cherokee country" in 1769, we learn that its Indian name is *Outoanaka*, which means "black stalk."

In the section of which our British Maidenhair may be taken as the type, there is one plant which has of late years attracted much attention, and which indeed is at the present time perhaps the most popular form in cultivation. This is the very beautiful *A. Farleyense*,



ADIANTUM PEDATUM.

which Mr. Moore, who first described it, well calls "one of the most graceful species yet known of perhaps the most lovely genus of the pre-eminently lovely family of ferns." It was first exhibited at a show of the Royal Horticultural Society in 1865, and at once attracted great attention. Its origin is a little obscure, and its claims to specific rank are not admitted by the best authorities on ferns, in spite of its extremely distinct appearance. The first example came up among some ferns sent from the West Indies by Mr. T. G. Briggs, of Barbadoes, the name of whose residence in that island (Farley Hill) is commemorated in the specific title of the plant. So far as we are aware, the fern has not been met with in a wild state; and Mr. Moore regards it as a well-marked "sport" of *A. tenerum*, or possibly a hybrid between that species and *A. trapeziforme.* It has, however, since been stated that seedlings of *A. Farleyense* have produced another species,

A. scutum, and this, if correct, would show it to be a form of that species. The dense masses and gracefully-pendant habit of the fronds, their large size and bright light green colour (the young ones being at first of a delicate pinkish hue), and the elegantly-fringed pinnules of the sterile fronds, combine to render *A. Farleyense* an object of intense admiration wherever seen.

Another species belonging to this group is *A. fragile*, a native of Jamaica, which has the disagreeable peculiarity (from a herbarium point of view) of shedding all its pinnules when dried. Sir W. J. Hooker says:—"I have received specimens from Jamaica from five different persons of this singular plant, all exhibiting the same unfortunate character of shedding every leaflet in the act of drying: so that the specimens have come home showing the tufted root, a perfect skeleton of wiry stipites (growing in tufts), with the exceedingly slender and equally wiry rachis very much branched, and the pinnules all lying apart from the plant. Not a specimen is fit for the herbarium nor fit for making a drawing."

Besides the above, there are many other very distinct and ornamental species of *Adiantum*, as, for instance, *A. macrophyllum*, a Tropical and Central American species, with long, simply pinnate fronds, which when young are often beautifully tinged with red, and equal-sided serrate pinnæ. Two other species from the same region—*A. digitatum* and *A. Feei*—are of climbing habit, having stems several feet in length. Indeed, whether we consider the beauty or the variety of form presented by the plants belonging to this genus, we shall find it entitled to an equally high position in the order to which it belongs.

The genus *Adiantum* is botanically distinguished by the peculiar position of the sori. In *Pteris*, as we have already seen, the sori are placed upon the margins of the pinnæ and covered over by the indusium; but in *Adiantum* the opposite is the case, inasmuch as the sori are attached, not to the frond, but to the under surface of the indusium, which consists, as Mr. Moore has said, "as it were of a portion of the apex of the lobe, reflexed and changed in texture into a thin, bleached, veiny membrane, the veins being the receptacles," and are, therefore, as the same author puts it, "turned upside down on to the surface of the frond." By this peculiarity plants of this genus may be at once distinguished from all other ferns. The free venation of the Adiantums is also noteworthy and characteristic; with the exception of four species, which, on account of their netted veins, have been placed by some authors in a separate genus (*Hewardia*), all the species have the veins quite free and separate. The black shining stipes is, as has already been said, also characteristic of the genus.

TRUE MAIDENHAIR: ADIANTUM CAPILLUS-VENERIS, *Linn.*

It is hardly necessary to describe at very great length so well-known and popular a fern as this; for, although several species of *Adiantum* are somewhat closely related, there is no European fern with which it can be confounded. The black or dark chestnut, shining, slender stems, entirely devoid of scales or hairs, with their thread-like branchlets, and the more or less fan-shaped pinnules, at once distinguish it from any other European species. It is a plant of perennial duration; the fronds which are persistent, are produced annually from a slowly creeping caudex, which is black and scaly, about as thick as a quill. These fronds droop considerably, are of a bright, cheerful green colour, and of membranous texture, are irregular in shape, and vary a good deal in size and in ramification; when first

produced, in spring, three or five pinnæ only appear, which shortly become divided into pinnules. The mature fronds themselves vary from four or six inches to a foot and a half, or even more, in length (including the stipes), their usual length being about midway between these extremes; their general outline is more or less ovate, or sometimes somewhat triangular. The pinnæ are alternate, as are also the pinnules; the latter vary a good deal in form, those on the fertile fronds being fanshaped or wedgeshaped below, and divided above into a number of lobes, the terminal portion of which is reflexed and changed into a thin bleached membrane, upon the inner surface of which the sori are borne in clusters. In the barren fronds, which are less frequent,

PINNULES OF THREE DIFFERENT PLANTS OF ADIANTUM CAPILLUS-VENERIS, SHOWING THE RANGE OF FORM. 1 AND 3 FERTILE, 2 BARREN.

the terminal lobes are not thus reflexed, but are carried onward, the outline of the pinnule then presenting a sharply-cut or serrated, instead of a rounded, appearance. The pinnules are beautifully lined in a delicate fan-like manner, with numerous closely-placed forked veins radiating from the base, the veins remaining distinct from each other, and not forming a network. Mr. Newman says that when grown in a Wardian case the lobes of the pinnules sometimes become viviparous at the extremities, the spores actually vegetating while *in situ*, and the young plants taking root, like parasites, in the substance of the old one.

ADIANTUM CAPILLUS-VENERIS, SEEDLING.

In Europe the Maidenhair is dispersed over the central and southern portions, being most abundant in the Mediterranean region. It is frequently met with in most parts of Spain and Portugal, on rocks and in caverns, and about wells and fountains, ascending in the Sierra Nevada to about four thousand feet. France, Italy, Switzerland, Hungary, Germany, Dalmatia, Belgium, and Holland all produce it; it abounds in Sicily, and it is also found in Turkey and Greece, in great quantity. One of its best known and most classical localities in Italy is that of the Fountain of Egeria, where it occurs in great beauty and luxuriance.

> "The mosses of the fountain still are sprinkled
> With thine Elysian water-drops; the face
> Of the cave-guarded spring, with years unwrinkled,
> Reflects the meek-eyed genius of the place,
> Whose green, wild margin now no more erase
> Art's works; nor must the delicate waters sleep
> 'Prisoned in marble; bubbling from the base
> Of the cleft statue, with a gentle leap
> The rill runs o'er; and, round, ferns, flowers, and ivy creep
> Fantastically tangled."

Bory and Chaubard, in their "Flore de la Péloponnèse," state that in that region under favourable circumstances its fronds attain the length of two feet or more, and are

proportionately large in all their parts. These authors refer also to a very remarkable variety collected by them in the fountain of Callirhöe, at Athens. This plant, although fully developed, was not more than two or three inches in height; the pinnules were small and hardly emarginate; and the variety greatly resembled *A. æthiopicum* in general appearance. Its extra-European distribution extends throughout the temperate and subtropical regions of the globe, especially in the northern hemisphere, it being less abundant within the Tropics. In Asia, we find the Maidenhair occurring in Siberia and in the Caucasus, in Arabia and Syria (Jerusalem, Sinai, and Galilee), in China and Japan, and throughout the damp hilly districts of India. It is very abundant in the African islands, occurring in Madagascar and Mauritius, the Azores, the Cape de Verde Islands, in Madeira and the Canaries; in the two last it is exceedingly common, growing wherever water trickles through the rocks, and affecting especially the vertical surface of walls, which are sometimes entirely covered with it. In the Canaries large porous vases, for the purpose of cooling and filtering the water supplied by the aqueducts, are almost indispensable to every household; and these vases are often entirely covered with Maidenhair, presenting a very beautiful appearance. So readily is the fern established in this situation that the inhabitants, wishing to encourage its growth upon new vases, find it sufficient to rub them over with the mature spore-bearing fronds, after which young plants are not long in making their appearance. On the African continent it occurs in Algiers, Abyssinia, and Egypt, and also in South Africa—in Natal and at Algoa Bay. In Australasia the plant is found in Queensland, and also in New Caledonia and the Sandwich Islands. In the New World it occurs in Mexico and other parts of Central America, in Chili, and in the West Indies; and also in the southern United States—Florida, Alabama, and westward.

In the British Islands, the distribution of the Maidenhair is distinctly of a western type. In England its headquarters are in the counties of Devon and Cornwall, in which it occurs in many localities, affecting low sea caves and the clefts of coast rocks; it was formerly abundant in the neighbourhood of Ilfracombe, but of late years has become very scarce there, and can only be obtained if the collector is sufficiently enthusiastic to allow himself to be let down over the cliffs by a rope. We do not think it advisable to give detailed descriptions of the localities recorded for this beautiful fern, which is already in danger of becoming exterminated, owing to the ravages of collectors, if, indeed, it has not already disappeared from some of its localities. It has also occurred in Dorset, and is recorded for North Somerset, although this is doubtful, as it is said that the leaves of a flowering plant, *Thalictrum saxatile*, have been mistaken for it at Cheddar. On the coast of Glamorganshire, it is, or was, abundant; there is a specimen in the British Museum Herbarium, collected in June, 1773, at Cardiff, from "a cliff called Nine-acre Cliff, half a mile from Porth Kerrig Church, in the face next the sea, where a petrifying water falls down, generally in places not accessible without much difficulty." On some parts of the Glamorganshire coast it grows very luxuriously, forming a green tapestry on the face of the cliff, and sometimes within reach of the spray. It has long been known as growing in the Isle of Man: other English counties have been recorded for it, but its occurrence in them has not been authenticated, and it is stated that in more than one instance young plants of the Bracken have been mistaken for the Maidenhair! It is, apparently, absent from Scotland, although it has been recorded from one or two stations in that country. In Ireland it is very local, occurring chiefly, if not entirely, in the West; the Isle of Arran and the Burren mountains are its oldest and best known localities, it having been recorded from Arran by Lhwyd previous to 1699. It has also occurred in various places of the county Clare, from Connemara, and Sligo; and it is reported to have

been found in a cave near the Giants' Causeway, Antrim. The Maidenhair of Burren and Arran is very luxuriant, and often has the pinnules more deeply cut than in the ordinary form of the species; the figure in "English Botany" (*t.* 1564) is from an Arran specimen.

In his "Nature-printed Ferns," Mr. T. Moore distinguishes three varieties of the Maidenhair as occurring in the United Kingdom. The first, *ramulosum*, has the main rachis divided two or three times near the top, so that the apex of the frond is formed of a spreading tuft of short pinnate branches. The second, *incisum*, has both the barren and fertile pinnules throughout the frond somewhat regularly split down into long, narrow, wedge-shaped lobes. The third, *rotundatum*, is marked by the outline of the basal pinnules being rounder than usual, with a truncate base; the fronds are narrow, and the pinnæ more spreading. There is a specimen in the British Museum Herbarium, descended from a plant collected at Boscastle, North Cornwall, which is apparently to be referred to the last-named variety; in this the pinnules are broader than long, and the whole aspect is very luxuriant—a circumstance probably owing to cultivation, at any rate in some degree.

On the faith of a statement in the "Synopsis Filicum," we had originally included in a list of European ferns *A. æthiopicum*, Linn., of which a figure will be found on plate 6. There is a specimen in the Kew Herbarium labelled "Spain, G. McLeay, 1860;" and this caused the insertion of the species in the "Synopsis" as a European plant; but it is not included in Willkomm and Lange's "Prodromus Floræ Hispanicæ," and there is thus reason to suppose some mistake in the matter. *A. æthiopicum* is a plant resembling *A. Capillus-veneris* in its wide extra-European distribution, and also resembling it very strongly in general appearance. Sir W. J. Hooker, however, says it is "truly and constantly distinct: firstly, in the more orbicular and less sharply and gradually attenuated base of the pinnules; and, secondly, in the fructification, the sori here being placed in the sinus of a notch in the lobe, and the involucres quite broad, lunate, or veniform, not occupying the whole apex of the lobe." As has been mentioned above, with regard to the plant collected by Chaubard and Bory at Athens, *A. Capillus-veneris* sometimes approaches *A. æthiopicum* very closely; but the two species are usually considered distinct by the best authorities on the subject.

The Maidenhair has in France acquired some little importance from its employment in the manufacture of a syrup known, from the Latin name of the plant, as *capillaire*, which has been supposed to possess pectoral qualities, and, when diluted with water, forms a very refreshing drink. It was formerly prepared by adding sugar and orange-flower water to an infusion of the fern; but as the Maidenhair was found to serve no essential purpose, it is frequently omitted and, according to Pereira, the syrup sold in the shops under the name of capillaire is nothing but clarified syrup flavoured with orange-flower water. The Prussian and Hamburgh Pharmacopeias authorise this substitution by giving formulæ for a *sympus floræ aurantii*, to be used "in loco sympi capillorum veneris." A recipe for making capillaire runs thus: Take of Maidenhair leaves five ounces; liquorice-root, peeled and sliced, two ounces; boiling water, five pints: let them remain for six hours; strain, and then add thirteen pounds of the finest loaf sugar, and one pint of orange-flower water. The simple infusion of the plant in water, sweetened in the manner of tea, has been recommended for the same purposes as the syrup.

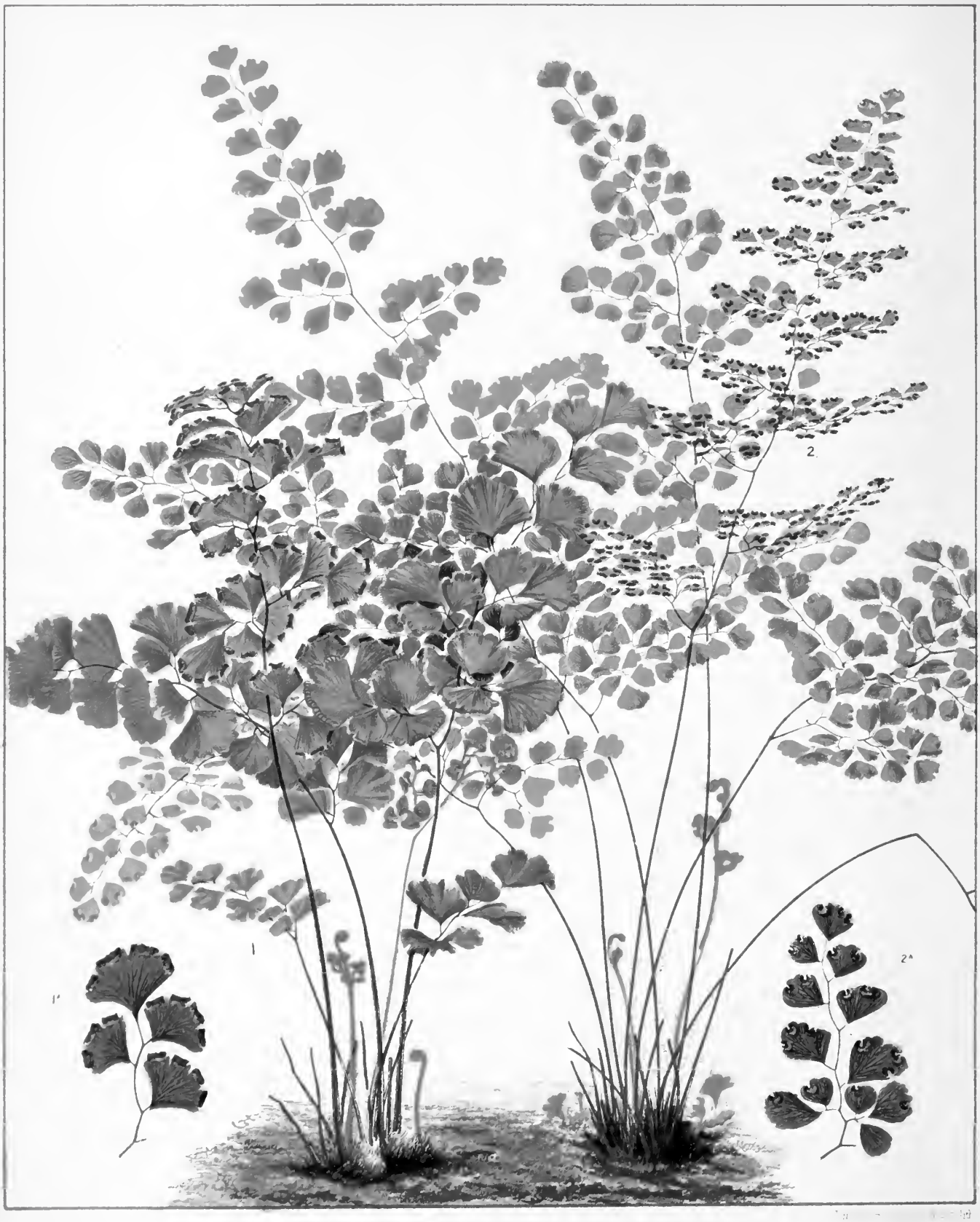
From some of the earlier Irish floras it would appear that the collecting of Maidenhair for the preparation of capillaire was at one time very extensively carried on. Thus Keogh, in his "Botanologia Universalis Hibernica" (1735), says of it: "The best in this kingdom is brought from the rocky mountains of Burren, in the county of Clare, where it grows plentifully; from thence it is brought in sacks to Dublin, and sold there:" and he goes on to narrate its virtues,

which are both numerous and varied: "it is pulmonic, lithontriptic . . . wonderfully helps those afflicted with asthmas, shortness of breath, and coughs . . . It is also good against jaundice, dropsy, and the bitings of mad dogs." It is stated that the fern was exported in large quantities to London from Ireland in the middle of the last century: and it is on record that two hogsheads were so sent by one person from the Isles of Arran, where the fern is very abundant in the deep clefts of the rocks, being known to the natives as *dubh-chosach*, or "black-footed."

In North America the beautiful *Adiantum pedatum*, to which reference has already been made, is employed more extensively in a similar manner, and is often substituted for the true Maidenhair. Its chief use is as a refrigerant drink in febrile diseases and in erysipelas; and its expectorant and subastringent properties render it also useful in coughs and asthma. The plant is highly valued by some American practitioners, and its properties are at any rate of sufficient importance to demand further investigation. It is said that its substitution in France for the true Maidenhair arose from the circumstance that the French Canadians sent over large quantities to France as a package for goods: its similarity to the true Maidenhair arrested attention, and it was ultimately used instead of it. According to Kalm, *A. pedatum* has been employed from time immemorial by the North American Indians in cases of difficulty of breathing. In some parts of Brazil another species, *A. dolabriforme*, bearing the vernacular name of *Venca*, is used in pectoral complaints. The fronds of *A. melanocaulon* are believed to be tonic in India.

The "vertues" of Maidenhair, according to old writers, were both numerous and varied. Many are set forward in Langham's "Guide of Health"—a black-letter seventeenth-century volume—and of these the following are samples:—"Seethe it in wine, and drinke it for shortnesse and straitnesse of breath, the hard and uneasie cough, and to cause easie spitting. . . . Bitings of mad dogges and venomous beasts, stampe it greene and apply it. It restoreth haire, dispatcheth the strume or swellings in children's throats. . . . Headach, weare a garland of it, or a quilted cap of it about the head. . . . Given in meat to quails, it maketh them to fight well:" and so on. The property last referred to is similar to one mentioned by Pliny as belonging to his "adiantum," which, as we have already said, is perhaps an altogether different plant. He says: "It is a general belief that partridges and cocks are rendered more pugnacious if this plant is mixed with their food." Langham's list of "vertues," however, pales before that set forward by one Peter Formius in a small French treatise devoted to the plant, which was published in 1644. Our illustrious countryman, John Ray, condenses his account in the "Historia Plantarum," and remarks that, if all these virtues existed in the Maidenhair, it might indeed be looked upon as a panacea for every disease, being in itself sufficient to cure any disorder, no matter of what kind, and regardless of the part of the body affected. He, however, proposes a drink to be made from it, which he suggests might be efficaciously employed in fevers and similar cases. For this about three handfuls of the recently collected leaves should be placed in warm or gently boiling water, and allowed to remain for the space of one night. It is said that a strong decoction will act as an emetic. Ray also tells us that in the neighbourhood of Narbonne the growth of Maidenhair about the wells and fountains is looked upon as a sure sign of the purity and sweetness of the water yielded by them. According to Pereira, other ferns, besides those already named, have been employed under the name of Maidenhair, especially the Black Maidenhair Spleenwort (*Asplenium Adiantum-nigrum*), the Wall Rue (*A. Ruta-muraria*), the Scaly Spleenwort (*Ceterach officinarum*), and the Hart's-tongue (*Scolopendrium vulgare*).

The name *Adiantum* is derived, as Pliny tells us, from the Greek ἀ (*not*) and διαίνω (*to wet*), because, he says, "when sprinkled with water or dipped in it, it has all the appearance of having been dried, so great is its antipathy to moisture." His description, however, is hardly appropriate



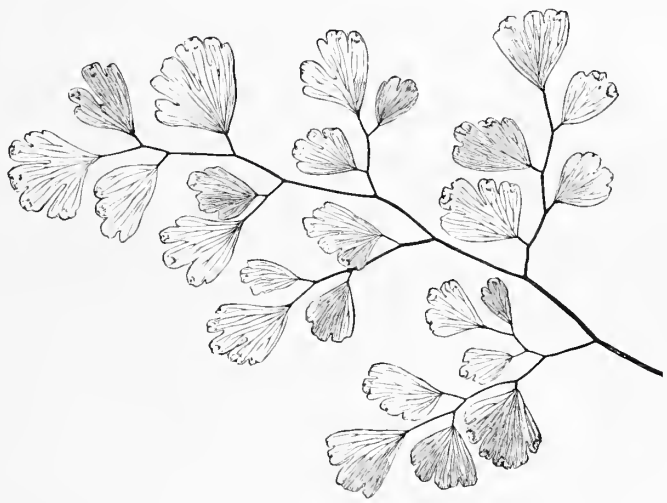
ADIANTUM (MAIDENHAIR FERN.)

1 ADIANTUM CAPILLUS VENERIS 2 ADIANTUM ÆTHIOPICUM (TWO THIRDS NATURAL SIZE

1A PINNULE IN FRUIT. 2A PINNULE IN FRUIT.(NATURAL SIZE)

to our Maidenhair, although he speaks of a use of the plant which accords well with that to which our species is supposed to owe its name. He says that a decoction of it was made in wine with parsley-seed for the purpose of imparting colour to the hair, large quantities of oil being added if it is desired to make the hair thick and curly as well; and he also attributes to it the property of preventing the hair from coming off. The black, hair-like stalks of our British plant probably suggested its name *Capillus-veneris*, as well as its English equivalent; and its supposed efficacy in restoring the hair is likely enough to have been suggested, on the "doctrine of signatures," by the same circumstance. Coles, writing in 1657, says: "The lye wherein Maidenhaire is sodden or infused is good to bathe the head, and make the haire come thicker in those places which are more thin and bare." The subject of our present description is here referred to; but various other plants have been called Maidenhair from time to time, among them the pretty yellow Bog Asphodel (*Narthecium ossifragum*), of which Johnson writes in 1636: "In Lancashire [it] is used by women to die their haire of a yellowish colour, and therefore by them it is termed Maiden-haire;" while the pretty Lady's Bedstraw (*Galium verum*) was also called Maidenhair—according to Coles, "from the fineness of the leaves."

Gerard seems to look upon the Maidenhair fern as one of the plants formerly named in commemoration of the Blessed Virgin, and says "it may be called Our Lady's Hair;" but the Latin name suggests that it was rather dedicated to Venus. As we shall see when we come to speak of *Asplenium Trichomanes*, that species has also been termed Maidenhair; and it is with this that Mrs. Chanter (in "Ferny Combes") associates a German legend which she does not definitely localise, and which has rather a modern sound. She says: "A lady was keeping tryst with her lover, when he was suddenly, after the fashion of Germany in those days, transformed into a wolf. The lady fled before him, and in her haste fell over a precipice, her black hair tangling in the bushes as she descended. On the spot where she fell a clear spring welled up, and round about her hair took root. The well is called 'the Wolf's Spring,' and the little custodian of the glen, after telling you the story, hands you a bunch of the 'Maiden's Hair.'"



ADIANTUM CUNEATUM.

Reference has already been made to *Adiantum cuneatum*, and it may be well to say a word or two more about it, inasmuch as it is probably this species which is considered by most people as being the true Maidenhair. It is certainly the plant usually grown in greenhouses under that name, and this is natural enough, as it is very much more easy to grow, and its fronds last longer when cut, so that it is more suitable for use in bouquets and for other decorative purposes. Notwithstanding its general cultivation at the present day, it is not an old inhabitant of our stoves, having been first introduced to this country in a living state in 1841, when plants were sent from the Botanic Gardens at Berlin to the Royal Gardens at Kew. The fronds are about a foot (sometimes more) in length, gracefully spreading, and ovate in form; they are very numerous, rising from a tufted rhizome, forming in large plants a dense mass;

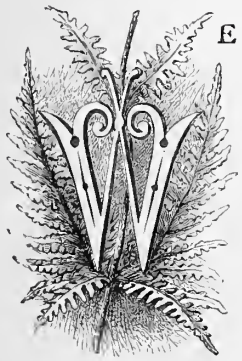
the pinnules are smaller than those of *A. capillus-veneris*, and more deeply cut, resembling rather those of *A. æthiopicum*. The fern, indeed, is closely allied to that species, but the pinnules are always wedge-shaped and more deeply lobed. The footstalks are black and thread-like, as in the true Maidenhair; the green of the fern is of a different shade, and the general appearance of the plant is more slender and lax, owing to the smaller size of the pinnules. Our figure shows the appearance of a portion of a frond.

A. cuneatum is very easily cultivated; indeed, when once established it will propagate itself by self-sown spores, which will readily spring up in neighbouring pots. But care must be taken to preserve the fronds from the drip of water, as, owing to their extreme delicacy, they will not stand this; a certain amount of moisture, plenty of room, and thorough drainage are essential to its successful cultivation. The species is a native of various parts of Brazil; other species of the genus from different regions are sometimes called *A. cuneatum*, but incorrectly.

ADIANTUM CAPILLUS-VENERIS.

a. Pinnule enlarged.

CHEILANTHES.



We have here a genus of ferns comprising about sixty or seventy species, for the most part natives of dry rocky places in tropical regions, but extending into temperate countries, three species being European and four or more natives of the United States. They are for the most part small ferns, but present a very considerable variation in size and form; the European representatives of the genus are, as we shall see, small plants, but many have fronds a foot or a foot and a half in length. The genus is characterised by having the sporangia borne on the thickened ends of free veinlets, bearing small roundish sori close to the margin of the frond: they are covered by a usually whitish and membranous indusium, which is formed of the reflexed margin of the frond. It is to this peculiarity that the name *Cheilanthes* (which is formed of two Greek words—χεῖλος, a lip, and ἄνθος, a flower) alludes; and the name Lip-fern is sometimes given as an English equivalent for the genus. The more or less compound fronds are often densely hairy or chaffy, with dark glossy stipites; though to this rule there are exceptions—as, for instance, in *C. multifida*, a native of Africa and Java, the fronds of which are nearly smooth, and triangular or somewhat deltoid in outline. The genus can hardly be considered well defined; Sir W. J. Hooker says, "Vain is the attempt to form any definite character which shall decide its proper limits." It is undoubtedly very near *Pteris*, scarcely differing from it in the greater distinctness of the sori.

One of the most popular species is *C. argentea*, which is often met with in cultivation. Its specific name refers to the appearance of the under side of the frond, which is covered with a white flour-like powder, as is the case with some species of *Gymnogramma;* the upper surface is of a bright dark green. *C. farinosa* is another species which is similarly silvered beneath; the two species are closely allied, their most obvious difference being in size and geographical distribution. *C. argentea* usually—although Milde speaks of Mandschurian specimens more than a foot long—has fronds from two to four inches high, and is a native of Siberia, China, Japan, the Malay Peninsula, and Khasia, from which last-named region we have a variety (*chrysophylla*) which is golden, not silvery, beneath. The fronds of *C. farinosa* are from half a foot to a foot and a half in length, and in cultivation have been known to occur as long as two feet; this is of more southern distribution, beginning in the Himalayas and extending throughout tropical India, Malaya, Ceylon, Arabia, and Abyssinia, and found also in Central America, where it ascends, in Mexico, to 8,000 feet. This species varies very much in cultivation, as is shown by Mr. John Smith's very fine range of specimens in the Herbarium of the British Museum. The author just mentioned did not look upon it as really distinct from *C. argentea*, and a note from him attached to a specimen in the Herbarium says: "Stunted, starved plants of *C. farinosa* assume the appearance of *C. argentea;* and I have no doubt that living plants, or plants raised from genuine spores of *C. argentea*, could, under cultivation, be made to assume the appearance of *C. farinosa*. Difference in size appears to me the only specific difference between them—the first being small, not exceeding two to four inches in height, while the second sometimes attains the height of nearly two feet." *C. argentea* was introduced to cultivation in England in 1823. *C. farinosa* was first grown in this country at the Royal Gardens, Kew, in 1827.

Besides these two well-known plants, many other species of *Cheilanthes* are or have been in cultivation in this country. Mr. E. J. Lowe, in his "Ferns, British and Exotic," figures eighteen species which were then known in English gardens, but two or three of these are referred to other genera by more recent writers. *C. viscosa* is a very pretty species, with deltoid or triangular, finely-cut, bright green, tripinnate fronds; it is an American plant, extending from New Mexico to Venezuela, and has been in cultivation in England since 1841. The specific name refers to a characteristic feature of the fronds, which are covered throughout with sticky glandular hairs, the viscidity of which is so powerful that, as noted by Mr. John Smith on a specimen in the British Museum Herbarium, the plant adheres to the paper without the aid of gum or paste. *C. radiata* is a very pretty plant, resembling an *Adiantum* in habit, and originally placed in that genus by Linnæus; it has long stipites, which are terminated by from five to ten pinnæ, all starting from a common centre like the spokes of a wheel, thus imparting a star-like appearance to the frond. This is a native of tropical America, and was cultivated at Kew in 1827: it is a very variable plant, some specimens not exceeding four inches, while others are as much as three feet in height. *C. pteroides* is a very handsome and distinct species, resembling a *Platyloma* in habit, and also approaching *Pteris*, as is suggested by its specific name. It is an old inhabitant of our greenhouses, having been introduced to the Royal Gardens at Kew from the Cape of Good Hope by Francis Masson in 1775; but is not commonly met with at the present day, although it well deserves attention, being one of the handsomest and finest species of the genus, as well as one of the most distinct. It has a thick, creeping, scaly rhizome, from which rise the large, smooth, tripinnate fronds, these being (including the stipes) from a foot to two feet and a half in length. The brown involucres extend over the whole margin of the pinnæ of the fertile fronds, and the contrast between them and the pale green of the fronds is very striking. It is a native of the Cape, at an elevation of from 1,000 to 3,000 feet, and is also found in Java at the top of Mount Gede. *C. tenuifolia* is a pretty, slenderly-divided species, reminding us of a *Cystopteris* in habit; it is a species of wide distribution, extending over the hilly districts of Eastern India, throughout Eastern Asia and the Malay Archipelago, and being very abundant in most parts of Australia: this was introduced to Kew Gardens in 1824. *C. Matthewsii*, a Peruvian species, is remarkable for its long, narrow, linear-lanceolate fronds; *C. micropteris*, a native of tropical America, has them similar in shape, but much smaller, seldom exceeding three inches in length. *C. speciosissima* is, as its name implies, a very beautiful species, a native of Central America, which ascends to 12,000 feet on the Peak of Orizaba, Mexico. The fronds are sometimes two feet or more in length; the rachis is covered throughout with brown, chaffy scales or hairs, and the general aspect at first sight reminds us of an *Aspidium* rather than a *Cheilanthes*.

CHEILANTHES FRAGRANS, *Hook.*

This pretty little fern is familiar to travellers in the Mediterranean region, being a general favourite on account of its delicately fragrant fronds. The fern tribe is not at all remarkable for fragrance, although many ferns have a peculiar odour which is by no means unpleasant; but here and there we come across species with a well-marked and distinct scent. Among our British ferns, for example, we have *Aspidium montanum*, with a pleasant smell of new-mown hay, which is more strongly developed in *A. æmulum;* while *A. fragrans*, a native of the Caucasus, Siberia, and Northern Asia, smells strongly of raspberries, the odour remaining even in the dried fronds, and becoming very obvious when these are soaked in water. A tropical

Vincent Brooks Day & Son Lith

CHEILANTHES.

C. FRAGRANS. (*Hook.*) C. SZOVITZII. (*F. & M.*)

NATURAL SIZE

a) PINNULES ENLARGED (b) PINNULES ENLARGED. 4½ TIMES NATURAL SIZE.)

and Central American fern, *Anemia tomentosa*, has an odour like that of myrrh; *Mohria thurifraga*, a Cape species, smells of benzoin; the bruised fronds of *Angiopteris evecta* are used in the Pacific Islands for imparting an agreeable scent to cocoa-nut oil; while in North America a *Dicksonia* (*D. punctilobula*) is sometimes called the Sweet-scented Fern, on account of the pleasant fragrance of its fronds. It is perhaps hardly necessary to say that the odour in these cases is due to the presence of a large number of very small glands, more especially on the under surface of the frond: when the plant is gathered these are crushed, and the odour is then given out. The fern we are now describing, *Cheilanthes fragrans*, retains its pleasant scent when dried; it resembles that of violets, or perhaps more strictly of violet-powder, there being a faint but perceptible starchy smell mingled with the perfume.

Cheilanthes fragrans (which is also known as *C. odora*) is a small fern of tufted habit; the stipes is short (from an inch to three inches in length), firm, and wiry, of a dark shining brown, and covered more or less densely with reddish-brown, linear, hair-like scales: these scales soon fall or are easily rubbed off, and the stipes has then a smooth appearance. The bipinnate fronds are usually about two inches long (sometimes, however, exceeding three inches), and about an inch broad in the lower portion, tapering gradually to the apex; the pinnæ are opposite, the lower broadly ovate and distant, the upper ones narrower and closer together; the upper surface is of darkish green, the lower is paler; the sori on the fertile fronds are singly or more numerously on the margins of the pinnæ, the indusium being at first pale or whitish, and becoming brown, the margin being toothed or crenate. The species is, however, very variable, not only in size, but also in the division of the fronds and their hairiness. The above description will apply to the usual European form of the plant. Milde distinguishes six forms, three of which are found in Europe. The most frequent of these is that already described, in which the indusium is continuous and ciliate. A second form has an interrupted indusium, which, as in the typical state of the fern, is "abruptly attenuate;" this occurs on Mount Vesuvius and in Sardinia. A third form has also an interrupted indusium, but this is herbaceous, not attenuated; it is a native of Spain. These two forms show by their characters that the distinctions between true *C. fragrans* and the plant which has been described as distinct under the name *C. maderensis*, are insufficient for specific purposes.

As we have already said, *C. fragrans* is one of the most characteristic ferns of the Mediterranean region, extending to the islands, and seldom found very far from the coast. It occurs in Central France, Dalmatia, and Piedmont, extending as far north as Switzerland; in the Eastern Pyrenees and in the south of Spain, on the rock of Gibraltar and in Portugal; and in many parts of Turkey and Greece. Its extra-European distribution is not very extended: it is found in Algeria and Morocco, and is abundant in the Canaries and Madeira, from which last-named island it was introduced to cultivation in England by Francis Masson in 1778. The Madeiran plant has been described as a distinct species by some authors, under the name of *C. maderensis*; but the characters by which it was proposed to distinguish it are neither important nor permanent. In Asia it occurs in the North-western Himalayas, at an elevation of 5,000 feet, as also in Afghanistan, Beloochistan, and Syria; at Jerusalem, and in Lycia and Cilicia. If the authors of the "Synopsis Filicum" are correct in identifying with this species *C. andina*, Hook., a native of the Peruvian Andes, the range of *C. fragrans* must be considerably extended, as it is not usually regarded as a plant of the New World.

C. fragrans is an easy plant to grow, and does well either in a cool fern-house or in a Wardian case. Like the other species of the genus, it should be potted in fibrous peat with sand mixed with small pieces of sandstone, care being taken to elevate the crown of the root

above the rim of the pot in which it is planted. It well deserves to be more generally cultivated than is at present the case; as, although many ferns are more strikingly graceful, and others have a more distinct character, it is in itself a pleasing object, and the fragrance of the fronds renders it a well-marked and interesting species.

CHEILANTHES HISPANICA, *Mett.*

This is a very rare fern—so rare, indeed, that it is but seldom represented, even in large herbaria—and hence our description of it must be borrowed from authors who have been more fortunate than ourselves in this respect. It is interesting as being one of the very few species which are exclusively European (a list—nine in number—of those of which the geographical distribution is thus limited will be found in our introduction, p. xiv.), and its range in Europe is far from extensive. It was originally discovered in Spain, in the province of Estremadura, by Schousboe, in 1798, and to this its specific name is due: since then it has been found on rocks on the banks of the river Mondego, near Coimbra, in Portugal, by the late Dr. Welwitsch; and Milde refers to it, without any doubt, a fern found near Messina by Tineo, which was described by Todaro in 1866, and named by him *C. Tinœi*, in compliment to its discoverer.

C. Hispanica much resembles *C. fragrans* in habit, but is readily distinguished by the distinctly deltoid outline of the twice or thrice pinnate fronds. The smooth-tufted, wiry stems are of a dark chestnut-brown hue, and shining; from two to three inches in length, and with a dense tuft of slender wiry hairs at the base, which are similar to the stem in colour. The fronds are of a coriaceous texture, from an inch to an inch and a half long, and about half as broad; they are green and smooth above, but on their under side are densely clothed with jointed, glandular, cinnamon-coloured hairs: the pinnæ are in opposite pairs, the lowest being the largest; these are oblong, or again branched on the lower side. The sori on the fertile fronds are very numerous, covering almost the whole of the under surface.

CHEILANTHES SZOVITSII, *Fisch. & Meyer.*

Although not so uncommon as the preceding, this fern is by no means frequently met with; in Europe, indeed, its distribution is very limited, as it only occurs in Italy and Dalmatia; but in the East and in Asia it appears to be more frequent, as it has been found in Lycia, the Caucasus, and Mount Taurus, and also in Algeria. It has also been brought from Beloochistan and Tibet, ascending in the last-named district to seven or eight thousand feet. It was first described in 1838, and named in honour of Szovitz, who first brought it from the province of Karabagh, in Asia.

This is an exceedingly beautiful species, and one which is at once readily distinguished—"primo viso," as Milde has it—from *C. fragrans* by the ferruginous wool with which the fronds are covered below. It is closely allied to *C. lanuginosa*, a North American species, from which indeed it only differs in having distinct scales mixed with the woolly clothing of the stipes and rachis.

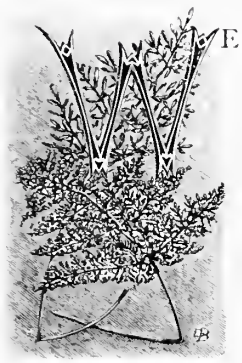
The fronds spring from a tufted roundish caudex, the crown of which is densely scaly. The stipes, which is about as long as the frond (the latter being from three to four, or even six inches in length, and about a third of that size in breadth), is wiry and somewhat shining, of a blackish purple hue, clothed, like the rachis, with spreading woolly hairs, with which slender scales are intermingled; the scales are scarcely more conspicuous than the hairs, but larger

and subulate (or awl-shaped), and these are very characteristic of the species. The pinnate fronds are narrow-oblong, quite smooth on the upper surface, but densely covered below with a thick coat of a brown woolly covering; the nearly sessile pinnæ are in opposite pairs, the lowest being the smallest, and almost deltoid in shape. The pinnules are set closely together, "cut down to the rachis below into small roundish beaded segments;" the divisions are again divided into ovate ultimate divisions, the margins of which are turned over so as to cover the numerous marginal sori with a spurious indusium, fringed with light-brown hairs. Although so densely clothed with light-brown wool below, the fronds are nearly smooth above, their green hue standing out with great distinctness against the brown marginal fringe which is afforded by the long hairs of the under-surface. One of its names, *C. fimbriata*, no doubt refers to this fringed appearance. Sir W. J. Hooker describes a variety (*β. Stocksii*) from Scinde and Afghanistan, in which the woolly covering is exceedingly dense and tawny, and "so copious and spreading as at first sight apparently to invest the whole frond."

CHEILANTHES ARGENTEA.

THE PARSLEY FERN.

CRYPTOGRAMME CRISPA, *Br.*



WE have here a fern which is the only species of the genus in which it is placed, and which may thus be supposed to stand out from its allies with especial distinctness. Genera, arbitrarily defined by naturalists for purposes of classification, are of course based upon certain resemblances or differences between plants or other natural objects, and their recognised extent is largely regulated by the views of different scientific men. As is the case with species in a yet more marked degree, what one man recognises as a distinct type, and then calls by a new and distinctive name, may be regarded by another observer as merely a new form belonging to a genus previously described, while a third savant may go yet further, and say that the plant, or insect, or whatever may be the object under consideration, is not only no new generic type, but has barely any claim to rank as a distinct species. This divergence of opinion leads our professors in two different directions; and while the bent of one man's mind induces him to recognise and describe as distinct, plants which have many points in common, another may go to just the opposite extreme, and err by his custom of referring almost every novelty to some well-known type, of which it must be considered a form or variety. The two opposing schools are characterised respectively in scientific slang as "splitters" and "lumpers," the former finding very thorough-going representatives in the describers of some hundreds of forms of our common Blackberry (*Rubus fruticosus*), while a reference to some of the more recent Colonial Floras will show that "lumping" has its advocates and practisers in very high quarters indeed. As a rule, indeed, it may be stated that those who study only the flora of a limited area, or who devote their attention to a small group of plants, are more likely to detect and lay stress upon comparatively small differences, and so to multiply species, while those who take a wider range and have to deal with the flora of a large province, or the plants of the whole world, are given to take very broad views of what constitutes a species, and to make their definitions so wide as to include a considerable range of variation. Two of our leading English botanists may be cited as offering an example of this. Professor Babington, in his "Manual of British Botany," maintains a large number of species which Mr. Bentham, in his "Handbook of the British Flora," will not allow a higher rank than that of varieties; the former has for the most part confined his attention to the British and European flora, while the latter has devoted himself to research in a wider field, and has probably passed under his notice the greater number of known plants. Each course of action has its good and bad points, and probably the old maxim, *in medio semper tutissimus ibis*, will apply to this as to so many other things.

But, after all this explanation, it will be found that there is a vast difference in the extent of genera. The largest genus of plants known is probably *Senecio:* this is estimated to contain about a thousand species, of which our common Groundsel (*Senecio vulgaris*) is one of the most familiar and ubiquitous examples. Other genera are monotypic, containing but one species; and of these we have an illustration in the Parsley Fern, to which we will now return.

CRYPTOGRAMMA CRISPA. (*R Br.*)

NATURAL SIZE

(a) PORTION OF BARREN FROND. (b) TERMINAL SEGMENT OF FERTILE FROND

FOUR TIMES NATURAL SIZE

Not only in its technical characters, but in its habit and general appearance, the Parsley Fern is one of the most easily recognised and least variable of European ferns. Looking through a large series of specimens, we are struck with the fact that the variation which exists in all natural objects is here confined within very narrow limits; there is singularly little difference between them, either in size or form. In saying this, we are speaking only of the European form of the plant: the Indian and American forms present differences which have been considered sufficient to entitle them to specific, or even generic rank, although they are now usually considered as varieties of *C. crispa;* but of these we shall speak further on.

The Parsley Fern is a small plant varying from four to eight or ten inches in height, sometimes, though rarely, attaining a foot. The densely-tufted fronds rise from a short, thick, slightly creeping caudex, which is sometimes hardly perceptible; the stipes, which is as long as or longer than the frond, is pale green, smooth, and straw-like. The fronds, which are of a bright green hue, and of a thick, somewhat leathery, texture, are more or less triangular in shape, and from two to three inches across at the base. They are of two kinds, or what is termed dimorphous, thus differing from all the species which we have hitherto described; one kind of the fronds being fertile and the other barren. This dimorphism is not very uncommon in ferns, while among flowering plants it exists in very varied forms, from a slight though permanent and important difference in the stamens and pistils of a flower to a complete change in the habit and general appearance in individuals belonging to the same species. Mr. Darwin has taken a leading position among the botanists who have directed attention to this phenomenon; his papers upon dimorphism in the flowers of the common Primrose, and upon trimorphism in the Purple Loosestrife, were mainly instrumental in attracting to the subject the observation which it has of late years received among naturalists. Among our European ferns, we shall find it more strikingly manifested in the Hard Fern, which stands next upon our list; in certain exotic ferns it is very conspicuously developed—we referred to one instance of it when speaking of the genus *Trichomanes.*

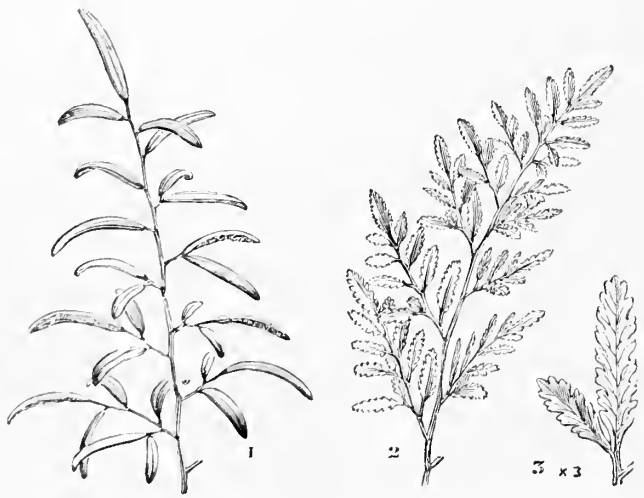
The fertile fronds of the Parsley Fern are, of course, readily distinguishable, when fully developed, by the clusters of brown sori with which they are thickly covered; in a young state these are of a pale yellowish green. The segments are much more narrow and slender in appearance than those of the barren fronds; this is due to the fact that the membranous edges of the segments are turned over upon the sori so as to cover them, thus supplying the place of an indusium, there being no true indusium in this species. Each division of the frond has a somewhat wavy simple or forked vein running down its centre; this produces several smaller veins which reach nearly to the margin of the segments, each bearing a round sorus near its termination. The sori are at first separate, but as they develop they spread out and become more or less confluent, covering nearly the whole surface of the back of the frond. The spores are smooth, and roundish or oblong in form.

The barren fronds are shorter than the fertile ones, and have a more elegant appearance, being less contracted, and offering a much greater variation in form; it is in them that we must look for that resemblance to parsley which has suggested the popular name of the fern, though it must be confessed that this is not always particularly striking. The fronds are divided into alternate or nearly opposite branches or pinnæ, which are spreading, and more or less triangular in form, the lowest being the largest. The segments into which the pinnules forming the pinnæ are divided are more or less cuneate, or wedge-shaped, and oblong, notched at the extremity with two or three distinct teeth. These barren fronds are of a very beautiful green, and their densely tufted habit renders the fern one of very attractive appearance.

Their capabilities from an ornamentist's point of view have already received attention. Mr. G. McKenzie, in the *Magazine of Art*, refers to the Parsley Fern as presenting "forms of leafage which would be of much use to the carver." "In studying from this plant," he adds, "much care and perseverance are needed; the practice followed was to detach the frond to be copied from its neighbours by means of a piece of black silk, which formed a perfect background for the bright green leaf, and then, as in the case of the object, Fig. 1, which was really no larger than a moderate-sized pea, the detail was made out by means of a good magnifying-glass, an instrument which must be used by everyone who would profit by the study of small plants, as in these are often to be found the most valuable lessons. Fig. 2 is a more advanced frond of the same. Fig. 3 is yet more expanded; the whole of the detail of this drawing was found in an object no larger than one's thumb-nail. Fig. 4 is the fully-opened leaf."

CONVENTIONAL TREATMENT OF ALLOSORUS.

The two kinds of fronds—the barren and the fertile—are almost always quite distinct; forms intermediate between them have been recorded, in which, although for the most part barren, fructification is found upon some segments of the fronds; these forms, however, are rarely met with. In Withering's "Arrangement of British Plants" (ed. iii. and others) there is a note stating that "Mr. Jackson has observed two varieties with curled leaves, the one curled like parsley, the other like the flowering part of *Osmunda regalis*." These two forms of the barren fronds—the one having the obovate segments deeply divided, serrated, and one-nerved, the other with elliptical, deeply serrate, and pinnately veined pinnules—are frequently to be noticed if we examine a large series of either fresh or dried specimens of the Parsley Fern. The annexed woodcut, taken from specimens collected in Scotland, shows portions of the fronds of a handsome form of the species which does not seem to be common, although there are other examples of it in the British Museum Herbarium.



VARIETY OF ALLOSORUS.
(1) *Fertile Frond.* (2) *Barren Frond.* (3) *Pinnæ (enlarged).*

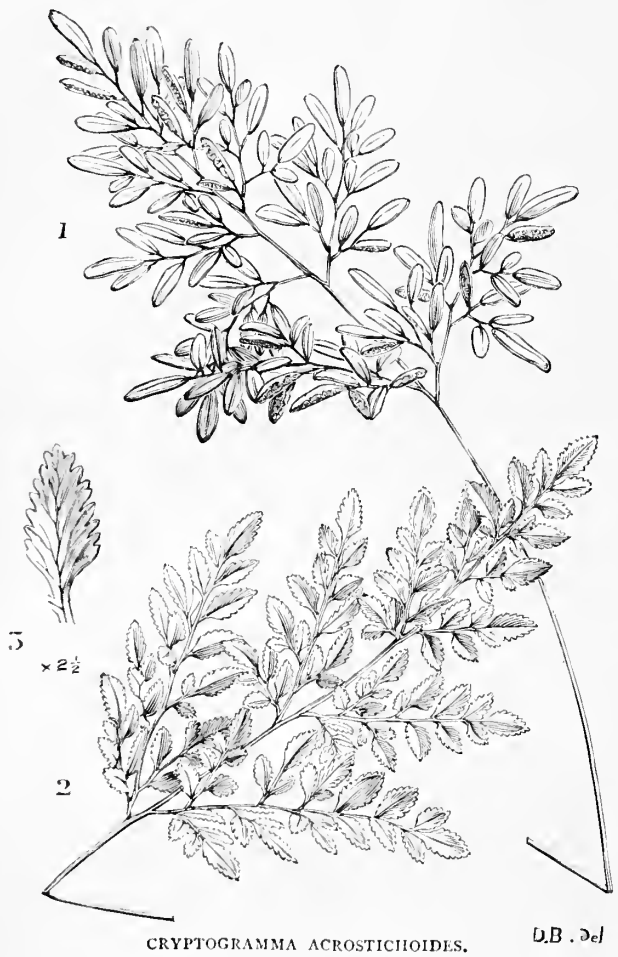
The synonomy of the Parsley Fern is very extensive, as will be at once apparent when we state that it has had as many as eleven generic names. It was originally described by Linnæus as an *Osmunda*—a fact which may seem strange to those who understand that genus as it is now limited, but which ceases to be surprising when we remember that in former days it had a much more comprehensive scope, and included, besides other ferns, the *Struthiopteris*, the Hard Fern (*Blechnum Spicant*), and the Moonwort (*Botrychium Lunaria*), in addition to the subject of

the present notice. Later on Linnæus referred the plant to *Pteris*, with which genus indeed, although so different in habit, it has several points in common, such as the folding over of the margin of the segments of the fertile fronds so as to form a false indusium. The common English book-name for the species, "Rock Brakes," bears witness to the time when the Parsley Fern was placed in the same genus with the common Brakes (*Pteris aquilina*). It is unnecessary to notice any of the other generic synonyms of the Parsley Fern with the exception of two—that under which it is described in these pages, and another one by which it is at least as often referred to, *Allosorus*. The name *Cryptogramma* was given by Robert Brown, who defined the genus in 1823, and is from the two Greek words, *crypto*, hidden, and *gramme*, a line, in reference to the lines of the fructification being concealed. Sir W. J. Hooker, pointing out this derivation, considers Brown's spelling to be inaccurate (as no doubt it is), and writes the name *Cryptogramme*. In this he is followed by many botanists; but this alteration in spelling is hardly in accordance with botanical laws of nomenclature, according to which the name under which a genus was published must be accepted as the recognised designation of the plant, and even the original spelling must be adhered to, unless in very exceptional cases. This rule might seem strange to those unacquainted with scientific terminology, and indeed outsiders might be excused for considering entirely wasted much of the ink and paper which has been devoted to what seems very trifling questions of nomenclature. The question of the right way of spelling Cinchona, for example, has given rise to a controversy of considerable extent. This name was intended to commemorate the Countess of Chinchon, who was the wife of a viceroy of Peru. Having been attacked with fever, a packet of powdered bark was sent to her physician by a native of Loxa, who assured him that it would prove efficacious in the treatment of her disease. The drug fully bore out its reputation, and the Countess was cured, and upon her recovery she caused large quantities of the bark to be collected, which she gave away in the form of powder to those sick of fever.* It was probably owing to this that the drug was introduced to Spain, and thence spread through Europe. Its employment by the Countess took place in 1638; it was not until 1742 that Linnæus founded the genus *Cinchona*. There is no doubt but that in so doing he intended to commemorate the Countess of Chinchon; and it has of late years been strongly urged that the spelling of Cinchona should be altered to Chinchona, and some writers on quinine and its sources have gone so far as to adopt this form. But the word Cinchona has been so thoroughly established, and so many derivatives have originated from it, that the proposed alteration has never been generally adopted, nor is it likely to become so. It has been pointed out that Linnæus also wrote the name *Cinhona*, a form of spelling which, however, may be owing to a blunder of the printer. In spite of Shakespeare's implication to the contrary, there is really a good deal in a name; and a very interesting chapter might be written on the subject of commemorative names alone. In many instances, as Linnæus himself tells us, these titles were bestowed on account of some fancied resemblance between the plants to which they were given and the botanists whom they commemorated: thus, for example, the genus *Bauhinia*, named after the brothers Caspar and John Bauhin, has a two-lobed or twin leaf; *Scheuchzeria*, a grassy Alpine plant, is so called in order to bring to our minds the two Scheuchzers, one of whom had a great knowledge of Alpine plants, and the other an extensive acquaintance with grasses. Sometimes such names were not complimentary—for instance, *Buffonia tenuifolia*, an insignificant plant, is said to have been so called

* Any one curious to see how much of interest and history may be associated with so simple a matter as the introduction of a drug should consult the account of Cinchona bark, given in "Pharmacographia," pp. 304–309.

in memory of the great French naturalist, whose pretensions to botanical knowledge were very slender.*

The genus *Allosorus* was established by Bernhardi in 1806, and then included numerous species of ferns. Many of these, however, have been transferred to other genera, and the Parsley Fern is now the representative of the genus. The name is derived from two Greek words—*allos*, various, and *sorus*, a heap, the intention probably being, as Mr. Moore observes, "to indicate the variation in the arrangement of the sori occurring among the plants originally thought to belong to this family. It may also apply to the apparent difference of arrangement in the sori of this plant at different stages of development, the young sori forming distinct roundish patches, and the older becoming effused into larger shapeless masses." It may, however, perhaps have been intended to refer to the difference between the barren and fertile fronds.



CRYPTOGRAMMA ACROSTICHOIDES.

(1) *Fertile Frond.* (2) *Barren Frond.* (3) *Pinnule (enlarged).*

In the "Synopsis Filicum," following Sir W. J. Hooker in the "Species Filicum," two ferns at one time regarded as distinct from the Parsley Fern are placed under it as varieties. Milde also follows this arrangement, while Mr. Thomas Moore opposes it, and considers the two plants alluded to to be even generically distinct. One of these, *C. Brunoniana* of Wallich, is a native of Northern India, ascending in the Himalayas to from eleven to thirteen thousand feet: the other, *C. acrostichoides* of Robert Brown, is a plant of North, and especially North-Western, America. These Mr. Moore considers as distinct, basing his opinion on the difference in the receptacles, which are linear and oblique in the two plants just named, while in the Parsley Fern they are punctiform. He says, "We follow Mettenius and others in keeping them distinct, on account of the difference in the receptacles, to which we attach considerable importance. In the typical species of *Cryptogramma*, the sori form short lines along a portion of the veins, after the gymnogrammoid type, and these lines being parallel, and near together, unite laterally as they become effused, and so form a broad linear mass transverse to the veins. In *Allosorus*, the sori instead of being elongated are punctiform, but they become laterally confluent in the same way as in *Cryptogramma;* and in some states of the plant a tendency to elongate is perhaps also to be observed." The two genera are

* This, however, has been controverted. See "Journal of the Linnean Society," ii., 183—190 (1858).

undoubtedly very closely united, and in habit and general aspect they are quite similar; the recent and careful observations of Milde entirely support Hooker's view, and from these the author referred to states very definitely that the two genera can in no way be retained, and that all the forms are referable to the species.

The Indian form, *C. Brunoniana*, is an erect, stout plant, of somewhat rigid habit, the barren fronds being quite like those of the European form, though the fertile ones more resemble those of the American variety: the segments of these are oblong, "about three lines long and one line broad, with the involucre spreading in the mature plant and a space left free from fruit in the centre." This occurs in various parts of Northern India, ascending to thirteen thousand feet in the Himalayas. *C. acrostichoides*, the North American form, of which we give a woodcut, is altogether a larger and stronger plant, with thicker and more prominently veined barren segments, which also are not so deeply cut; the stipites are more robust, and the chaffy scales are longer in proportion; the fertile pinnules also are larger, broader, and more flattened, with the involucre spreading as in the Indian form. This is especially a North-West American fern. It was first found by Menzies at Nootka Sound, and then by Sir John Richardson in the Hudson's Bay territory, between fifty-six and sixty degrees north. Douglas collected it in 1825-27 in various localities in the Rocky Mountains, about the Columbia River: his specimens are certainly more luxuriant than any of the European examples we have seen, the fertile fronds being nine inches or more high, and stout in proportion. Other North American specimens, however, according to Sir W. Hooker, possess quite the European form; but statements of this kind, after all, seem to depend a good deal upon the ideas which those making them have formed of the type of a species; for while the author just quoted says that specimens from Isle Royale, Lake Superior, agree entirely with the Parsley Fern of Europe, Professor Asa Gray retains the name *acrostichoides* for the Isle Royale plant, although he says it is "very near *A. crispus* of Europe." The interest of this locality lies in the fact that it is the only one known for the plant in the United States.

Besides these two forms, which have some claim to be considered distinct, Milde* describes two others, *A. Stelleri* and *A. sitchensis*. The former is only a depauperated form of *A. crispus*, with a very slender rhizome, and fronds which are sometimes barren at the base and fertile towards the apex. This is a native of Siberia and the East, and of India. Milde says that he has seen North American specimens which entirely agree with the Asiatic plants. It has also been called *A. minutus*. *A. sitchensis*, which Milde places between *A. acrostichoides* and *A. Brunonianus*, has very small, minutely denticulate ultimate segments; it is only known from Sitka, but the author already quoted says it is certainly not specifically distinct from *A. crispus*. He also says that he possesses an example of *A. crispus* from the Salzburg Alps, which unites in itself the varieties *Stelleri* and *acrostichoides*. The upper part of the frond is fertile and the lower barren, while the segments of the barren portion accord with *acrostichoides*. Forms of *crispus* approaching *Brunonianus* are, according to Milde, much more frequent; and a careful study of his minute and detailed observations, based, as they evidently are, on the examination of a very large series of specimens, seems to point to the accuracy of the conclusion that the whole are but forms of one and the same species.

It may be interesting to enter upon a somewhat more detailed account of the geographical distribution of *C. crispa*, considering it in its more restricted acceptation, and hence excluding from our present estimate the forms just described.

* "Filices Europeæ et Atlantidis," p. 26.

Beginning with our own country, we shall find that the Parsley Fern is frequent on the mountains in many parts of Scotland and the north of England, with a few outlying stations further south, some of which, however, certainly require verification. This is the case with the Devonshire locality, for example: Mr. N. B. Ward recorded the finding, in 1840, of a single plant of this fern, "at or within six miles of Lynton, North Devon," and what appears to be the same locality has been recorded for it in somewhat different terms in various works. But from the way in which the Somersetshire locality for the plant is recorded by Mr. Newman, it seems most probable that the Devonshire locality should be altogether suppressed. Mr. Ward* says the fern was found "in company with *Polytrichum alpinum*," near Lynton, as already quoted; Mr. Newman† has no mention of any Devonshire locality, but under Somersetshire says, "I am indebted to Mr. Ward for a specimen found in 1840. The plant grows very sparingly on a stone wall, about a mile from Simmonsbath, in company with *Polytrichum alpinum*." The wording of these two records leaves little doubt that the same locality is intended in each case, and the occurrence of the Parsley Fern in Devonshire must be considered as requiring confirmation. Worcestershire and Shropshire each have one locality for the Parsley Fern: in the former county it grows sparingly on the eastern side of the Herefordshire Beacon, and in the latter on Titterstone Clee Hill. There is an old record for it in Derbyshire, and it is stated on more recent authority to occur in Cheshire. As we go further north the Parsley Fern becomes more abundant; it has numerous localities in Lancashire, although in some of them it is extinct, or nearly so, and is also found more or less plentifully in all the northern counties. In many parts of the Lake district it is very abundant, so much so, indeed, as to attract the attention of even non-botanical tourists, who cannot fail to be struck with the charming contrast afforded by its delicate fronds growing in masses around the dark slaty rocks. Plentiful in many parts of the district, it is nowhere more abundant or more beautiful than at the foot of Honister Crag, where it grows in company with the beautiful silvery Alpine Lady's Mantle (*Alchemilla alpina*) and other interesting plants. As might be expected, the Parsley Fern did not escape the notice of the Lake poets, although they do not seem to have enshrined it in verse. Southey, however, calls it "the most beautiful of all our wild plants, resembling the richest point-lace in its fine filaments and exquisite indentations;" while we read in Wordsworth's Memoirs, how "suddenly stopping before a little bunch of harebell which, along with the Parsley Fern, grew out of the wall near us, he exclaimed 'How perfectly beautiful that is!'

> "'Would that the little flowers that grow could live
> Conscious of half the pleasure that they give!'"

The Parsley Fern is recorded as having been found in most of the Welsh counties, but we have no notice of its occurrence in Pembrokeshire, Anglesea, and Flint. In Caernarvonshire it has a considerable range of elevation; it is found on stone walls between Llanberis and Caernarvon, at a very slight altitude above the sea-level, while it ascends to the very summit of Snowdon, and is found also, though in small quantity, upon most of the mountains and hills of the county. In Scotland the Parsley Fern is widely distributed, extending to Caithness, although absent from some few counties, and not growing very plentifully in some others: it occurs in the Hebrides, but not in the Orkney or Shetland Isles. In Ireland it is quite local, occurring only in the east and north-east; it grows in the counties of Louth, Down, Antrim, and Derry, ranging in altitude from one thousand feet in Derry, to two

* "Phytologist" (1842), p. 21. † "History of British Ferns" (1844), p. 105.

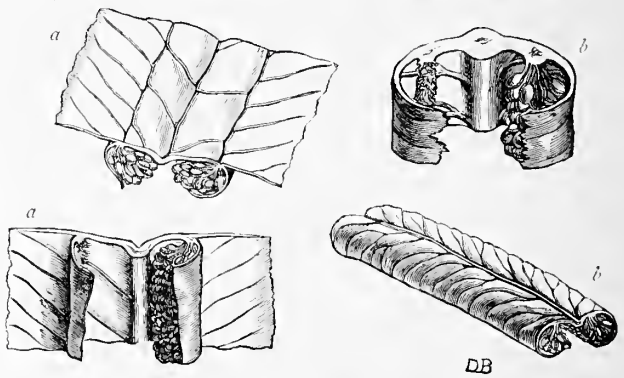
thousand four hundred feet in Slieve Bingian, co. Down. Several of the recorded Irish localities require confirmation. It is said to have been found near Belfast, but was there probably planted.

On the continent of Europe (to which indeed, with the exception of the British Islands, the typical Parsley Fern seems to be confined) it is widely, though by no means universally, distributed. It is abundant in Lapland and Finmark, extending to Greenland, and occurs in the North of Sweden, and throughout the greater part of Norway. Coming farther south, we find it in Hungary and Belgium, though not in great abundance; on the Swiss Alps, and in the sub-alpine parts of Switzerland; in Lower Austria, Styria, and the Tyrol. It occurs in Piedmont and in several parts of France, notably among the mountains of Dauphiné and in the Pyrenees; crossing these, we find it also in Spain, in the highest region of the Sierra Nevada, and ascending to ten thousand feet on the Picacho de Veleta. It seems to be entirely absent from Portugal. Going east, we meet with it upon Mount Olympus, and it is recorded as occurring in Siberia. This may be regarded as the limit of the Parsley Fern, if we take a restricted view of the plant; but if, as seems most in accordance with the evidence produced, we take a more comprehensive view, and include under the same species the Indian *Allosorus Brunonianus* and the American *A. acrostichoides*, we shall of course take a much more extended estimate of its geographical range.

ALLOSORUS CRISPUS.

BLECHNUM.

WE have here a genus of ferns which is generally regarded as sufficiently distinct for separate mention, but some members of which in many points—notably in general appearance—resemble so closely another genus, *Lomaria*, that its solitary European representative, *B. Spicant*, is often referred indiscriminately to both, some authors calling the plant *Blechnum Spicant* or *B. boreale*, while others style it *Lomaria Spicant*. It is one of those cases in which, if guided only by general resemblance, we should certainly place the two genera under one head; the contraction of the fertile fronds, which is sometimes given as a characteristic of *Lomaria*, is certainly manifest enough in our common Hard Fern; but the technical difference between the two must be sought for elsewhere. Mr. Moore has put this so clearly that we cannot do better than avail ourselves of his observations on this point. He says:* "The distinction between *Lomaria* and *Blechnum* becomes easy when full force is given to the technical characters assigned to each respectively. The peculiar characteristic of *Lomaria* is that the sori are produced at the margin; whilst the characteristic of *Blechnum* is to have the sori distinctly within the margin, and near to the costa. Thus in technical and exact terms, the sori of *Lomaria* are marginal, and in *Blechnum* costal or intramarginal. The fructification of *Lomaria* is determined by the indusium being a continuation of the margin of the frond, which becomes membranaceous, and is inflected over the spore-cases. The fructification peculiar to *Blechnum*, on the other hand, is known by the indusium springing directly from the under surface of the frond, the margin extending beyond. This is a clear and intelligible difference, and the genera are only satisfactorily divided when these peculiarities are allowed to have full force." The accompanying figures will show the technical distinction between the two genera.



(*a*) PORTION OF FROND OF BLECHNUM (ENLARGED) SHOWING POSITION OF SORI. (*b*) DITTO OF LOMARIA.

The "Synopsis Filicum" enumerates thirty-nine species of *Lomaria*, several of which are in cultivation. They are widely distributed, occurring principally in the South Temperate Zone, but having representatives in most parts of the world, although—unless we regard the Hard Fern as a *Lomaria*—finding no place in the European flora. *L. attenuata* is a widely-spread species, occurring in both the Old and the New Worlds—in the former in Polynesia, Norfolk Island, the continent of Africa (Fernando Po, Cape Colony, etc.), and in the Mascarene Islands; in the latter from Guatemala southward to Brazil and Juan Fernandez, and in the West Indian Islands. It is a handsome evergreen plant, from a foot to two feet in height, having a somewhat climbing woody root-stock, which is thickly covered with dark brown hair-like scales. The barren fronds are rigid and rather leathery in texture, quite smooth on both

* "Nature-printed British Ferns" (octavo edition), ii. 208.

sides, and of a very dark green hue; they are pinnate and broadest in the middle, narrowing towards each end, the central pinnæ being three or four inches long, and narrowed into fine points. Another and a yet more striking species is *L. chilensis*, which, as its name denotes, is a native of Chili; this is a handsome plant, with arched dark green fronds, in well-grown examples from four to six feet long, and is quite hardy. It will flourish for months in an ordinary sitting-room, and, in favourable situations, will grow on an outdoor rockery as far north as York. The same frond is often partly barren and partly fertile.

A plant allied to the last-named species, *L. caudata*, a native of the Andes of Ecuador, has a curious peculiarity. The barren fronds are very much narrowed towards the apex,

CAMPTOSORUS RHIZOPHYLLUS.

where they take root and produce fresh plants, in the same manner as we sometimes see the arching shoot of a bramble rooting at its apex; or, to take another example, resembling the Banyan (*Ficus indica*), though not in the extent of its growth, if we may accept the statement that the celebrated Banyan-tree on the Nerbuddah has three hundred large and three thousand smaller stems, and is capable of sheltering three thousand men. This habit, by the way, is developed to a singular extent in a little North American fern, *Camptosorus rhizophyllus* (called, on account of this peculiarity, the "Walking Leaf"), of which we give a figure. It is a small plant, with evergreen spreading tufted fronds, which are undivided and heart-shaped at the base—reminding one somewhat of the common Hart's-tongue (*Scolopendrium vulgare*), with which it is sometimes generically associated—but tapering above into a long slender elongation, which bends down to the ground and, under favourable circumstances, takes root, giving rise to new plants. These in their turn, on arriving at maturity, behave in the same manner, so that, as in the case of the Banyan, it is possible to have two

or three generations thus connected together, all the offspring of one and the same plant. It is easily cultivated in the Wardian case, and is well worthy of notice. Our figure illustrates this peculiarity, which is shared by an allied species, *C. sibirica*, a native of Siberia and Japan. We shall have occasion to recur to this or a somewhat similar mode of increase when we come to the description of our next genus, *Woodwardia*; an example familiar to those acquainted with the more commonly cultivated exotic ferns will be found in *Asplenium bulbiferum*, of which we shall speak more at length under the head of the genus to which it belongs.

An Australian *Lomaria*, *L. Patersoni*, is remarkable on account of its frequently quite simple, narrow, undivided fronds; these are from a foot to two feet long, and are sometimes pinnatifid with a few narrow segments. This has been in cultivation in England since 1839, when it was raised from spores in the Royal Gardens at Kew; but it is more curious than striking, and is not often met with in cultivation. A New Zealand species, *L. Fraseri*, has an erect, slender rhizome like that of a tree-fern, attaining a height of two or three feet, and covered, as in the ordinary tree-fern, with the bases of the old stipes. It has numerous tufted bipinnate fronds from one to three feet long, including the stipes. *L. volubilis* is a South American species of very remarkable habit. Sir W. J. Hooker says of it: "This is the most remarkable of the genus *Lomaria* which it is my privilege to describe. There are species of *Lomariæ* with scandent caudices or rhizomes which measure from twenty to twenty-five feet, but here that length is attained by the frond itself, or rather by the main rachises of the frond, which, having considerable intervals free from the pinnæ, twine round each other, as well as over and among bushes (perhaps much after the manner of *Lygodium*), intermingling—as it would appear—sterile and fertile fronds, so that it is difficult to trace the pinnæ to their respective rachises. Of the caudex and even stipes we know nothing. The primary petioles, which are quite inarticulate, are often nearly opposite, two inches and more long, and stand out at right angles from the rachis. The fertile pinnæ have always fewer pinnules, and they exceed those of the sterile ones in length, being more than twice as long, and generally very falcate. A folio page would not suffice to do justice to a figure of this fine species."*

L. gibba, a native of New Caledonia, presents one or two features of interest. In the first place, it is one of the species which seem to suggest the possibility that the distinctness of the two genera, *Lomaria* and *Blechnum*, is a matter which further investigations may show to be at least questionable, for specimens have been met with in which the sori are cut quite marginal, thus showing an approximation to *Blechnum*, of which, as we have seen above, the non-marginal sori form a distinctive feature. Then it is not only a very handsome plant—having deeply-pinnatifid fronds, from one to three feet in length, and about half a foot broad, rising from a short stout stem—but one that is easily grown. It is also a very variable plant: one of its most striking varieties (*L. gibba crispa*) has a rather dwarf habit, with densely leafy waved pinnæ; another form (*L. gibba major*) is much larger than the type; and there are others in cultivation. It will do well in a cool house, so long as care is taken to avoid frost, and is extremely useful for dinner-table decoration. Our attention has been directed to an example of this species flourishing in a glass window-case in one of the worst suburbs of Manchester—worst, we mean, from a gardener's stand-point, inasmuch as the smoke and exhalations from the chemical works make plant-life a real struggle for existence. Even when protected by glass it is impossible here to grow some plants with permanent success; but ferns do fairly well, and few better than this handsome *Lomaria*. Were this a suitable opportunity, we might point out all that this success

* "Synopsis Filicum," vol. iii., p. 30.

implies, illustrating our remarks by reference to the repeatedly unsuccessful attempts to induce any kind of tree to grow in Manchester Cathedral-yard. Londoners who are accustomed to see plane-trees flourishing in the heart of the city, and who find it possible to maintain a very decent semblance of a garden round St. Paul's itself, would look with astonishment on the few black sticks which are all that remain of the last attempt at tree-planting in Manchester. The fearfully vitiated atmosphere of course explains the whole matter, but tree-planting is not always a success even under more favourable auspices; what, for example, could be more melancholy than the attempts at arboriculture which we may suppose were intended to adorn the pavements in Sackville Street, Dublin?

But we must now pass on to the genus *Blechnum*, a genus containing some twenty or thirty species—although this estimate varies, some plants referred to it by certain authors being considered by others as belonging to *Lomaria*—bearing for the most part a general resemblance one to the other, and widely distributed through the tropical and south temperate regions of the globe. Our sole European representative, *B. Spicant*, which we shall shortly consider more at length, is a plant of wide distribution, but the other species are more restricted in their range, but few of them being common to both hemispheres. One tropical American species, *B. volubile*, is, as its specific name denotes, of climbing habit. It has a spreading, twining stem, by which it climbs to the top of lofty trees to a height of from twenty to thirty feet, and bipinnate fronds; some peculiarity in the indusium induced Mr. John Smith to propose this as the type of a new genus, *Salpichlæna*, but it is now generally considered as a species of *Blechnum*, remarkable on account of its scandent mode of growth. In this it bears a strong resemblance to *Lomaria volubilis*, to which we have already referred. The pinnules vary a good deal in length and breadth, but are often very large; they are sometimes as much as fifteen or sixteen inches long, and (the barren ones) two inches and a half broad. Mr. Purdie, who collected the plant in Columbia, has recorded that when the sori and involucres have completely fallen away from the fertile pinnules, the last-named, which have hitherto been narrower than the barren ones, increase in size until they are indistinguishable from these latter.

BLECHNUM LANCEOLA.

Among the exotic species of *Blechnum* which are—or have been—in cultivation in England, none is more distinct than *B. Lanceola*, a small evergreen species, native of Tropical America from Panama southwards to Brazil and Peru. This, indeed, cannot be confused with any other species of the genus, being distinguished from all of them by its simple fronds. These are from four to six inches long, and usually less than half an inch broad, narrowed gradually at each extremity, and rising on slender stipites from a creeping stoloniferous rhizome; the sori form a continuous line close to the midrib. This was in cultivation in Kew in 1841, and is not very uncommon in collections, although its interest lies rather in its exceptional appear-

ance in the genus than in any special beauty or attractiveness. There is a variety (*trifoliatum*) in which there are one or two pairs of small pinnæ at the base of the large one which terminates the frond. *B. longifolium*, a form of which is known as *B. gracile*, is a pretty species frequently met with in cultivation; it was introduced to the Royal Gardens, Kew, in 1833. It has slender pinnate, deep-green fronds, varying from six inches to a foot and a half in length, with a few large, distant pinnæ, similar to the solitary one of *B. Lanceola*. This is a native of Tropical America—from Mexico and the West Indies southward to Brazil and Peru. *B. asplenioides* is a pretty little plant, having very narrow fronds with small, broad segments placed very closely together, and reminding one very much at first sight of the Maidenhair Spleenwort (*Asplenium Trichomanes*); it is a Tropical American plant. One of the Australian species, *B. cartilagineum*, which is peculiar to the Australian continent, is of some interest as being probably the only species of the genus possessing any claims to be considered of economic importance. It has a short, thick, woody rootstock, covered with shining black scales. The fronds are from a foot to two feet in length, with very numerous serrulate pinnæ, from three to six inches long, of a somewhat leathery texture. It is the thick rhizome that possesses economic value; this is first roasted by the natives, and then beaten so as to break away the woody fibre: its taste is said to resemble that of a waxy potato. *B. cartilagineum* is a very handsome species, and will succeed well in a cool greenhouse.

BLECHNUM SPICANT, *L.*

Owing to its readily recognised form and habit, this species, generally known as the Hard Fern, was familiar to our older botanists, who were not in those days in that danger of confusing it with any allied fern which exists in times like the present, when our knowledge of plant-life has so wonderfully extended and developed. Gerard's brief description, however, is not very graphic, although the figure by which he illustrates his remarks leaves little to be desired in this respect. He calls it "*Lonchitis aspera*, Rough Spleenewoort," and says: "Rough Spleenewoort is partly like the other ferns in shewe, and bereth neither stalke nor seede, having narrow leaves a foote long, and somewhat longer, slashed on the edges even to the middle rib, smooth on the upperside, and of a swart green colour; underneath rough, as is the leaves of the Polypodie: the roote is blacke, and set with a number of slender strings." He adds: "The Rough Spleenewoort groweth upon barren heathes, dry sandie banks, and shadowie places in most parts of Englande, but especially on a heath by London called Hampsteede Heath, where it groweth in great abundance;" and where, we may note, it is still to be found in spite of the mania for fern cultivation; the ravages of collectors—whether botanists or horticulturists—being kept in check by the watchful care of the local magistrates, who have determined to preserve the natural flora of the Heath. The name Rough Spleenwort, like that of Hard Fern, refers to the rigid harshness of its fronds, and is appropriate enough. Spleenwort was a name (now applied to the species of *Asplenium*) given formerly to many ferns, from a belief that they were efficacious in diseases of the spleen.

Gerard's description, it must be confessed, though accurate enough so far as it goes, does not go very far; but the art of describing species was in those days in its infancy. Curiously enough, he does not seem to have noticed the very obvious and characteristic feature of the dimorphic fronds, nor are these clearly shown in the figure which he gives. Parkinson,* writing about fifty years later, is much more explicit on this head. "In the middle of the outer leaves," he says, "rise up other bigger and blacker stalkes of narrower leaves, like unto them, but fully separated, and so finely dented about the edges that they seeme curled with brownish spots, or scales on the backes of them as if other fernes; the roote hath a thicke head, covered with scales, lying one upon another, with divers fibres at them." He refers also to "another of this sort, lesser than this, found about Colchester in Essex, and in other places, growing in the wet borders of fields, and by the hedge sides." This was probably a variety of the Hard Fern, which, as we shall see, is a very variable plant. The rhizome is tufted and hairy, covered at the apex with black hair-like scales; the roots are, as Gerard describes them, "a number of slender strings," black and tough; and the fronds, as we have already said, are of two kinds. The deeply-pinnatifid barren ones are evergreen, supported on short, scaly stipites, and from six inches to a foot or rather more in length. They are narrow and lanceolate, of the same width (about one or two inches across) for the great part of their length, but tapering to the summit and also towards the base. Many of them rise from the same rhizome: they are at first upright, but soon assume a spreading position, often lying quite flat upon the ground. The segments are long and narrow, rather blunt, or nearly acute at the apex, curved slightly upwards, entire (in the typical form), and united towards the base, where they are attached to the rachis; they are conspicuously veined, there being a stout mid-vein producing once or twice forked lateral ones. The fertile fronds (which

* "Theatrum Botanicum" (1640), p. 1043.

are also evergreen) are much longer than the barren ones, attaining a height of from one to two feet, or sometimes more. They are upright or slightly inclining, and rise conspicuously above the last-named. They are pinnate,* the pinnæ being very narrow, and more distant than the segments of the barren frond, especially the lower ones. The rachis in these is of a shining dark-brown or nearly black hue; in the barren fronds it is green—although by some accident this distinction between the two is hardly shown satisfactorily in our plate.

We have said that the Hard Fern is a variable species; this will at once become manifest when we state that Mr. Moore enumerates and describes at length no fewer than thirty-four varieties.† It would be impossible to do more than allude to these in the space at our disposal; but we may just glance at the six principal of them, which have been thought by Mr. Moore of sufficient importance to merit a botanical diagnosis.

In the variety *lancifolium*, which is the least divided form of the species, and a very distinct-looking plant, the fronds (both fertile and barren) are very narrow (from a quarter to half an inch wide), and undivided for about a third or even more of their length, from the apex downwards. This has been found at Tunbridge Wells, near Todmorden in Lancashire, in North Wales, and in the Clova mountains; it is permanent and fairly constant in cultivation. The frequent occurrence in Mr. Moore's book of the Todmorden locality for varieties of ferns seems to suggest that if collectors in other places would take up the subject as energetically as Mr. Stansfield has done in the district named, their search would be rewarded with many new forms.

The variety *subserratum*, a very elegant and permanent form, has small narrow elongated fronds, which are, to quote Mr. Moore's description, "usually curved in a lateral direction, and the acute segments remarkably curved forwards in a falcate manner, so much so as to overlie each other; the anterior margin of these segments is entire, while the posterior margin is notched with conspicuous shallow rounded lobes or crenatures." This has also been found in Yorkshire.

The variety *imbricatum* is notable on account of its short broad sterile fronds, the segments of which are densely crowded, and imbricated, that is, lying over one another in the manner of tiles upon a roof. The stipes is very thick. This variety is constant in cultivation, and seems to be not unfrequent in a wild state; it is recorded from Devonshire, Somersetshire, Lancashire, Staffordshire, Pembrokeshire, and Perthshire.

The variety *strictum* has long narrow fronds, the segments being more distant than in the normal form, and shorter, the margins being more or less irregularly toothed. Allied to this, which has been found in Westmoreland, Lancashire, and North Wales, there is another form, *heterophyllum*, which is remarkable for the irregular appearance of its barren fronds. Some of these are normal, but in others many of the segments are very much reduced, while a few of them extend to their normal size; this occurs quite irregularly, and the result is that the fronds present a singularly quaint and untidy appearance.

The varieties hitherto considered have been those in which the fronds have retained their normal shape; but there are others in which they are branched or much divided either below or at the apex. The most common of these is one in which the fronds, or some of them, are

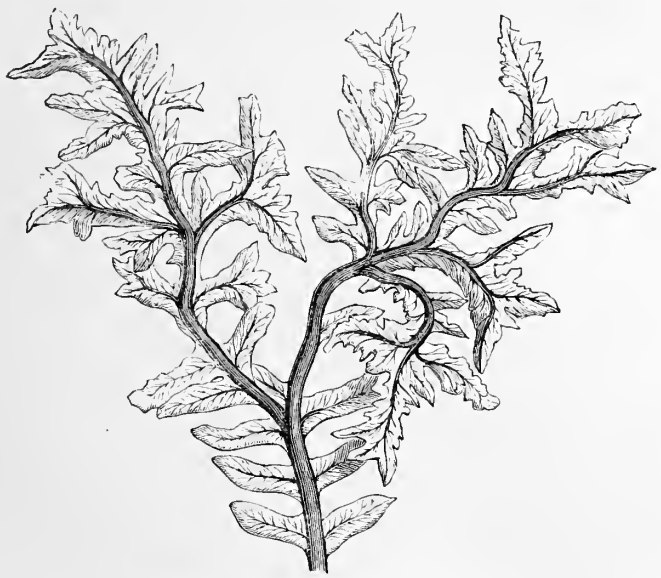
* The difference between the somewhat similar terms *pinnate* and *pinnatifid* should, perhaps, be explained, and the fertile and barren fronds of the *Blechnum* afford a good illustration of this. In the former the pinnæ are distinct, arranged on opposite sides of the rachis; in the latter the segments of the frond, although deeply divided, are not separated at the base.

† "Nature-printed Ferns" (8vo edition), vol. ii., pp. 217—228.

simply bifid at the apex, as shown in the accompanying figure; the extremes of this method of division are seen in the two forms *multifidum* and *ramosum*, of which we give cuts. In the first of these, the barren fronds (the fertile ones are not known) are often branched once or twice near the base, or many times forked towards the apex, thus forming a flat spreading tuft. "The segments resulting from these apical furcations," writes Mr. Moore, who has paid much attention to the variations of British Ferns, and to whom we acknowledge our indebtedness, "are quite irregular in form and size, but they spread out, and are most of them extended into a lengthened acute point, of which the margins are irregularly notched, producing a somewhat ragged appearance: the fronds are about six to eight inches long, tapered below." The variety *ramosum*, which has an exact counterpart in a variety of the common Hart's-tongue (*Scolopendrium vulgare*) bearing the same name, is a very pretty plant. The fronds in this are repeatedly divided in a forked manner into numerous branches, each of which terminates in a dense crested tuft. This variety, which is well worthy of cultivation, has been met with in the Irish counties of Wicklow and Mayo, and also in Westmoreland.

FORKED VARIETY OF HARD FERN.

The Hard Fern is a plant of wide though not general distribution, but it is mainly confined to Europe. Its extra-European localities are—in the Old World, Madeira, the Azores, and the Cape Verde Islands; it is also said to occur at the Cape of Good Hope, and in North Africa: while in the New World it is reported from Sitka, Nootka Sound, Oregon, and Chili. It is spread almost all through the mountainous and sub-alpine districts of Europe,



BLECHNUM SPICANT, Var. MULTIFIDUM.

BLECHNUM SPICANT, Var. RAMOSUM.

as well as in the lower regions, extending from Lapland to Sicily, from Spain and Portugal to Crete and the Caucasus. With ourselves, it is recorded for nearly all the English and Scottish counties, and doubtless occurs in the whole of them, as those from which it is not as yet

recorded are counties which are but poorly represented in botanical literature. Mr. Watson, speaking of its distribution in Britain, says: "Taking both horizontal and vertical range into account, this is perhaps the most widely distributed of all our ferns, *Lastrea dilatata* being its nearest ally or rival in this respect."

In spite of this wide distribution we should hardly reckon the Blechnum as one of our commonest ferns. It is somewhat particular as to its place of growth, and is never found at any great distance from water. It varies a good deal in size, attaining its largest dimensions on sheltered banks in moist woods where there is a stagnant pool, or where a tiny brooklet winds its way among the trees. Here the Hard Fern grows most luxuriantly, forming dense tufts, the fertile fronds rising gracefully above the more robust barren ones, forming a beautiful object. In more exposed localities it is a much smaller plant—often, indeed, not exceeding in size the figure given in our plate, although that is only about half the average size of the fern. It is a conspicuous object upon the countless acres of peat-bog which extend with intervals throughout the south and west of Ireland—conspicuous, not indeed on account of its size, but from its colour. The barren fronds in this exposed situation are of a peculiar yellow-green, which it would puzzle even an artist of the school now most in vogue to render at all accurately. This, no doubt, is partly owing to the surroundings—the dull herbage, and the rich deep brown of the moorland bog, where this has been laid bare in the preparation of "turf;" and the brilliant white tassels of the cotton-grass, in numbers such as to produce from a distance the effect of a drift of newly-fallen snow.* But whatever may be the cause, the bright fronds of the Blechnum are among the most conspicuous objects on an Irish bog in the early summer-time—a time when, in Ireland, the wild flowers seem to have forgotten their proper dates for blossoming, and get mixed up in an extraordinary fashion. As an instance of this we may mention that we recently saw the primrose and fox-glove in blossom together on the same hedgebank in many parts of the County Waterford—the former, indeed, having a little passed the period of full bloom, while the latter had not yet attained it; but both being sufficiently well represented to attract attention. Perhaps the fairies have something to do with the jumble; for, although philologists do their best to prevent our believing that the name *fox-glove* should be written *folk's-glove*, there is no doubt but that in Ireland fox-gloves and fairies have had a good deal to do with each other; for not only is the plant called fairy-cap, fairy-bell, fairy-glove, and fairy-weed, but it is also named *lusmore*, the "great or important herb," owing its importance to the use made of it by the "good people," who, when disturbed in their revels by the approach of a human foot, take refuge in the bells, and remain concealed until the danger is past. The Blechnum extends throughout Ireland, in boggy and heathy places, except upon pure limestone. Although the Bracken may have been the fern more especially intended by Cowper when he wrote the following lines, the species now under consideration may have been also present to his mind when he spoke of—

> "The common *overgrown with fern*, and rough
> With prickly gorse that, shapeless and deformed
> And dangerous to the touch, has yet its bloom,
> And decks itself with ornaments of gold."

The uses of the Hard Fern may be almost expressed by a cipher, although in the "good old times," when no plant was considered entirely destitute of "vertues," it was not regarded

* This appearance of the cotton-grass explains a simile used by Ossian:

> "Her bosom was whiter than the down of *canna*."

Cannach or canna-down is the Gaelic name for the cotton-grass, and is still in use in some parts of Scotland.

as quite useless. Parkinson says, "The dryed leaves of this taken in vinegar, is held to be good to dissolve the hardnesse of the spleene, and the greene leaves to be singular good for wounds, and to keepe them from inflammations." He includes the Ostrich Fern or, as he writes it, "the Estridges Ferne" (*Onoclea Struthiopteris*) in the same chapter; but the "vertues" seem to be attributed to the Blechnum; and Threlkeld, writing in 1727, says of this that "it hinders inflammations of wounds."

The Blechnum is one of the few ferns which has a genuine vernacular name apart from that by which it is usually known in books. Indeed, it has two or three—but one of these it shares with the Royal Fern, both being known in the New Forest district as "Snake Fern." It is a noticeable fact that snakes and adders play a prominent part in the vernacular nomenclature of plants, and notably so among our British ferns. Besides the Adder's Tongue (which has its serpent associations also perpetuated in its Latin title, *Ophioglossum*), we find that the common Bracken is called "Adder-spit" in Sussex, while the common Polypody (*Polypodium vulgare*) is called in Hampshire "Adder's Fern." It is quite likely that the somewhat snake-like appearance which the uncoiling fronds of some ferns—such as the Bracken—present, has suggested this association of names and ideas: it will also be observed that most of the plants, whether flowering or cryptogamic, which are so associated with snakes, are conspicuous in the spring and early summer, when adders and their relations abound. The second vernacular name for the fern now under consideration is, however, peculiar to it, and indeed would not be appropriate to any other British species. At Winderwath, on the borders of Westmoreland and Cumberland, we are informed that it is known as the "Herrin'-bone Fern;" and the resemblance between the form of the fronds, especially the fertile ones, and the object referred to in this local appellation, is certainly striking enough. In that interesting collection of letters, the "Correspondence of John Ray," published some thirty years since by the Ray Society, we find in a letter from Lhwyd to Ray a reference to the Blechnum under its old name of *Lonchitis aspera*. Speaking of certain "coal-plants" "found at a coal-pit in the Forest of Dean," he mentions "*Lonchitis aspera*, called by the workmen 'Vox Vearn,' *i.e.*, Fox Fern." His identification of the fossil Fern with our recent Blechnum may, however, be considered open to question, but it is worthy of note that the vernacular name used by the workmen is the same as that given by Parkinson as applied to the Hard Fern; he says "this is called Foxes Ferne in many places of this land."

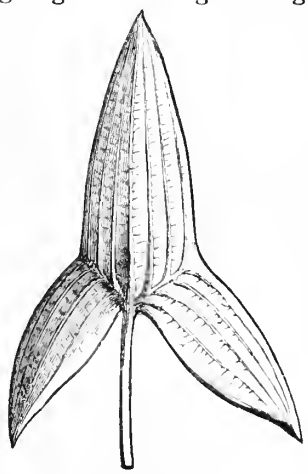
It seems strange that the vernacular and popular nomenclature of our British ferns should be so very limited as it certainly is. One would have thought that ferns were abundant and conspicuous enough to have obtained at any rate a fair share of popular attention, and, as a consequence, a due proportion of vernacular names; but such does not seem to be the case. Even so well-known and striking a fern as our common Bracken is almost destitute of genuine English names; so that it is not surprising that other less conspicuous members of the family should have received but scant notice. But it is very difficult, if not impossible, to arrive at any conclusion as to the causes which render a plant sufficiently popular to receive a copious vernacular nomenclature. It is, of course, obvious that such a plant must be generally and abundantly distributed, and capable of arresting attention by brilliancy of colour or peculiarity of form, or by the possession of some medicinal or economic properties which cause it to be in frequent request. Yet such conspicuous and well-known wild flowers as the Forget-me-not (*Myosotis palustris*) or the Fleabane (*Pulicaria dysenterica*) are almost devoid of any popular nomenclature; the Mistletoe, with all its wealth of tradition and

historical association, has no other English name; the Bracken, as we have already seen, is scarcely better off: and yet one would have thought that all these were sufficiently common and striking plants to have attracted a good deal of attention. It would seem, speaking generally, that spring flowers are the richest in vernacular names. Coming after the barrenness of winter, and appearing usually in great abundance, it is natural that they should force themselves more clearly upon the notice of the casual observer than those later blossoms which make their appearance in a field already occupied; and so it is that we find not only such odd plants as the Lords-and-Ladies (*Arum maculatum*) and the Purple Orchis (*Orchis mascula*) with scores of quaint and varied English names, but even such ordinary-looking flowers as the Lady's Smock (*Cardamine pratensis*) and the Stitchwort (*Stellaria Holostea*) with a goodly roll of titles. The absence of blossoms, and the uniform green hue of the fronds, may be considered to explain the paucity of popular fern-names: it must be admitted, however, that the ferns are more than compensated for this neglect by the number and variety of titles which have been showered upon them by scientific men. This absence of popular vernacular names for ferns seems equally noticeable in other languages, so far as the literature of the subject enables us to judge. One or two ferns, indeed, have such names in French and German, but —as is the case among ourselves—this is so markedly the exception that it can only be regarded as proving the rule.

BLECHNUM SPICANT (REDUCED).

The name *Blechnum*, in its Greek form, *blechnon*, was employed by Dioscorides. It is the ordinary Greek equivalent for a fern. The specific name *Spicant* is, however, a difficult one to explain; indeed, it may be doubted whether any certain explanation of it is possible. It may be observed that it is spelt with a capital initial letter, and this distinction is reserved in botanical nomenclature for two classes of specific names—those which are commemorative, or taken from the names of people, and those which at one time ranged as generic or substantive names. It may be well to explain, for the benefit of those not specially acquainted with scientific nomenclature, that the Latin names of all natural objects are made up of two parts—the first being called the substantive or generic name, and the second the trivial, adjectival, or specific name. Thus, in *Blechnum Spicant*, for example, *Blechnum* is the substantive or generic, and *Spicant* the trivial or specific name. Certain rules or canons have been laid down for the guidance of those naming plants—some of them proposed by Linnæus, who conferred an incalculable boon upon scientific men, whether readers or writers, by systematising nomenclature, and by establishing the law that no animal or plant should receive a name of more than two words; others, comparatively recently, at a Botanical Congress, by M. Alphonse De Candolle. It may be objected by some that this is a small matter for legislation, and we may be reminded of the axiom "*de minimis non curat lex;*" but order is essential in small things as well as in great, and readers of scientific journals will notice how

frequently questions connected with nomenclature are brought before them, just as scientific workers are but too well aware of the difficulties presented by synonymy. Generic names always begin with a capital letter—we have already said something about these at p. 59—specific ones with a small one, except in the cases which we have mentioned above. Some of these names point out something special about the plant upon which they are bestowed; for instance, the Yellow-wort, or Yellow Centaury, is called Chlora *perfoliata*, in allusion to the curious way in which the stem seems to pass through the leaves; the Arrowhead is named Sagittaria *sagittifolia* because of its arrow-shaped foliage, and so we might go on through a long list, for an interesting chapter might be written on the meanings and applications of generic and specific names.* When the specific name is commemorative—of which we have already had an example in *Cheilanthes Szovitzii*—a capital letter is employed, and this is also the case when it is a name which was formerly used as substantive or generic; of this we had an example in *Onoclea Struthiopteris*, Struthiopteris having been at one time employed as a generic name. This accounts in some measure for the spelling of *Spicant* with a capital S. Linnæus so wrote it, and it is to be supposed that by so doing he showed that he regarded it as an old substantive name. Such, indeed, it may be, and most probably is, for it is difficult to see otherwise how it could have arisen. It has been suggested that the name originated in a *lapsus calami*, and that it should be written *spicans*, but there is no ground for such a supposition. Bauhin† has among its synonyms "*Spicant Germanorum, forte a radice Indicam spicam referente*," but the resemblance between the rhizome of the *Blechnum* and that of *Nardostachys Jatamansi*—a valerianaceous plant, which, according to the best authorities, constituted the spikenard of the ancients—is not very striking, although a certain similarity may be traced. But it would seem that the name Spicant is still in use as a popular German equivalent for the plant.‡



LEAF OF ARROWHEAD.

* A full explanation of the generic and specific names of British plants with a very interesting introduction to the subject, will be found in Mr. R. H. Alcock's "Botanical Names for English Readers."

† "Pinax," p. 359 (1623).

‡ See F. Kirschleger's "Flore Vogéso-Rhénane," ii., p. 262 (1870).

WOODWARDIA.

THIS is a small but handsome genus of ferns, with large handsome bipinnatifid fronds, natives of the North Temperate zone, extending, though but slightly, into the Tropics. The genus was established by Sir James Edward Smith in 1794, and named by him in commemoration of Mr. Thomas Jenkinson Woodward, a British botanist who published some papers on seaweeds and fungi towards the end of the last century. Six species are recognised by Hooker and Baker. The rhizome or underground stem is very thick, covered with scales, and rooting very freely. The stipites are covered at the base with long narrow scales. The fronds are uniform in some of the species, and dimorphous in others; they are once or twice pinnate, with undivided or divided pinnæ, and in many cases are proliferous, giving off small scaly buds from the upper side of the fronds, which produce fresh plants. We shall say more about this peculiarity in our description of *W. radicans*. The sori are oblong or linear, "arranged in one or more chain-like rows or transverse anastomosing veinlets parallel and near to the midrib."* This disposition of the sori has suggested the name "Chain Fern," by which the genus is sometimes called in books. These veinlets form a series of elongated meshes, technically termed *arcoles*.

Of the six species, four have uniform fronds, while in two they are dimorphous. Of the dimorphous-fronded species, one, *W. Harlandi*, is a native of Hong Kong, while the other, *W. angustifolia* (called also *W. areolata*), is a United States plant, extending from Massachusetts to Florida, and most abundant in the Southern States. Of this latter the sterile fronds are membranous, from a foot to a foot and a half in height, with slender stipites and numerous pinnæ; the fertile fronds are taller and somewhat leathery, with stout erect brown stems, and narrow entire pinnæ, which are about half an inch apart. This was introduced to the Royal Gardens, Kew, in 1830. Among the species in which the fertile and barren fronds are similar, one, *W. virginica*—a native of the United States, from Maine to Virginia, and southwards—was known to Linnæus, who described it under the name of *Blechnum virginicum*. It has a creeping underground stem, broad, smooth, pinnate fronds, from a foot to two feet high, the veins forming a row of narrow meshes, or *areoles*, along the midrib of the pinnæ. This is a handsome and hardy fern, which has been in cultivation in England since 1774, when it was grown by Dr. Fothergill. *W. orientalis*, a native of Japan and southwards, is very nearly allied to *W. radicans*, of which it may be a form. Of this a remarkable variety, at first described by Sir William Hooker as a species,† was collected in the Loo Choo Islands, 1825-28. It is a smaller plant than the type, and the divisions of the pinnæ are more copiously netted with veins; but "its most remarkable feature," to quote Sir William's description, "arises from the copious scaly buds, each bearing a young frond, which appear on the upper side of the laciniæ (divisions of the pinnæ), and always from a certain point of the nervation, in the upper angle of the costal nerves, occasioning a corresponding depression on the under side." He adds:—"Our specimens are almost entirely destitute of sori." This

* Gray: "Manual of the Botany of the Northern United States."

† "Botany of Beechey's Voyage," 1841, t. lvi., p. 275.

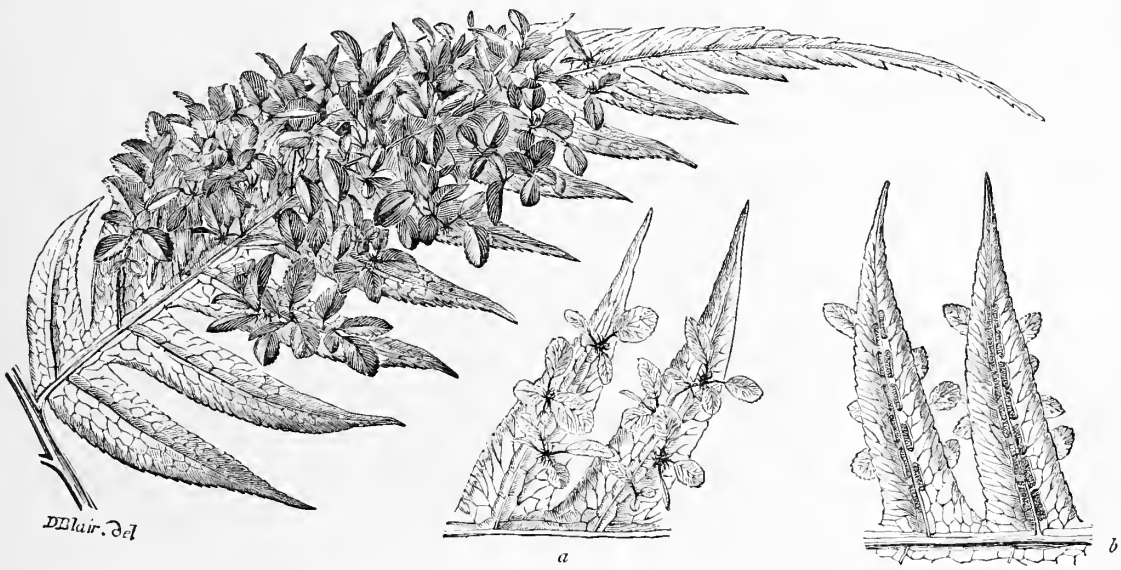
1 WOODWARDIA RADICANS. *Sw*

(1/6 NATURAL SIZE)

2 UPPER SIDE OF PINNULE, NATURAL SIZE.

3 UNDER SIDE OF PINNULE, NATURAL SIZE.

failure of the ordinary method of reproduction is often to be noticed in cases where, as in the present, the plant is propagated by extraordinary means. The typical form of *W. orientalis* is equally remarkable in the respect just mentioned, although not invariably so. The peculiarity has long been known, and did not escape the wondering comments of our last century naturalists. Thus the great John Ray, in the supplement to his large folio "Historia Plantarum" (1704), describes it under the name of "Filix Emuyaca pinnis proliferis mire ornatis," and thus refers to its peculiar mode of increase:—"Verum, quod mirum videtur, et huic speciei ex omnibus notas unquam vidimus proprium, ex ipsis foliis, et quantum discerque licuit seminalibus lineolis, enascuntur plantulæ innumeræ fere, denso velut cespite totam foliorum superficiem operientes." There are several specimens, collected in the East during the early part of the last century, in the Sloane Herbarium, which is, historically, one of the most important



PORTION OF FROND OF WOODWARDIA ORIENTALIS (NAT. SIZE).

(*a*) *Under-side of Pinnæ.* (*b*) *Upper-side of Pinnæ.* (*Both magnified.*)

of the collections in the National Herbarium at the British Museum. This herbarium is contained in about three hundred volumes, for the most part folio, and of considerable thickness, and contains collections from all the botanical explorers of the latter part of the sixteenth and earlier portion of the seventeenth century. No complete list either of the collectors or of the plants contained in this herbarium has been published; but a careful working up of the specimens would no doubt bring to light many new and interesting facts which are at present buried in these ponderous tomes. At Sir Hans Sloane's death, in 1753, this collection was, in accordance with the provisions of his will, offered to the nation for a large sum: the terms were at once agreed to, and the plants thus acquired formed the basis of the British Museum Herbarium. Among the specimens of *Woodwardia orientalis* contained in the Sloane collection is included that from which our figure is taken, with others apparently from Father Kamel (or Camelli), a Portuguese Jesuit missionary, who collected numerous plants in the Philippic Islands, and particularly at Luzon, where he was stationed for many years, towards the end of the sixteenth century. He paid much attention to botany, and was in correspondence with Ray, Petiver, and other botanists; he was also a good artist,

and many of his drawings of plants are also in the British Museum. It was in his honour that Linnæus named the familiar and beautiful genus *Camellia*, Camellus being the Latinised form of his name. Many of the earlier Catholic missionaries were also acute naturalists, and found time to combine with their spiritual labours a careful investigation of the fauna and flora of the—then almost, if not quite, unknown—regions to which they were sent by their superiors. For example, Louveiro, while employed as a missionary, investigated the botany of Cochin China; his work upon the subject (published in 1712) being still our principal authority on the plants of that region. It is to Kamel that we owe the introduction of the drug known, in compliment to the founder of the Society of Jesus, as St. Ignatius's Bean (*Strychnos Ignatii*); this he collected in Manila, sending specimens to Ray and Petiver, which were laid by them before the Royal Society of London in 1699; other plants of economic value were also introduced by him to the knowledge of European *savants*.

Woodwardia orientalis is, as we have said, not always proliferous, although this is very usually the case. The species attains a great size in Formosa, where the fronds are three or four feet long. Our cut (taken from a specimen in the Sloane collection) shows a pinna with the young plants springing from it, and also a small portion of the same enlarged.

WOODWARDIA RADICANS, *Sm.*

This handsome plant, the type of the genus, was known to Linnæus, by whom it was described under the name of *Blechnum radicans*. It is a large fern, with gracefully arching pinnate fronds from four to six feet long—in favoured localities in California it attains a length of from eight to ten feet—the stipes of each being densely scaly at the base and smooth above; they are somewhat thick in texture. The pinnæ are lanceolate and distant, the lower being often a foot or nearly so in length, deeply pinnatifid, and narrowed towards the apex into a long tail-like point; the segments are almost entire, but oftener minutely and sometimes conspicuously serrate, especially towards the apex, which often terminates in a bristle-like point. The veins are reticulate or netted, there being a single row of meshes (areoles) outside the sori. These latter are parallel with the mid-vein of each segment of the pinnule; they are short and oblong in form, and covered with a thick involucre of the same shape, which is usually persistent, and closes like a lid over the sori.

Towards the top of the rachis, at the base of one or more of the pinnæ, may be noticed a conspicuous mass of brown scales, which is indicated in our (necessarily much reduced) coloured plate as a small brown spot. In the accompanying woodcut this is shown of its natural size: it is, in fact, a bud, which is capable of reproducing the plant. The young fern arising from this will put out fronds while still attached to the parent plant; Mr. Lowe* says "it is not at all uncommon to see plants with half-a-dozen fronds a foot long, receiving all their support from the parent leaf." We can hardly go so far as this from actual experience, but it is certainly by no means unfrequent to see young plants attached to the parent frond after the manner shown in the cut. It will be noticed that the position in which these scaly buds are produced is quite different from that in which the young plants occur in *Woodwardia orientalis*, already referred to; in that species they grow from the upper side of the segments of the pinnæ, whereas here they occur on the rachis. In Prof. Eaton's handsome work on the "Ferns of North America," the author speaks of this as a

* "Ferns British and Exotic," vol. iv., t. 108.

bud developed into a short rhizome, with several rudimentary fronds coiled up and hidden in the chaff. In a foot-note he adds: "The fact that a stalk may produce a rhizome, though perhaps more evident in the case of *Dicksonia pilosiuscula* than in other ferns, is by no means unknown. In Sachs' Text-book (English version, p. 351) several instances are given of the same thing, as *Pteris aquilina*, which often produces a shoot from the back of the leaf-stalk

UPPER PART OF FROND OF WOODWARDIA RADICANS, SHOWING YOUNG PLANT GROWING ON THE RACHIS.

close to the base, and *Aspidium Filix-mas*, which produces buds a short distance above the base, oftenest on one side of the stalk. The slender stolons of *Onoclea Struthiopteris* are said to be formed in a similar way, and *Acrostichum aureum* and *Woodwardia radicans* seem to do a like thing. The formation of proliferous buds on the stalk of *Asplenium fragile* and on the rachis of *Asplenium ebenum*, the bulblets of *Cystopteris bulbifera*, the scaly bud of *Woodwardia radicans*, the terminal bud of *Camptosorus rhizophyllus*, the numerous little buds on the upper surface of the pinnæ of *Woodwardia orientalis* and of the Australian *Aspidium proliferum*, rightly regarded, are all manifestations of the same power which many ferns have of producing an adventitious proliferous bud from almost any part of the plant."

This *Woodwardia* was introduced to the Royal Gardens, Kew, from Madeira, in 1779, by Francis Masson. In Madeira, indeed, it is plentiful in many places, as on the Plateau of Santa Anna, about a thousand feet above the sea, on shady hedge-banks and the margins of streams, and at Ribeiro Frio, at an elevation of about three thousand feet, where it is very luxuriant. It also grows to a very large size at Teneriffe, and occurs in several of the Azores. On the African Continent it is reported from Congo and Abyssinia. In Asia it occurs in the Himalayas, at an elevation of from four to five thousand feet, and also in Simla; it likewise grows in Java. In the New World its distribution is limited: it grows in California by streams in shady places in the valleys and cañons of the coast ranges, and of the Sierra, from Long Valley to San Diego, and is frequent in Mexico and Guatemala; but it is not known elsewhere.

The distribution of the *Woodwardia* in Europe is confined to the Mediterranean region and the Spanish peninsula, but its occurrence is local. It is found in Spain and in Portugal; in Sicily it occurs on grassy rocks in shady volcanic valleys, on Mount Etna, and elsewhere; in Italy at Sorrento and Naples, and in the Island of Ischia.

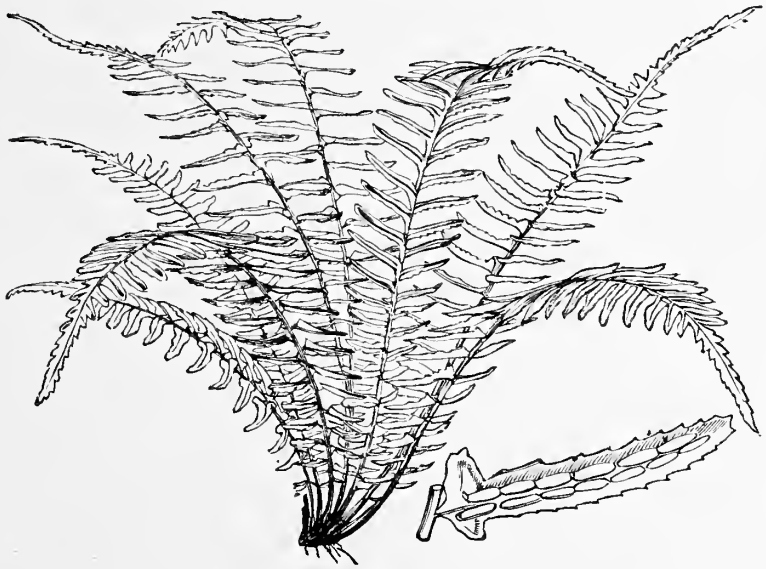
Two varieties of this *Woodwardia* have attracted notice during the last few years. One (*W. radicans Brownii*) was found growing wild in the Island of St. Michael by a Mr. Brown, whose name it bears. Both the pinnæ and pinnules are extensively subdivided, the latter being deeply cleft at the ends and "finishing up the sides of the fronds with tufted branches or crests starting from each other almost at right angles. The terminal crests are larger, frequently several inches in width, and composed of almost innumerable small excurrent points." It is difficult to see how this differs from *W. radicans cristata*, which is described as having drooping fronds averaging from eighteen to twenty-four inches in length, each pinna being crested, while at the apex of the frond there is generally a tassel, which often attains a large size. This is a useful decorative plant, and will flourish either in the conservatory or temperate house.

Woodwardia radicans is an easy fern to grow, and one which, from its gracefully arching fronds, is well adapted for conservatory decoration. It prefers a loamy soil, and does best when planted out, the fronds being of a richer green and more luxuriant in favourable situations out of doors than they are under glass. In many localities it is quite hardy; but it is safest to give the crown of the root some slight covering as a protection during winter. It is easily increased by means of the young plants which are, as we have said above, often formed at the ends of the fronds. These will soon grow and become independent plants if the frond upon which they have formed be pegged down flat on the surface of a broad seed-pan filled with peat and sand in about equal proportions, care being taken not to bury the frond. If the soil be kept moderately moist, in a close frame or in a pit with gentle heat, the young ferns will soon take root; as soon as they have become established, the frond from which they have originated may be cut into as many pieces as there are plants, and after a short time they may be removed from the pit and planted singly in small pots.

DOODIA.

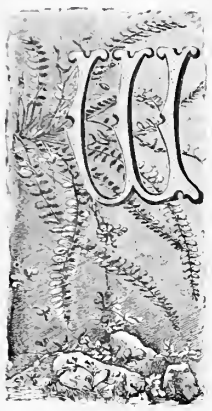
Nearly allied to *Woodwardia*, and included in it by some botanists, is the genus Doodia. This is a small genus of five or six species, with a limited geographical distribution, extending from Ceylon eastward to Fiji, and having its head-quarters in Australia and New Zealand. The species differ from *Woodwardia* mainly in having the sori on the surface of the frond instead

of sunk into cavities, and in the shape of the indusia. *Doodia aspera*, which is not unfrequently met with in greenhouses, has stiff, very rough fronds, about a foot high, resembling in general appearance those of a Blechnum; it was introduced to the Royal Gardens, Kew, by George Caley, in 1808. *D. caudata*, another Australian species, is more commonly met with, as it is very easily cultivated, and readily propagates itself by spores; the fronds are six or eight inches long, the terminal segment being much elongated. It was on this plant that Robert Brown established the genus in 1810; the name *Doodia* commemorates Samuel Doody, who was curator of the Chelsea Botanic Garden during the latter part of the seventeenth and the beginning of the eighteenth centuries, and devoted much attention to British botany, especially to the Cryptogamia, although he did not publish; his collections form part of the Sloanean Herbarium already referred to, now in the British Museum. There is a curious form of *D. caudata* which has been described as a species under the name *D. linearis;* this has long, narrow fronds, which are quite entire in the upper half, more or less divided towards the middle, and have distinct, short, rounded lobes at the base. Another Australian species, *D. blechnoides*, is sometimes met with in cultivation; it resembles *D. aspera*, but is a larger plant, and the fronds are much less scabrous.



DOODIA CAUDATA (REDUCED).

ASPLENIUM: THE SPLEENWORTS.



WHEN describing the Parsley Fern (*Cryptogramme crispa*),* we took occasion to remark upon the very variable extent of genera, and noticed how, while some included hundreds of species, others were what is termed monotypic, that is, containing but one species. We have now to consider the largest genus of ferns—a genus containing at least between three and four hundred species, and one which, as might be supposed from its extent, exhibits a very great deal of variation in the character of its members. It is, indeed, not easy to estimate the extent of some of our larger genera of ferns. These plants present great attractions to the botanical collector, and even to the resident in foreign countries, who is no botanist, but takes sufficient interest in his surroundings to collect specimens for his friends at home. Since the publication of the "Synopsis Filicum," by the late Sir W. J. Hooker and Mr. J. G. Baker (the second edition of which bears date 1874), and in which three hundred and thirty species were enumerated and described, many collections from different parts of the world—notably from Madagascar and Borneo—have been brought or sent to this country alone, without referring to the many others which have found a resting-place in Continental herbaria. The latter of the authors above-named has published in the "Journal of Botany" and in the "Journal of the Linnean Society" numerous lists of recent collections of ferns from different parts of the globe; and "the cry is still 'They come!'" for scarcely any collection of ferns is named without there being detected in it a considerable proportion of novelties. The accuracy of this statement is manifested the more strongly, inasmuch as Mr. Baker certainly cannot be accused of the slightest tendency towards the undue multiplication of species. When we remember that in all only about a hundred and ninety species of ferns were known to Linnæus, and contrast this with the number at present described belonging to a single genus, we can form some idea of the rapid increase of our knowledge of the fern world.

Of the genus *Asplenium*, the second edition of the "Synopsis Filicum" enumerates, as we have already said, three hundred and thirty species, and this number is certainly below the mark at the present time, if we accept a broad estimate of what constitutes a species. But it must be remembered that under this generic name are included many groups which are ranked by other authors under separate generic heads: as regards one of these, the *Ceterach* or Scale Fern, we ourselves have preferred to follow those who consider it sufficiently distinct to be ranked as a separate genus. But, with all deductions, the genus is a very large one, and, moreover, one which has many European representatives, while eight at least of our British ferns are found in its ranks.

We have already said that the genus *Asplenium* presents considerable variation; and this variation is equally apparent whether we consider the forms of the plants, their size, or their geographical distribution. Some, such as *A. Hemionitis* and *A. Nidus*, have entire fronds—of these we shall speak more at length when we come to consider the first-named species—in others the fronds are pinnate, with small pinnules, such as the Maidenhair Spleenwort (*A. Trichomanes*), or the Green Spleenwort (*A. viride*), or with very large ones, as in *A. salicifolium*; while some of those with pinnate fronds have the pinnæ divided into almost hair-like segments.

* See page 56.

Others are bipinnate, as is the case with our Black Maidenhair Spleenwort (*Asplenium Adiantum-nigrum*), or tripinnate. In texture, too, there is great variety; some species are membranous others (and those the most numerous) are stout and herbaceous, while others again are tough and leathery. We shall take an opportunity of referring more at length to some of the foreign Spleenworts when describing the European species to which they are most nearly allied.

The name *Asplenium* dates back to Dioscorides, who bestowed it upon the Scale Fern or Rusty-back (*Ceterach officinarum*)—which is still placed in the genus *Asplenium* by some writers on ferns, in allusion to its use as a remedy in diseases of the spleen; so that the English name Spleenwort is only an adaptation of the Latin. We shall have to recur to it again as applied to the Scale Fern, when we come to speak of that plant. The names of very many plants, indeed, both Latin and vernacular, have been given to them in consequence of the real or supposed influence possessed by them over certain parts of the body, or in the case of certain disorders. Were this a suitable opportunity, much might be said in illustration of this statement. The "doctrine of signatures" suggested a vast number of names. This was thus quaintly explained, more than two hundred years ago, by William Coles, in his "Art of Simpling" (1656):—"Though Sin and Satan have plunged mankinde into an ocean of infirmities, yet the mercy of God, which is over all His works, maketh grasse to grow upon the mountains and herbes for the use of men, and hath not only stamped upon them a distinct forme, but also given them particular signatures, whereby a man may read, even in legible characters, the use of them." These characters, it must be confessed, are sometimes hardly as "legible" as Coles seems to think. For instance, it is not until we see the yellow under-bark of the Barberry (*Berberis vulgaris*) that we understand how the "doctrine of signatures" can account for its use in cases of jaundice; but when this is known, it is easily understood that a yellow-wooded tree would naturally suggest itself as a remedy for that disease. Our garden Jerusalem Cowslip (*Pulmonaria officinalis*) owes its common English name, Lungwort, as well as its Latin generic equivalent, to the 'spotting' of the leaves, which was considered to indicate that they would be useful in diseases of the lungs. The Viper's Bugloss (*Echium vulgare*), according to Lyte's "Niewe Herball" (1578), "is very good against the bitings of serpents and vipers, and his seede is like the head of a viper," hence the name, both Latin and English, the former being an adaptation of *echi*, the Greek word for a viper. The Wood Sanicle (*Sanicula europæa*) took its name from its healing properties, real or supposed; as also did the genus *Salvia* (from *salvo*, I heal). The Colts-foot is called in Latin *Tussilago*, from the word *tussis*, a cough; it is still employed as a remedy against coughs. We might adduce many more instances of this method of naming; but those already cited are sufficient to show how many of the plant-names still in use have their origin in some allusion to the real or imaginary "virtues" which were possessed by the species to which they belong. The earlier Latin names of plants, by which they were referred to in the old herbals before Linnæus reduced scientific nomenclature to a definite system, were still more frequently framed in allusion to some healing property of the species. Thus, the Comfrey, which now bears the name *Symphytum* (from the Greek *symphyo*, I make to grow together), was formerly known as *Confirma*, in allusion to that property of consolidating of which we had occasion to speak in our Introduction (p. xxvi).* The meaning

* The subject of the origin and history of plant-names is a very interesting one; for Latin names, Théis' "Dictionnaire de Botanique" and (for those of English plants) Alcock's "Botanical Names for English Readers," should be consulted; for English names, Dr. Alexander Prior's "Popular Names of British Plants," Britten and Holland's "Dictionary of English Plant-Names," published by the English Dialect Society, and Professor Earle's "English Plant-names from the Tenth to the Fifteenth Century."

and origin of many plant-names is very obscure, especially as these names often refer to some supposed property or association of the plant upon which they are bestowed that is now forgotten; just as the old ecclesiastical titles for plants have become obsolete and meaningless, now that the festivals which suggested them have ceased to occupy a prominent place in the religious life of the people. But to those who are gifted with a taste for antiquarian research, and are willing to take some little trouble in the pursuit of an object, there is plenty to be done in the way of investigating the names (and their meanings) of our common plants. How readily we may meet with a puzzle, even at the very outset of our journey, may be illustrated by the fact that the names Cowslip and Paigle, with which most of us are familiar enough, are still unexplained, the latter especially having had spent upon it a vast amount of speculative ability, with, as we venture to think, little if any advance towards a solution of the difficulty.

Several species of *Asplenium*, of which *A. bulbiferum* is a well-known type, offer good illustrations of viviparous plants—that is, they produce young plants upon the surface of their fronds, and when the latter fall to earth, these plants take root and assume an independent existence. We have already had occasion to refer to this phenomenon in connection with *Camptosorus rhizophyllus* (figured at page 65), and also when speaking of Woodwardia. Although the normal mode in which plants are propagated is by means of the seed, it cannot have escaped the notice of even a casual observer that there are other methods of perpetuating the species. The formation of seed is the result of an arrangement which recent researches into fertilisation have shown to be somewhat complex, and which may be interfered with in numerous ways. Many plants, indeed, seldom bring their seed to perfection, and Nature then—

> "So careful of the type she seems,
> So careless of the single life——"

supplies the deficiency in various ways; or, where the deficiency does not exist, lavishly, bestows upon some favoured plant a double mode of increase. The strawberry, for example is propagated more by runners than by seed; so is the sweet violet: other plants, such as the yellow loosestrife (*Lysimachia vulgaris*) have underground suckers, which run along for some distance under ground and then send up new shoots; others are mainly extended by the spread and division of the roots, such as the Great Bindweed (*Convolvulus sepium*); others by division of the plant itself, as in the case of the American Waterweed (*Anacharis Alsinastrum*), of which, in spite of its great abundance, the male plant has not yet been met with in England, so that it cannot be perpetuated by seed.

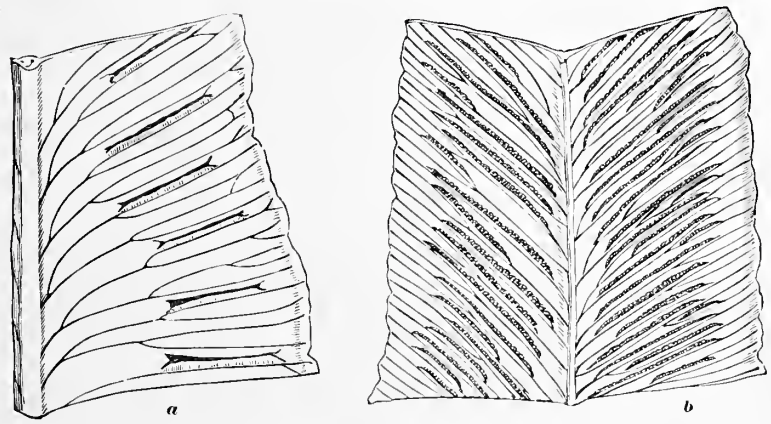
Like most other ferns, the Aspleniums are useful rather than ornamental. Some of the British species were formerly credited with medicinal properties, as we shall see when we come to consider each of these in detail; and we have already described * the superstitious regard paid by the natives of New Zealand to *A. lucidum*. But it must be confessed that the genus is sufficiently beautiful to find in that fact ample support to its claims to attention; and we may well regard this beauty as compensating for the absence of any qualifications for notice on account of general usefulness.

ASPLENIUM HEMIONITIS, *L.*

Our first species of *Asplenium* is one which stands out very distinctly from any other European member of the genus by reason of its simple entire fronds. At first sight, we should

* See Introduction, p. xxv.

be disposed to doubt its being correctly placed as an *Asplenium:* it seems to have much more resemblance to a *Scolopendrium*, with which indeed it has been confounded by more than one writer on ferns; but in technical character it is a true *Asplenium*, belonging to the small section *Thamnopteris* of Presl, which contains only twenty-four species, most of which have quite undivided fronds, our plant having them hastate in form, with a triangular terminal lobe and two large heart-shaped ones at the base, all being pointed at their extremity. The most striking of these entire-leaved Aspleniums is the Bird's-nest Fern (*A. Nidus*), a widespread species, native of the Himalayas, Japan, and other Eastern regions, extending to Queensland and New Caledonia, and found also in the Mauritius and other African islands, where it is called *Langue de bœuf*. This has a dense circle of fronds growing round a vacant centre, in shuttlecock fashion; the fronds are from two to four feet long, and from three to eight inches broad, and are of a leathery texture. The largest form of this, which is sometimes regarded as a distinct



ENLARGED PORTIONS OF FRONDS OF (*a*) SCOLOPENDRIUM HEMIONITIS AND (*b*) ASPLENIUM HEMIONITIS, SHOWING THE DIFFERENCE IN THE FRUCTIFICATION OF THE TWO PLANTS.

species (*A. musæfolium*), has fronds sometimes six feet long and a foot broad. Mr. John Smith quotes from a Penang correspondent: "I saw two fine specimens of the Bird's-nest fern; each had between forty and fifty perfect green leaves; the average length of the leaves was six feet, and from a foot to fourteen inches across in the broadest part. They were growing on each side of the doorway of the mansion; when I was walking up to them I thought they were American aloes." * This has the largest simple entire fronds of all known ferns.

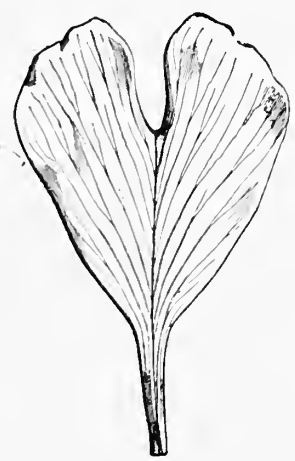
A. Hemionitis, as has been already observed, is distinguished from all the other European species of the genus by its simple fronds. These rise from a short, somewhat creeping, rhizome; the stipes is dark-brown, from four to ten inches long, smooth, and channeled; the fronds are from two to seven inches in length, and about the same in breadth, measured across their broadest part; they are, as has been said above, somewhat spear-shaped, with a triangular terminal lobe, which is longer than the two (or sometimes four) large, heart-shaped, lateral ones; they are broadly triangular in outline, of herbaceous texture, light-green in colour, and ever-green. The veins are close together, and usually simple, often with a narrow line of fruit on each. The plant singularly resembles in general appearance a species of *Scolopendrium* bearing the same specific name, as will be seen if the cut here given of *Asplenium Hemionitis* be compared with the figure of *Scolopendrium Hemionitis* given in the

* "Historia Filicum," p. 330.

plate, and the two plants have been confounded by some authors and collectors. Mr. Kippist, however, who thoroughly investigated the history of the species,* describes the type-specimen in the Linnean Herbarium (now the property of the Linnean Society of London), which was named by Linnæus himself, as "clearly an *Asplenium*, with long, slender, closely-placed lines of fructification, extending nearly to the midrib and indusia, bursting towards the apex of the leaf, or of the lobe on which they are placed. The fronds are truly palmate, scarcely longer than broad, five-lobed (with the two posterior lobes more or less rounded), and usually shorter than their slender glabrous petioles." Our cut (p. 85) shows the difference in the fructification of the two plants.

This beautiful species has long been in cultivation in England, having been introduced from Madeira in 1779, by Francis Masson. It deserves to be more frequently met with than is at present the case, inasmuch as it is a plant of very distinct habit, and one which will do well upon rock-work, and still better in a cool greenhouse. When found in cultivation, it is often under the name of *A. palmatum*. It is a plant of very limited geographical distribution, being a maritime and Atlantic species, touching Europe only on the coast of Portugal. Here it abounds in crevices and holes among the loose blocks of granite at Cintra, near Lisbon, and this appears to be its only European locality. It has been reported, on the authority of Cavanilles, as occurring also in Spain, but this requires confirmation. In Madeira it is very plentiful in shady, woody places, along the northern coast, generally under, or not much above, a thousand feet of elevation, and descending to a very low level. It is also found in Teneriffe, in the Cape Verde Islands, and in several islands of the Azores. On the African continent it seems to be limited to the extreme north, having been collected in Algeria and at Tangiers, and this terminates its geographical range, so far as we know at present. The Cintra locality was known to Linnæus. A specimen received thence in his herbarium at the Linnean Society, already referred to, is localised "in monte alto quo situm est castellum vetustum, prope Cintra Lusitanis."

There is a crested variety of this fern in cultivation (*A. Hemionitis cristatum*) which differs from the type only in having a large tuft or crest, at the upper extremity of the frond, similar to that which we have already had occasion to notice in so many other ferns. Milde describes two wild forms, both occurring in Madeira—the first (var. *lobatum*), a small plant with simple triangular, or cordate-ovate fronds; the other (var. *elatum*), a tall, upright plant with acute lobes, the lateral ones being very much elongated.

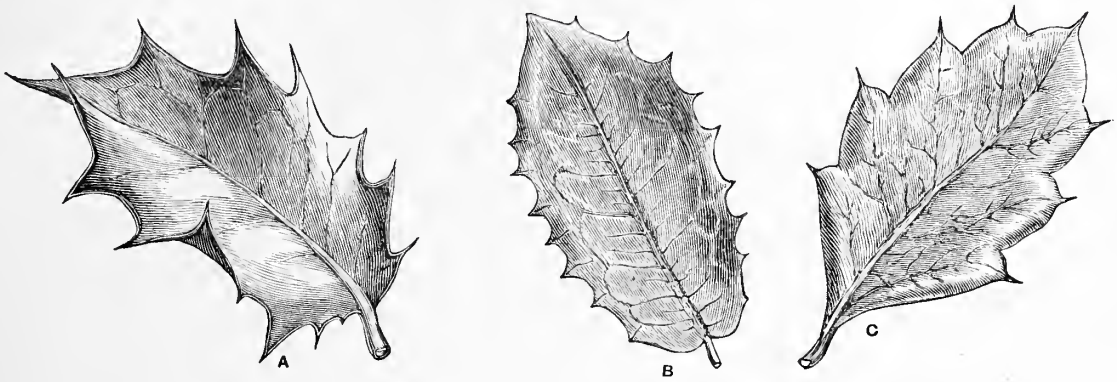


LEAF OF SALISBURIA.

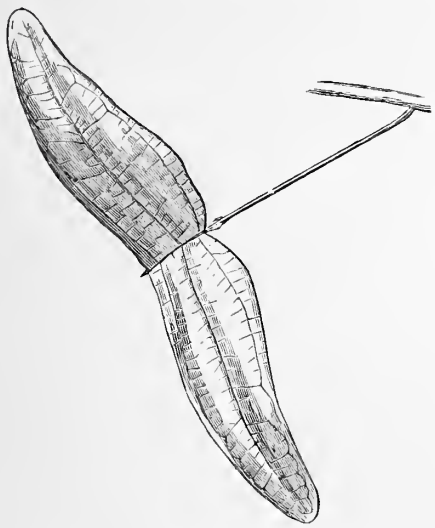
We have already referred to the likeness between this *Asplenium* and a *Scolopendrium* (*S. Hemionitis*). This strong resemblance between two plants, which yet in essential characters are decidedly distinct, has excited some attention during the last few years, and the term "mimicry" or "mimetic analogy" has been applied to it. The same phenomenon had previously attracted notice in the animal creation—the bearing which it obviously has upon the Darwinian theory having of course contributed to make the subject interesting and prominent. Without going into speculations as to the why and wherefore of a phenomenon which undoubtedly exists, we may point out one

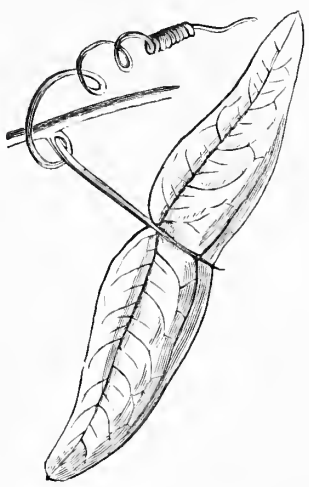
* "Botanical Magazine," t. 4911.

or two instances of it in plants far more widely separated than the two ferns which suggest the topic. Here, at any rate, the plants resembling each other belong, at least, to the same family; but we find among the *Coniferæ* a tree, the *Salisburia* (or *Ginkgo*) *adiantifolia*, which has leaves so strikingly resembling the pinnules of the Maidenhair Fern as to suggest its



Latin specific name and its common English designation, Maidenhair-tree. A good authority upon ferns was deceived by *Stangeria paradoxa*—a Cycadaceous shrub which is exceptional among its allies in its fern-like foliage—and described it as a genuine member of the *Filicinæ*. No less practised a botanist than Sir William Hooker was deceived into describing a New Zealand *Veronica* as a species of *Podocarpus*, in the order *Coniferæ*. We see something of the same sort in our British flora, in the way in which the Fringed Buckbean (*Limnanthemum nymphæoides*) recalls to our minds the members of the Water-Lily tribe; while it is certain that any person unfamiliar with the plant who should meet with the handsome, prickly, blue-green foliage of the Sea Holly (*Eryngium maritimum*) growing among the sand upon the sea-shore, would think he had come across a thistle of some kind. We might pursue this subject to an indefinite length: but any one who has at all an extensive acquaintance with foreign plants will be able to recall numerous instances. A tropical African vine (*Vitis jatrophoides*) bears a striking resemblance when dried to a branch of the common sea-weed *Fucus serratus;* while, to come back to the British flora, the likeness between the Horsetails (*Equiseta*) and the Marestail (*Hippuris vulgaris*) is most obvious, although the latter is a flowering plant, while the former are Cryptogams. We would draw special attention only to two of such cases. The Holly type of leaf is, as we all know, not very uncommon, but it is strange that the three leaves here shown are from plants of different natural orders. A is a leaf



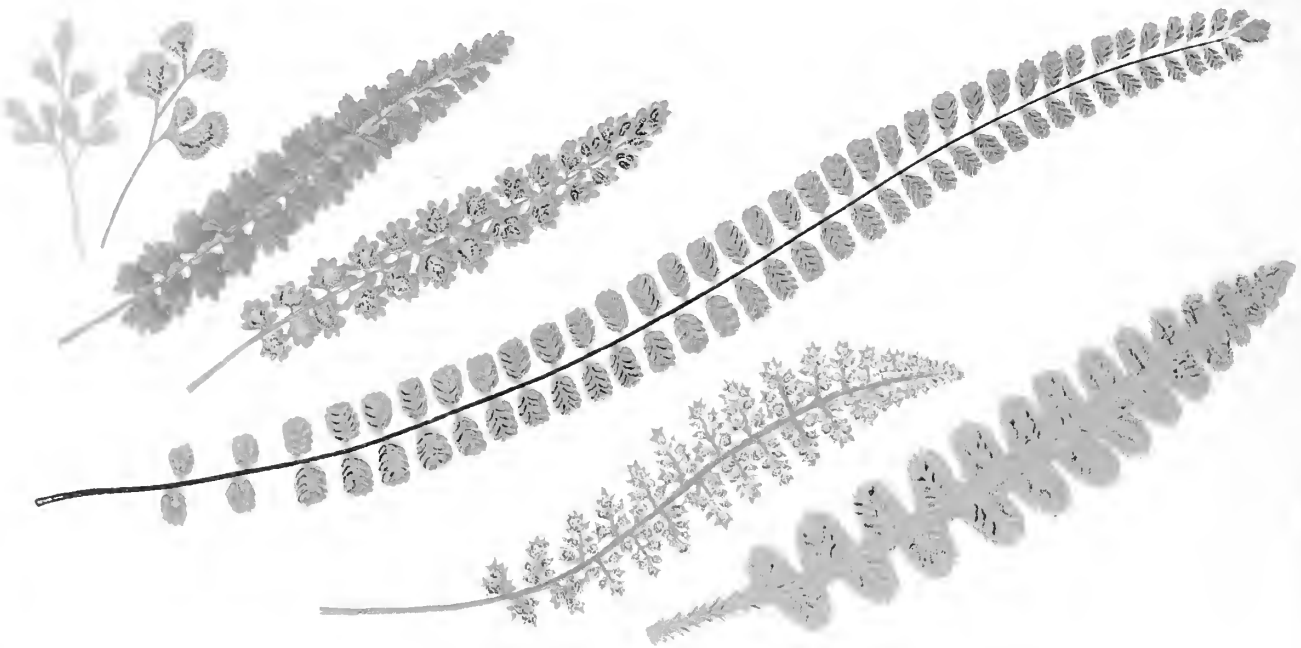


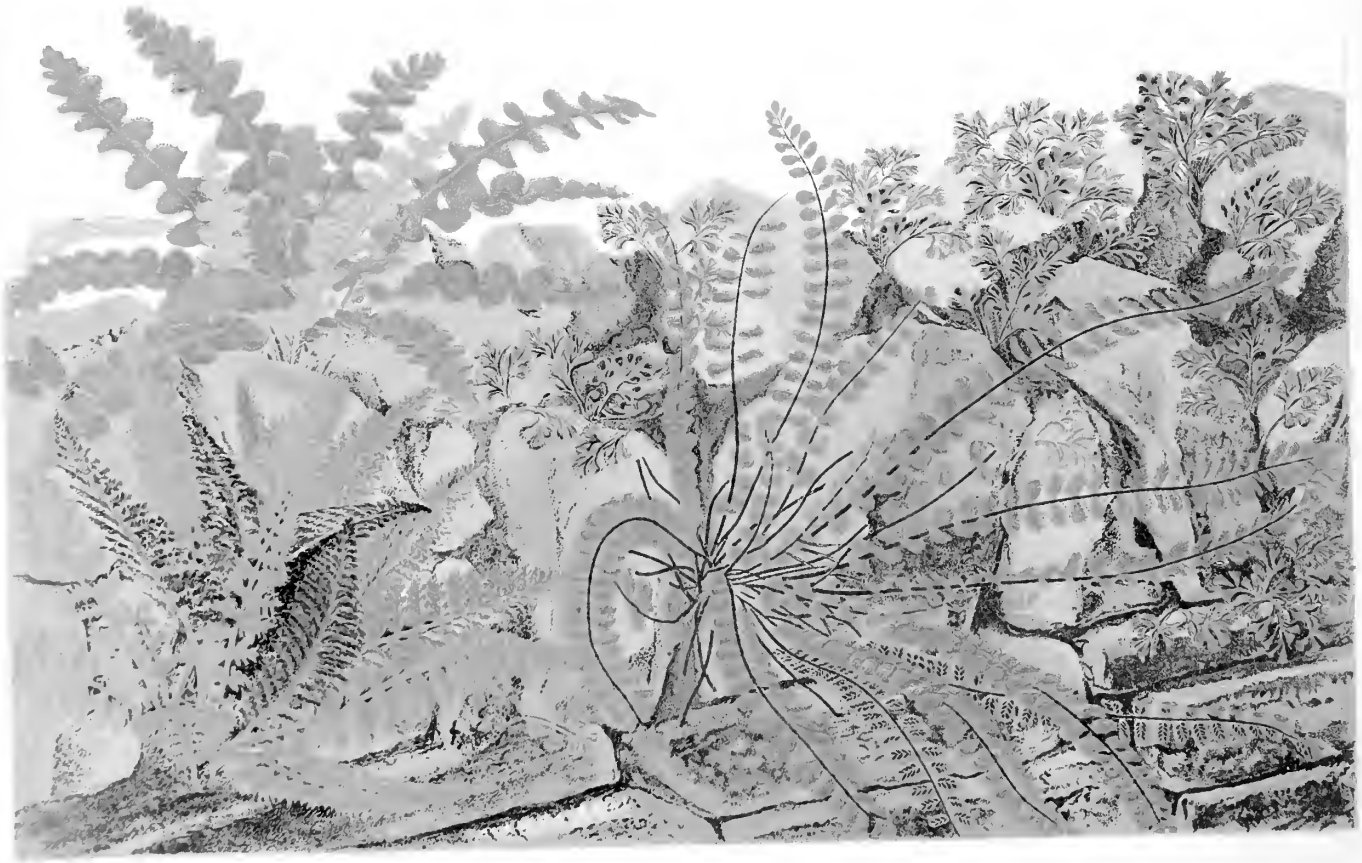
of the ordinary Holly; B, one of a Cuban species of Vitex (*V. ilicifolius*); C, one of a solanaceous shrub from Peru (*Desfontanea spinosa*). It would be easy to match them exactly upon any good-sized Holly-tree, and there are very many shrubs, belonging to as many different natural orders, which resemble these in their common approximation to the Holly type of foliage. Our other illustration is perhaps even more striking, inasmuch as the type of leaf is infrequent. A is a leaf of *Loureа vespertilionis*, a Leguminous plant from the Indian Archipelago; B, a leaf of a Tropical American Passionflower (*Passiflora vespertilionis*), the specific name in each case alluding to the curious bat's-wing type of leaf presented by two plants widely separated, both botanically and geographically.

ASPLENIUM HEMIONITIS.

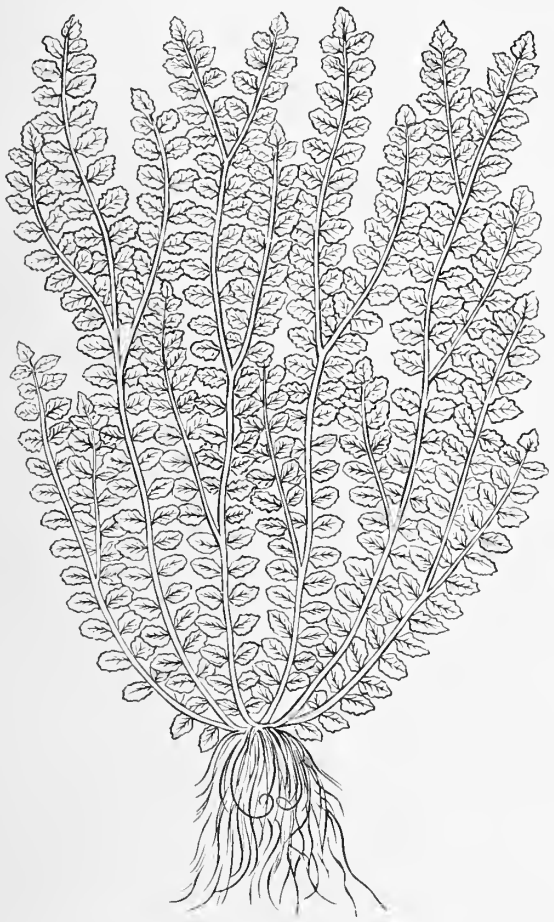
THE GREEN SPLEENWORT: ASPLENIUM VIRIDE, *Hudson.*

This extremely pretty little fern has much in common with the species last described, so much, indeed, that it was considered as a variety of it by Linnæus, while some recent authors—Mr. Bentham for example—regard it as a form of that species. This view is, however, exceptional, nor do we think it is borne out by the facts of the case. The plant was known to the old writers, but was first described as a distinct species under the name it now bears by Hudson, in his "Flora Anglica" (1762). The green rachis of *A. viride*, as contrasted with the dark one of the next species, *A. Trichomanes*, is a character by which the two plants may at once be separated; and there are other points of difference to which we referred when speaking of the English Maidenhair. The evergreen fronds arise from a tufted, somewhat creeping caudex, which is sparingly covered in its upper portion with dark-brown scales. These fronds





vary a good deal in length; in well-grown specimens they are as much as ten inches long, but are usually shorter—from four to six inches—and narrow, about half an inch—or rather more—broad, tapering towards the apex; the stipes, which is brown at the base, though green in its upper portion, is about a third of the length of the frond. The pinnæ are of a pale delicate green, very different from those of *A. Trichomanes*, although the difference is one not easy to express on paper; they are less numerous than in the species just named, somewhat square in outline, with a wedge-shaped base, and waved or sometimes slightly cut at the margin; they are usually alternate, and, like those of *A. Trichomanes*, attached to the rachis only by their short stalks. There is a good deal of variation in their shape, as the accompanying figures will show. Mr. Newman finds in their venation a character which distinguishes the plant from the English Maidenhair; he says:—"The lateral veins are either simple or forked; they bear a long linear mass of seeds, and when forked the mass is most [almost?] invariably situated before the fork; this appears to me a very excellent distinguishing character, and one by which this species may readily be known." The fructification is principally situated on the upper part of the frond; the sori are linear and at first distinct, and covered with a white entire or toothed indusium; this disappears when the spores are ripe, and the masses become of a bright brown, and join one another, covering the centre and the greater part of each pinna.

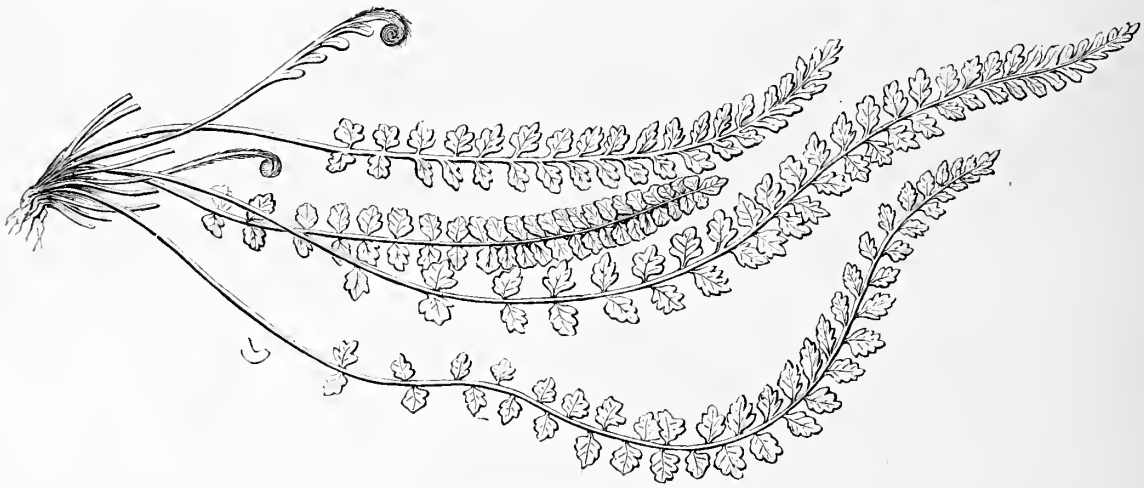


BRANCHED VARIETY OF ASPLENIUM VIRIDE.

The Green Spleenwort is not a variable species. Mr. Moore names four varieties, which seem very slight ones, depending only upon the subdivisions of the frond or the pinnæ, the names of which—*multifidum*, *bipinnatum*, *incisum*, and *acutifolium* — show sufficiently their respective peculiarities. The multifid or branched form is the only one worthy of special mention; it is said to be very frequent in some places, and is figured by Gerard as "Trichomanes fœmina, the Female English Maidenhaire," while it was described by Linnæus as a branched form of English Maidenhair (*A. Trichomanes ramosum*). We reproduce the figure given by Gerard, which will give a good idea of this form of the plant.

The geographical distribution of the Green Spleenwort, both in the British Islands and elsewhere, is much more restricted than that of *A. Trichomanes*. In England it is entirely absent from the southern counties, although it has been recorded from Surrey, Sussex, and Middlesex, but only in situations where it has probably been introduced; Glamorgan, Monmouth, and Worcester (where it is supposed to be extinct) are its southern limits, nor does it appear on the eastern side of England below York. It seems to be rather a frequent Welsh plant, as,

besides the counties already named, it is recorded for Brecknockshire, Merionethshire (Cader Idris), Denbighshire (near Llangollen), and Carnarvonshire (Llyn y Cwm, Twll du, etc.); but in many of these localities it is found very sparingly, the collecting of rare ferns by guides for sale to tourists having tended greatly to its reduction. The other English counties producing this little fern are Stafford, Derby, York, Cumberland, Westmoreland, Durham, and Northumberland; it is also recorded from Cheshire and South Lancashire, but its occurrence in these counties requires confirmation. In Scotland it is not unfrequent, extending as far as Shetland. In Ireland, too, it is not a very rare, although a local, plant; it is absent from the north-east corner, and, indeed, from the whole eastern side of the island, but is frequent along the west and toward the centre, extending from Killarney up to Donegal. On the continent of Europe the Green Spleenwort is found in Lapland, Finmark, and northern Russia; it extends, indeed, from the Arctic regions to the Pyrenees, growing for the most part in mountainous or subalpine regions, and most frequently met with upon calcareous rocks. Sweden, Norway,



ASPLENIUM VIRIDE.

Germany, Bohemia, France, Italy, Greece, and Spain all produce this pretty little plant. In Spain it ascends to an elevation of nearly ten thousand feet, in the Sierra Nevada. In the south of France, at Grasse, it grows at an altitude only slightly above the sea-level. In Asia it occurs in northern India, in the Himalayas and Kumaon—in the latter locality at an elevation of ten thousand feet—and also in eastern Siberia. It is entirely absent from Africa and its islands, and from Australia; but it is found in the New World, in Greenland, Newfoundland, and the island of Sitka (a very small form); and, again, in California, on moist, shady rocks in the Rocky Mountains; in the United States, however, it does not put in an appearance. There are one or two allied American species which differ from *A. viride* especially in their viviparous habit; one of these is *A. projectum*, a Peruvian fern, which bears young plants at the end of the fronds, and the rachis of which takes root at intervals; the other, *A. fragile*, is a native of the Andes. Of this Sir William Hooker observes:—"Were it not for the curious little viviparous bulbilli seen upon the stipes, it would be difficult to say in what respect this species differs from *A. viride*, of the European Alps; and it is possible that this peculiarity may originate in its elevated locality, which is no doubt very considerable at all times on the Andes of Columbia."*

* "Icones Plantarum," tab. 932.

Asplenium viride is not a difficult fern to grow if it be planted in a light soil and a moist atmosphere; but it does not take kindly to cultivation, and is not always an attractive-looking object in cultivation. It is propagated by division of the crowns of the roots. "A compost, consisting of chips of micaceous rock, sand, peat, and a slight admixture of thoroughly decayed leaf-mould, seems best adapted to its requirements; it also needs good drainage, and likes to be covered with a bell-glass." *

Between this species and the next (*A. Trichomanes*) may fitly be placed a plant which partakes of the characters of both, and is probably a hybrid between them. It is found upon serpentine rocks in Moravia, Saxony, and Northern Bohemia, and was described by Milde under the name of *A. adulterinum*. It resembles *A. viride* in the texture of the fronds, which is softer than *A. Trichomanes*, and also in the absence of any wing to the rachis, while its relationship to the English Maidenhair is shown in the placing of the spores, and also in the colour of the greater portion of the rachis, which is dark brown or black, although in the upper portion it becomes green, showing that the mixture of the two species has been very complete. Some German botanists, however, regard it as a distinct species. Another hybrid having *A. Trichomanes* for one of its parents is *A. dolosum* of Milde, of which we shall speak further when describing *A. Adiantum-nigrum*, its other parent. Hybrids among ferns are not, perhaps, very uncommon; the beautiful *Adiantum Farleyense* (see p. 43) is supposed by some to have been thus produced, and among the "Gold and Silver Ferns" (*Gymnogramma*) they are said to be very frequent. A good deal of interesting information upon the subject of hybridity in connection with ferns will be found in Mr. F. W. Burbidge's instructive volume upon "Cultivated Plants," pp. 308—312. The author points out that "a clever and a careful manipulator might be able to produce hybrid ferns by removing the antherozoids † by means of a drop of water on the hair-like point of a sable brush, and applying them to the archegonia or female ovary-like cells of another species;" and he cites a large number of cases in which hybridisation is thought to have occurred. Among these is another member of the genus Asplenium (*A. ebenoides*), which is thought to be a natural hybrid between *A. ebeneum*, a common North American species, and *Camptosorus rhizophyllus* (see p. 65). It has been found in very small quantity growing with the two ferns named on limestone cliffs on the Schuylkill river, near Philadelphia. One or two other actual or probable hybrids among the European species of *Asplenium* will be referred to later on. The subject of hybridity in ferns would certainly repay any attention bestowed upon it, and if a series of careful experiments were undertaken, the results would be interesting, and probably new.

ASPLENIUM DOLOSUM.

* Newman's "History of British Ferns."

† Or spermatozoids. See pp. viii.–ix. of Introduction for an explanation of these terms.

ENGLISH MAIDENHAIR: ASPLENIUM TRICHOMANES, *L.*

This very pretty and graceful fern is a plant of wide distribution, and one which occurs with considerable frequency throughout Great Britain and Ireland. It varies a good deal in the selection of a habitat; sometimes found upon hedgebanks, it is more frequent upon rocks, and is perhaps most usually found upon old walls. In this last-named situation it is not unfrequently associated with the Wall Rue (*A. Ruta-muraria*) and Scaly Spleenwort (*Ceterach officinarum*). In the County Waterford, the old walls in the neighbourhood of the Comeragh Mountains produce large quantities of these three ferns, growing together with the greatest luxuriance, sometimes mingled with small plants of the Hart's-tongue (*Scolopendrium vulgare*), or, more often, with some flowering plants such as the Herb Robert (*Geranium Robertianum*)—the contrast in this case between the free-spreading foliage and bright pink flowers of the Cranesbill and the darker hue and more formal growth of the ferns is very striking. The flora of an old wall is often very extensive, affording representatives of some of the principal groups of flowering plants and grasses, as well as numerous ferns, mosses, and lichens; beginning in the early spring with the Whitlow-grass (*Draba verna*) and Rue-leaved Saxifrage (*Saxifraga tridactylites*), and going on through a succession of flowering plants until winter sets in, and the ferns, which have been almost eclipsed by their flower-bearing neighbours, become again the prominent and the only ornament of the wall. In the County Waterford many old walls are covered from top to bottom with a thick growth of the ferns above-named, and very striking they look in their green robe. Fern-collecting has become such a mania in England that every fern which is in the least interesting is removed as soon as found to some garden or rockery; this, of course, is especially the case near large towns. But in Ireland, notably in the south of that country, there is but little demand for ferns, and the supply is considerably more than enough to satisfy the few who wish to grow them. It may be doubted whether it would not "pay" an enterprising fern-merchant to make an excursion to the south of Ireland; he would certainly find plenty of material to set him up in business, and English people with ferneries would be glad of the opportunity of procuring some of the fine specimens which abound on the walls, seemingly throughout the County Waterford, and in many other places in Ireland.

As we have already remarked, the English Maidenhair is generally distributed throughout England and Scotland from Cornwall to the Orkney Islands, although in some districts it is by no means common, especially of late years, since the days of ferneries; in Ireland also it is frequent, though rather local. If we go beyond the British Isles we shall find it widely distributed over the globe in both the temperate and tropical regions. It is found throughout the length and breadth of Europe, from Iceland and Lapland to the Rock of Gibraltar, and throughout the Mediterranean region, and from the extreme west of Ireland to the extreme east of Europe. If we pass to the African continent, we shall find it in the north (Algeria, and throughout Morocco, ascending to two thousand two hundred feet) and south (Cape of Good Hope); but it does not appear to enter the tropics. It is more frequent in the African islands, occurring in Madeira (at an elevation of three thousand feet), the Canaries, the Azores, and also, though very rarely, in the Cape Verde Islands. In Asia we find it in the Caucasian region, in Persia, in Afghanistan, and in various parts of northern India, ascending in Kumaon to an elevation of from six to twelve thousand feet; in southern India it occurs in the Neilgherries; it is also found in Siberia and Japan. It is met with in

several parts of the Australian continent, as well as in Tasmania and New Zealand; and occurs also in the Sandwich Islands. Passing to the New World, we find the English Maidenhair throughout the United States, and also in Canada, from Montreal to Nootka Sound; it is found also in Mexico and Guatemala, in the latter region ascending to the height of ten thousand feet; also in Peru and Quito; and, in the West Indies, in Cuba and Jamaica. It will thus be seen that the geographical range of *A. Trichomanes* is a very wide one.

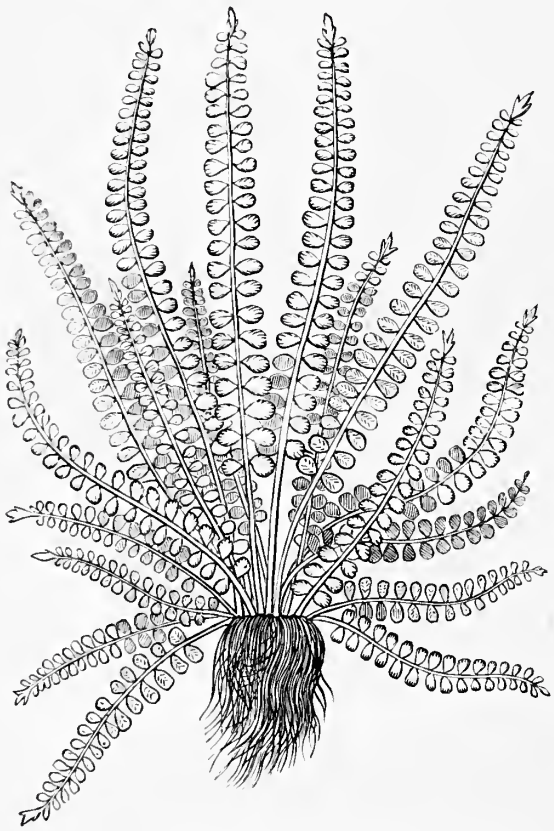
The name *Trichomanes*—which is used by Dioscorides—is from the Greek *trichoma*, "a growth of hair," and bears reference to the property which this plant was supposed to possess in promoting or restoring the hair. Lonicer, in 1551, applies the name more particularly to the plant now under consideration, but speaks of it as being used with a much more general signification. However, it seems to have been generally believed in as a "hair-restorer," perhaps on the theory of the "doctrine of signatures," to which reference has already been made, the black, hair-like stems suggesting its employment with matters connected with the hair. Gerard says, "The lie wherein it hath beene sodden, or laid to infuse, is good to wash the head, causing the scurffe and scales to fall off, and hair to grow in places that are pild and bare." According to Parkinson, writing a little later, it still more closely resembled the vaunted "hair-restorers" of the present day. He says, "It both stayeth the shedding of the haire, and causeth it to grow thicke." It was supposed to possess other "vertues" at a period when every plant was endowed with almost as many attributes and quasi-miraculous properties as a quack medicine of our own time. In our description of the true Maidenhair (*Adiantum Capillus-veneris*) we quoted * some of the properties attributed to it from William Langham's "Garden of Health," published in 1633. This author says, that the "English Maidenhaire hath the same vertues that *Capillus Veneris* hath; being sodden with wine or hydromell, and drunke dayly, it helpeth the obstructions of the liver, the jaundies, griefes of the lungs, difficulties of breath . . . it softneth the hardnesse and swelling of the milt, expelleth poyson that hath been drunk . . . and breaketh the stone." Not a bad catalogue this for a plant which, in our degenerate age, has no reputation for usefulness of any kind. Our illustrious countryman John Ray mentions its use in diseases of the chest and lungs, and also in cases of strangury and calculus; while we learn from Lightfoot † that the country-people in Scotland sometimes give a tea or syrup of it for coughs and other complaints of the chest, though it is rarely sold in shops. Like so many other ferns, it seems to have been employed, either as a substitute for the true Maidenhair, or on account of its own supposed merits, in the manufacture of capillaire; and one of its French names is *Capillaire rouge*, though it is difficult to see in what way it could have been associated with a red hue. A large number of ferns are known as capillaire in France, no doubt from their employment in the preparation of the syrup so-called, which we described at page 47: thus the Wall Rue (*A. Ruta-muraria*) is *Capillaire blanc*—a name also applied to *Polypodium rhæticum;* the black Maidenhair Spleenwort (*A. Adiantum-nigrum*) is *Capillaire noir; Adiantum pedatum* is *Capillaire du Canada; A. tenerum, Capillaire du Mexique;* and a moss, *Polytrichum commune, Capillaire doré*—the last-named having formerly been classed with the Maidenhairs, and called Golden Maidenhair in English.

The English Maidenhair is so very distinct from any other British fern that there is no danger of its being mistaken for a different species. The only fern at all like it is the Green Spleenwort (*A. viride*), and from this it is at once distinguished by the rachis, which here is of a dark, shining, chestnut colour, or purplish-black, while in *A. viride* it is green. The fronds

* Page 48.

† "Flora Scotica" (1777), p. 663.

arise from a short tufted caudex; they are often very numerous, the remains of the old stipes forming a dense, almost globular, black mass, and looking very strange as they protrude from cracks in an old wall. Their singular appearance is enhanced by the fact that the pinnæ, when old, easily become detached from the rachis, and drop to the ground, leaving the bare, black stems standing up erect. The rachis is rounded behind, but flat in front, and in this differs from the rachis of *A. viride*, which is flat on both sides. The fronds vary very considerably both in length and breadth. Under very favourable circumstances they attain, or even exceed, a foot in length, while in less suitable situations they do not exceed two or three inches, and they are about half an inch broad. The average size, however, is fairly represented by the accompanying figure—a facsimile of that given in Johnson's "emaculate" edition of Gerard's "Herbal," published in 1633. It will be seen from this, and one or two other old figures of ferns which we purpose to reproduce in the course of the present work, that the art of correctly portraying plants is by no means one of recent date. Indeed, it may be doubted whether the figures of the older herbalists are not in many instances more characteristic than those produced with all the assistance which the advance of modern art has been able to supply. The outline engravings with which Leonard Fuchs adorned his "History of Plants" in 1542 have hardly been surpassed in fidelity to nature, except, perhaps, in the grand coloured folio plates which illustrate Curtis's "Flora Londinensis;" and even in artistically less valuable works, such as the "Herbals" of Gerard and Parkinson, we often come across figures which at once arrest our attention, on account of the accuracy with which the habit, or what the French call the "*port*" of the plant delineated has been caught and transferred to paper. In this respect, indeed, many of our modern artists would do well to take a lesson; they would be puzzled to give a more graphic representation of an entire plant in a small compass than was presented by these old authors in the days when engraving and printing were in their infancy.



ASPLENIUM TRICHOMANES, FROM JOHNSON'S EDITION OF GERARD'S "HERBAL."

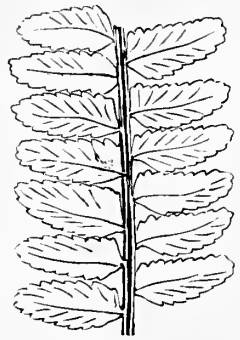
The fronds of the English Maidenhair are narrow, linear, and pinnate. The pinnæ, which are very numerous and alternate, or opposite, are thick and dark-green, and vary a good deal in shape: in their normal form they are roundish egg-shaped, blunt at the apex, and somewhat tapering to the base, where they are attached to the rachis by extremely short stalks; their margins are sometimes entire, but usually more or less waved. The pinnæ are either distant or crowded in different plants; we have already alluded to their deciduous character, and the readiness with which they drop away from the rachis. Their venation consists of a central vein, from which forked veinlets are given off; the upper one of these veinlets or venules bears the narrow, oblong sori, which at first are covered by a long, whitish indusium, which disappears

as the sori enlarge. When mature these are brown, and often run together into one mass, when the whole back of the frond is more or less covered with them. This is one of the ferns which has been recorded as having, by a strange freak, produced its fructification upon the upper side of the pinnæ. Mr. Moore* speaks of "a specimen gathered in Italy by [the late] E. W. Cooke, R.A., in which, besides the copious fructification of the under surface, one of the pinnæ bore a solitary but complete sorus on its upper surface." The most striking example of the production of fructification in the upper surface of the fronds of ferns is offered by a Ceylon Polypody (*Polypodium anomalum*), in which the sori are always on the upper surface.†

ENLARGED PINNULE, SHOWING FRUCTIFICATION.

Several varieties of *A. Trichomanes* are enumerated and described by Mr. Moore;‡ to two or three of the more important of these we will now briefly refer. One of the most striking is a branched variety known as *ramosum*, in which it is not merely a forking of the frond at the apex which is to be noticed, but a distinct branching of the rachis at irregular intervals. This is constant under cultivation, and deserves a place on the rockery. A still prettier form, however, is *incisum*, which attracted the attention of the earlier botanists. It is figured in Plukenet's "Phytographia"§ (1691), and was found in Jersey by Sherard; it is also included in Smith's "English Flora." Our figure shows the elegant appearance which the fronds present; the pinnæ are somewhat triangular in outline, and are deeply cut into narrow, acute, somewhat irregular segments. This has been found wild in England in numerous localities; it is difficult to cultivate, and does not produce spores: Milde describes the plant under the varietal name *lobato-crenatum*, and distinguishes four forms of it. Mr. Moore describes a crested variety (*cristatum*), similar to the corresponding variety of *Blechnum Spicant*, already referred to, having the apices of the fronds developed into a tuft or tassel: this produces spores plentifully, and is readily increased by this means, and it is constant in cultivation. The variety *multifidum* also corresponds to the similarly-named form of the Hard Fern. Mr. Moore names ten varieties in all; Milde arranges the forms somewhat differently. Besides the one already mentioned, he has a variety *auriculatum*, the segments of which are auricled or lobed at the base; a variety *umbrosum*, which is described as a flaccid, slender plant, with coarsely crenate, oval pinnæ, and few sori; a variety *microphyllum*, a very small plant, with decumbent fronds, forming a rosette, found in Italy, the Tyrol, and on Mount Libanus; and two large varieties, named *majus* and *rotundatum* respectively—the first a tall, robust form, found in

A. TRICHOMANES, Var. INCISUM.



LARGE FORM OF ASPLENIUM TRICHOMANES.

* "Nature-printed British Ferns" (8vo. edition), vol. ii., p. 135.

† See Hooker's "Journal of Botany and Kew Gardens Miscellany," viii. 360, tab. xi. (1856.)

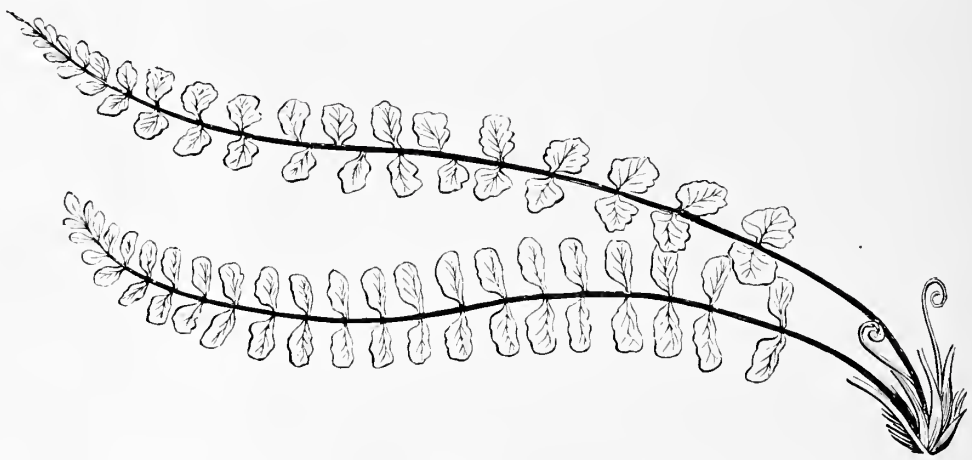
‡ "Nature-printed British Ferns" (8vo. edition), vol. iii., pp. 109–112.

§ Tab. lxxiii., fig. 6.

Spain; the second having pinnæ rounded at the base, found in Sardinia, the Tyrol, and the Canaries.

Besides these European forms, there is a Madeiran plant, which has been regarded as a distinct species under the name of *A. anceps*. It differs from the ordinary form of *A. Trichomanes* mainly in size, being a much more robust plant, with taller fronds and larger pinnæ. A plant which Mr. H. C. Watson considers "inseparable from the *Asplenium anceps* of Madeira and other Atlantic islands" has been collected in the south-west part of Surrey. On a specimen of this, in the Herbarium of the British Museum, Mr. Watson notes: "This may fairly be called *anceps*, but it is quite traceable into the more usual form in south-west Surrey."

Since the greater part of this account was written, Prof. Asa Gray, the well-known American botanist, has published the following brief account of what he describes as "a phenomenon which, I suppose, has never before been noticed," to which his attention had



ASPLENIUM TRICHOMANES.

been directed by Mr. E. J. Loomis, of Washington, and which he commends to the attention of botanists:—"A tuft of *Asplenium Trichomanes* gathered last autumn in the mountains of Virginia is growing in his house in a glass dish. About two months ago he noticed that one of the fronds—a rather short and erect one, which is now showing fructification—made quick movements alternately back and forth in the plane of the frond, through from twenty degrees to forty degrees, whenever the vessel was brought from its shaded situation into sunlight or bright daylight. The movement was extensive and rapid when the frond was younger. When I saw it on the twenty-third of January its compass was within fifteen degrees, and was about as rapid as that of the leaflets of *Desmodium gyrans*. It was more rapid than the second-hand of a watch, but with occasional stops in the course of each half vibration. This was in full daylight, next a window, but not in sunshine. No movement had been observed in the other fronds, which were all sterile and reclining, with the exception of a single one which was just unfolding, in which Mr. Loomis thinks he has detected incipient motion of the same kind." This opens up a new field for botanical observers, and it will be interesting to learn whether similar automatic movements have been observed in any other fern; so far as we are aware, nothing of the kind has been previously recorded.

I ASPLENIUM

A SEPTENTRIONALE A. PETRARCHAE A. GERMANICUM A. SEELOSII.

(½ NATURAL SIZE)

2 UPPER SIDE OF PINNULE 2× UNDER SIDE OF PINNULE (TWICE NAT SIZE)

ASPLENIUM HEUFFLERI, *Reichardt.*

This is a rare and little-known fern, which, although taking rank as a species in the "Synopsis Filicum," is considered by Milde as "sine ullo dubio" a hybrid between *A. Trichomanes* and *A. germanicum*, agreeing with the former in size and habit, and with the latter in the wingless rachis and the toothing of the pinnæ. It has densely-tufted fronds, the dark slender stipes of which is two or three inches long; the fronds themselves are but one or two inches in length, and consist of three or four pairs of opposite distant pinnæ, the lowest of which is about a quarter of an inch in length and breadth; the pinnæ are toothed or lobed, and uniformly narrowed into a distinct petiole. *A. Heuffleri* is a native of the Tyrol, between Vilpian and Mölten, and also occurs at Eichhorn, in Moravia; it is a plant of comparatively recent detection, as it was not described until 1859.

PETRARCH'S SPLEENWORT: ASPLENIUM PETRARCHÆ, *DC.*

This extremely pretty little species is one of the rarest of European ferns. It is a small plant, with a thick, somewhat creeping stem, from which spring very numerous pinnate fronds from two to three inches long, having dark shining stipites from one to three inches in length; the black line extends to the rachis, which, however, becomes greenish in its upper portion, and is covered throughout with stalked glands. The pinnæ are nearly opposite, and few in number—from seven to fourteen pairs; they are lobed or pinnatifid with entire lobes, firm and membranaceous, obtuse at the apex, half an inch or less long, and less than half of that measurement in breadth; the sori are from four to six in number, becoming confluent when fully developed. Although from the description it might be supposed that this plant is very similar to *A. Trichomanes* and *A. viride*, it is really very distinct from both, even in general appearance; in some specimens, indeed, it reminds one more of a *Woodsia* in its aspect. The whole plant is much smaller, and the pinnæ are longer in proportion, and lobed or pinnatifid in a manner quite different from the cutting of those in the species named; and it differs more conspicuously still in the stalked glands with which the whole plant is clothed, to such a degree as to give it a hoary appearance.*

This is one of the few ferns almost peculiar to Europe, and even on that continent its range is extremely restricted. It has been recorded as a native of the British Islands; Milde records "Hibernia" among its localities without any indication of doubt, and it is also included in Newman's "History of British Ferns"† as a *bonâ fide* Irish plant. In spite of this testimony, however, Petrarch's Fern‡ is not regarded as possessing sufficient claims to be included among the natives of the British Islands; the authors of the "Cybele Hibernica" suspect a form of *A. Trichomanes* was mistaken for it.

Petrarch's Fern is found upon dry chalky rocks, especially near the sea, in the Mediterranean regions—in the South of France, at Montpellier and Toulon, besides at Vaucluse, as mentioned below; at Mentone and Nice, at Palermo in Sicily, and near Malaga and in Murcia in Spain; it has also been recorded from Greece. Its only extra-European localities are in Algeria, where it has been met with by two collectors.

* Hooker and Greville's "Icones Filicum," t. clii., where is a good coloured figure of the plant.

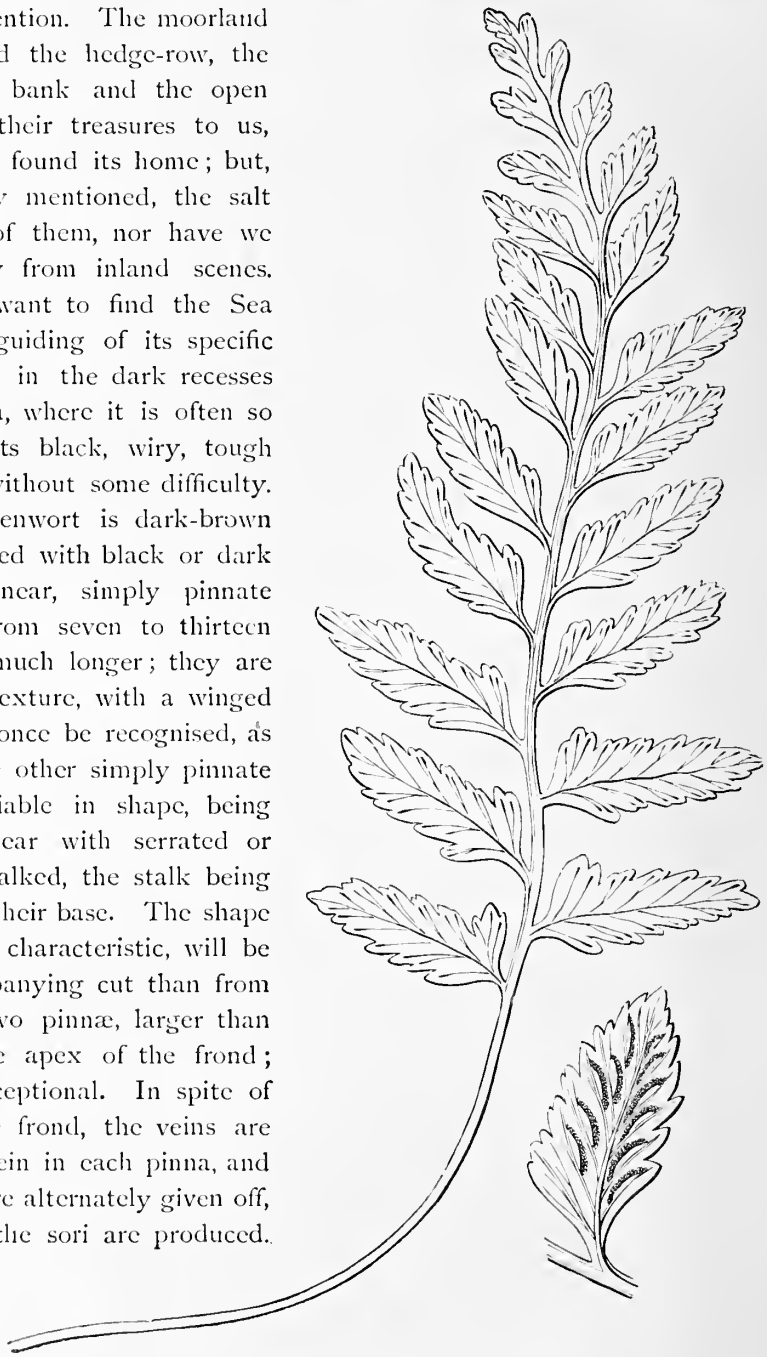
† Fifth (people's) edition, pp. 146—8.

‡ The specific name has reference to the immortal Italian poet, to whom the locality where this little fern was first found—Vaucluse—was especially endeared by association, as we learn from his well-known ode.

THE SEA SPLEENWORT: ASPLENIUM MARINUM, *L.*

We have hitherto been looking for ferns in essentially inland localities. If we except the True Maidenhair, we have not been led within scent of sea breezes by any of the plants to which we have directed our attention. The moorland and the barren rock, the wood and the hedge-row, the wall and the hill-side, the shady bank and the open common—all these have yielded their treasures to us, and in each of them some fern has found its home; but, with the single exception already mentioned, the salt spray has not dashed upon any of them, nor have we been allured in our search away from inland scenes. But now all is different. If we want to find the Sea Spleenwort, we must follow the guiding of its specific name—*marinum*—and hunt for it in the dark recesses and clefts of rocks close to the sea, where it is often so firmly fixed in the crevices by its black, wiry, tough roots that it cannot be extracted without some difficulty.

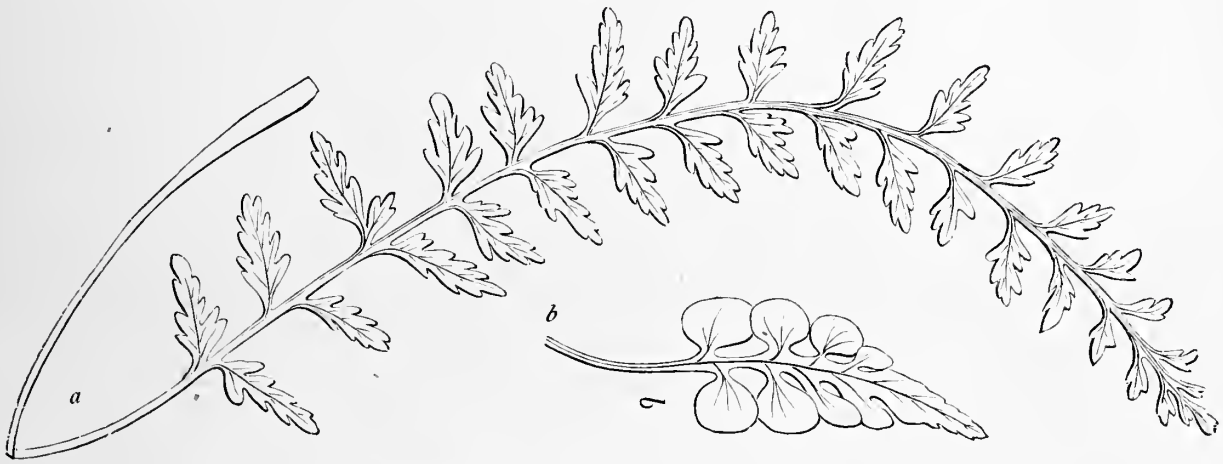
The rhizome of the Sea Spleenwort is dark-brown or black, tufted, and densely covered with black or dark scales. From this spring the linear, simply pinnate fronds, which are on an average from seven to thirteen inches long, but sometimes very much longer; they are smooth and somewhat leathery in texture, with a winged rachis, by which the fern may at once be recognised, as that feature does not exist in the other simply pinnate species. The pinnæ are very variable in shape, being oblong and rather broad, or linear with serrated or crenated margins; the lower are stalked, the stalk being winged, and are thus connected at their base. The shape of the pinnæ at the base, which is characteristic, will be better understood from the accompanying cut than from description. Newman says that two pinnæ, larger than the rest, frequently appear near the apex of the frond; but this seems to us somewhat exceptional. In spite of the thick, leathery texture of the frond, the veins are very apparent; there is a central vein in each pinna, and from this lateral veins (or venules) are alternately given off, and on the anterior side of these the sori are produced. These sori are at first covered with a white membranous indusium, which does not fall away, but opens towards the apex of the fronds, revealing the bright brown sori within.



FROND AND PINNA OF ASPLENIUM MARINUM.

The Sea Spleenwort is a plant of the Atlantic type of distribution, occurring along the coast of England and Scotland, except on the east side, its range extending from Cornwall,

Devon, Dorset, and Sussex to the Hebrides, Orkneys, and Shetlands. It is abundant along the coast of the whole of Ireland. Although so essentially a seaside plant, there are one or two instances on record of its occurring some distance inland; as in a stone quarry near Warrington (Lancashire or Cheshire), and a red sandstone rock at Newton, Lancashire. Mr. Newman found very small examples, the fronds of which were not more than two inches long, on a steep rock near the Lakes of Killarney. When the plant grows at any distance from the sea it seems to become unnaturally dwarfed, assuming the appearance shown in the accompanying figure (*b*). The specimen marked (*a*) has the pinna narrower and more deeply divided than usual. The other extreme in size is also recorded by the author just quoted, who mentions specimens in Guernsey, having fronds two feet or even thirty inches long.* It is mainly confined to Southern and Western Europe, although specimens exist from Nova Scotia, Jamaica, the Bermudas, and South Brazil. It is abundant in the Canaries and Madeira, at about the level of the sea, and occurs in some other of the



IRREGULAR FORMS OF ASPLENIUM MARINUM.

African islands; it also gets into North Africa, being reported from Algeria and Tangiers, while in Morocco it grows on Cape Spartel, in inaccessible places. In Southern Europe the Sea Spleenwort is found in various parts of the coast of France, in many districts of Spain, including Gibraltar, and also in Portugal, in Corsica, and Sicily.

As we have said, this is a somewhat variable species, and numerous forms of it have been described. Mr. Moore enumerates eleven, six of which he considers to be worthy of varietal names and technical descriptions. The variety *trapeziforme* is thought to be the plant which Hudson, in the "Flora Anglica" (1762), described, under the name of *Adiantum trapeziforme*, as a distinct species from Scotland. It is a dwarf plant of robust habit, with short rounded dark-green leathery segments, the lower of which are trapeziform and deflexed; this has been found in several parts of England. The variety *acutum* has narrow, elongated pinnæ, which are drawn out to an acute point; the fronds are long, and distantly and loosely pinnate; this has been found in the south of England and the Channel Islands. The variety *assimile*, an Irish and Channel Island form, "may be considered as a deeply lobed condition of the variety *acutum*." The variety *incisum* is a small and pretty form, the short pinnæ of which are

* Mr. Moore speaks of the variety *parallelum* as attaining even greater length.

deeply and unevenly cut: it is usually quite a small plant, seldom attaining seven inches in length. The variety *ramosum*, which is rare and constant, "is a very marked variety. One of its chief peculiarities is that the fronds are branched, which branching takes place sometimes in the rachis, but more frequently at the base of the stipes, so that the fronds become united in pairs, the junction often taking place before they separate from the caudex, so that two fronds appear to grow side by side from one point."* The most divided of all the varieties is *sub-bipinnatum*, a small plant with deeply pinnatifid pinnæ, which is constant in cultivation and is not known to bear fruit. The largest form of the species is the Channel Island plant called *parallelum*, the fronds of which are as much as three feet long, with long, narrow, and very distant pinnæ.

The Sea Spleenwort is said by Newman to be a difficult plant to cultivate, unless carefully protected from exposure: "it will thrive luxuriantly in a stove-house, with a moist heat of 70° Fahr., but dies on rockwork, even in the purest air, if denied the advantage of the sea-breeze." Mr. Moore, however, says it is easily grown in sheltered situations, but it will not bear frost, and has been known to be frozen even when kept in a close greenhouse. It is well worthy of cultivation, owing to the bright, deep shining green of the fronds.

According to Ray,† the Sea Spleenwort has been employed in medicine in cases of obstruction; and a mucilage extracted from it is said to be useful, when all other applications have failed, if applied externally to burns. A similar use of the Hart's-tongue (*Scolopendrium vulgare*) in the county of Westmeath has gained for it there the name of "Burntweed."

ASPLENIUM FONTANUM, *L.*

There is a special interest attaching to this extremely pretty little fern in connection with its occurrence as a native of England. Its claims to that position are considerable; and yet the best authorities and most careful pteriologists are divided upon the point. The distribution of plants is an extremely interesting subject, and one which has, especially of late years, attracted a good deal of attention. Mr. H. C. Watson, whose numerous works upon the geographical distribution of British plants are well known, and who has done so much to reduce the study of botanical geography to a science, has summed up his researches in an invaluable compendium, entitled "Topographical Botany," in which may be seen at a glance the distribution of any given species through the English and Scottish counties; and the work is being carried on by a club formed for the purpose, called "The Botanical Record Club." For the work of chronicling the distribution of the comparatively few plants which form the flora of the United Kingdom is not yet complete; indeed, it is an illustration of the inexhaustibility of even a portion of a branch of natural science that, although there is probably no spot in the whole world which has been so thoroughly investigated by botanical observers as the British Islands, we have constantly to chronicle new facts in distribution, or even the addition of fresh species to our list. Any one who has had any experience in the compilation of a local flora will recognise how almost impossible it is thoroughly to exhaust that of even a very limited area.

That the distribution of plants is very irregular may be seen at a glance by an observer who removes from a district with which he is thoroughly acquainted to one which is strange to him. At first he is struck by the presence of unfamiliar forms; and a little

* "Nature-printed Ferns" (8vo edition), vol. ii., p. 98.

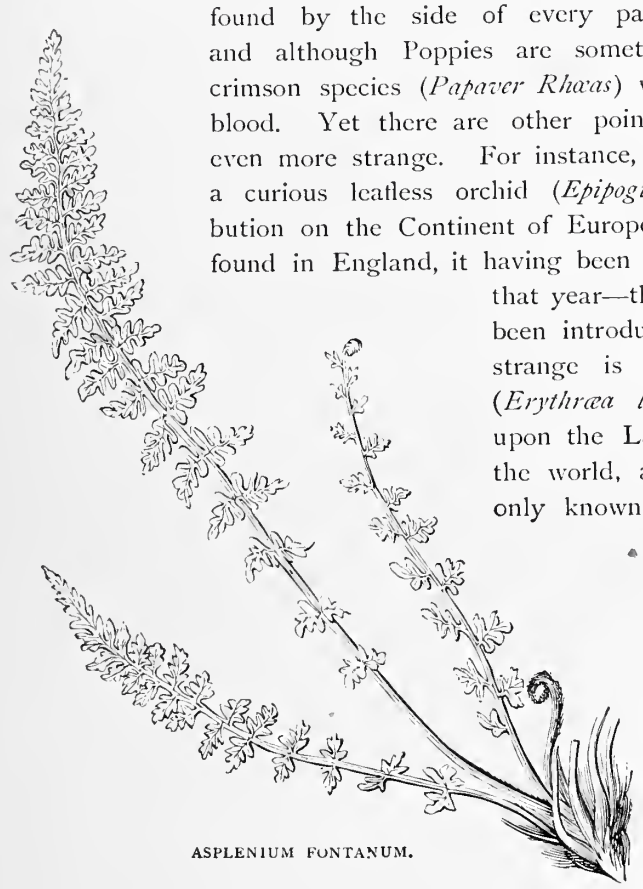
† "Synopsis" (3rd edition), p. 119.

Vincent Brooks Day & Son Lith

ASPLENIUM MARINUM

a & b. UPPER & UNDER SIDE OF FERTILE PINNA 3 TIMES NATURAL SIZE

later, when he has had time to observe rather more closely, he is equally impressed with the absence of others which he had come to look upon as almost integral parts of his botanical surroundings. For instance, if a botanist from the neighbourhood of London goes to Manchester, he will miss the common Mallow (*Malva sylvestris*) which he has been accustomed to see in every waste corner and by every roadside; in the neighbourhood of Manchester this is so uncommon that even where met with there is some suspicion that it has been introduced. The pretty little Bindweed, again, (*Convolvulus arvensis*) which he has found by the side of every path and in every corn-field, is absent; and although Poppies are sometimes seen, they are not of the brilliant crimson species (*Papaver Rhœas*) which dyes our southern corn-fields with blood. Yet there are other points connected with distribution which are even more strange. For instance, it is difficult to account for the fact that a curious leafless orchid (*Epipogum aphyllum*), of somewhat wide distribution on the Continent of Europe, has been once, and once only (in 1854), found in England, it having been discovered in a copse in Herefordshire in that year—the plant being one very unlikely to have been introduced in any accidental manner. Equally strange is the history of a species of Centaury (*Erythræa latifolia*), which, until lately, was found upon the Lancashire sand-hills, and nowhere else in the world, and which has not now occurred in its only known locality for some years, its last record dating 1865; so that we have apparently here an instance of a plant dying out in very recent times.



ASPLENIUM FONTANUM.

The history of *Asplenium fontanum*, to which it is high time we returned, is not difficult to trace, although it is far from easy to come to any definite conclusion as to its nativity as a British plant. It was first added to our lists in 1762, by William Hudson, who includes it in his "Flora Anglica" of that date, and says, "Habitat in fissuris rupium et muris antiquis. Supra Hammersham church, D. Bradney; in locis saxosis supra Wybourn in Westmorlandia." With regard to the Amersham Church locality (in Buckinghamshire), it is certain that the true plant was found there; and it is equally certain that it does not occur there now, nor has it done so for very many years. Bolton figures the plant (his plate being dated 1785), and after quoting the localities just given says, "The specimen here figured and described was sent to my brother, A.D. 1775, by a gentleman who gathered it in Buckinghamshire." This was probably from Amersham Church, although it is not absolutely specified. In the British Museum herbarium there are two specimens, said to have been collected by Lightfoot, a botanist of the last century, to which is attached a ticket, upon which, after citing the old synonyms and the above-named Westmoreland locality, is written: "This was gathered on Ammersham Church, Bucks." This is not dated; but Sir James Edward Smith,* writing in 1828,

* "English Flora," iv. 314.

says: "On Amersham, or Agmondesham, Church, Bucks, found by a Mr. Bradney, according to Hudson, and from whence it was brought alive to Kew Garden, by the late Mr. Aiton, from whom I have a specimen; but the church has been whitewashed, and the plant destroyed." Since then it has not been found at Amersham, although many botanists (ourselves among the number) have made very careful investigation of the walls of the church, in the hope that it might reappear. The accompanying figure is taken from one of the British Museum specimens referred to above. With reference to the Wybourn locality, mentioned by Hudson, Sir J. E. Smith says: "Mr. Hudson gathered the same in a stony situation near Wybourn, in Westmoreland; or rather, perhaps, Wiborn, in Cumberland." Nothing more has, so far as we know, been heard of the occurrence of the fern in this locality. The next record in chronological order is probably that which is also authenticated by

ASPLENIUM FONTANUM, FROM ALNWICK.

specimens in the British Museum herbarium, which were originally (like those of Lightfoot, already named) in the possession of Mr. Brown. Unfortunately there is no date attached to them; but they were probably collected early in the present century. The ticket accompanying them runs thus: "The specimen of *Asplenium fontanum* was gathered from a strong plant sent with many more of the same species by the Duke of Northumberland from his estate at Alnwick in Northumberland. They appeared to have been growing in the crevices of moist rocks, part of which were adhering to them. They varied from one to five inches high, and were found about two miles from the castle." This account seems sufficiently circumstantial; but it has not been corroborated by subsequent observers. About this time the plant was recorded from Keswick and Saddleback, Cumberland, in Hutchinson's History of that county; but it seems hardly likely that it would have escaped the observation of the numerous botanists who have visited the Lake district if it were really to be found there. More than one Yorkshire locality for the fern is on record: Mr. R. M. Redhead, in the

"Phytologist" for 1844 (p. 1084), says that he collected specimens in Wharncliffe Wood in 1838, although he was not able to find it subsequently. In the same work (p. 482) Mr. Samuel Gibson writes: "I found a single root of this plant on an old wall above Skipton Castle in July, 1835; I took all the fronds, and the plant, of course, disappeared. And I have a specimen of the plant given me as a Teesdale plant, but perhaps under some mistake." Mr. Gibson was not, however, a very accurate botanist, and in this case some error is quite probable. Mr. H. Shepherd, of the Liverpool Botanic Garden, found the fern in 1826 on the rocks above Matlock,* but no later collector has been equally fortunate. But Mr. Newman, who always opposed the admission of *Asplenium fontanum* to the lists of British plants, throws much doubt upon the accuracy both of Mr. Redhead's and Mr. Shepherd's records, and states that a dealer in British ferns was in the habit of selling the species as genuinely British from an apparently inexhaustible stock.† Later on the Rev. W. T. Bree records a Scottish locality, an "intelligent gardener" having found the fern "in considerable abundance on shaded rocks by the sea, two miles north-east of Stonehaven, Kincardineshire, in 1842."‡ The plant was next recorded from Surrey, where it "was wont to luxuriate somewhat plentifully in the crevices of an old wall" on Tooting Common; but here again it had been destroyed before the locality was placed on record in the "Phytologist" (iv. 478, 1852). Then the Rev. A. Bloxam came forward with the announcement that he had seen a specimen from between Tan-y-Bwlch and Tremadoc, Merionethshire, and that the fortunate finder of it there had also collected it at Swanage Cave, in the Isle of Purbeck. Last of all, in 1852, the Rev. W. H. Hawker communicated specimens to the Linnean Society, and to various herbaria, of the plant from the neighbourhood of Petersfield, Hampshire. Here the fern grew "on the north side of an old wall, about five feet high," in company with Hart's-tongue and Polypody. Mr. Hawker had known of its existence for many years; he says: "It is growing abundantly and luxuriantly, for I counted twelve tufts of it the last time I went to look at it, and I think the largest of these tufts must be fully two feet in circumference . . . I have measured some of the fronds which I have by me, and find the largest to be close upon six inches long." This is, we believe, the most recent record of the occurrence of the plant. Besides these British localities, Mr. Moore says he has seen a specimen from Cavehill, near Belfast; but the authors of the "Cybele Hibernica" do not refer to this.

Our readers will be able to estimate for themselves the value of the evidence adduced, and may form their own judgment as to the nativity of *Asplenium fontanum* in Britain. We are inclined to think that the Amersham and Alnwick localities were genuine, although the plant is there extinct; these date from a period anterior to the time when fern cultivation became general. This, indeed, would make us suspect the thorough wildness of many of the more recent localities, which, it will be noticed, are usually walls.

The head-quarters of *Asplenium fontanum* are to be found in central Europe. It is met with in Spain, on the Pyrenees and in other localities; in the mountainous parts of France upon damp rocks; in Italy (Naples) and Greece; in Flanders, Hungary, and Switzerland (Geneva), and in Germany, though rarely (near Marburg); it is recorded for Scandinavia, but this requires confirmation. Its extra-European distribution is very limited; it occurs in the Ural mountains and in the Himalayas, and Dr. Aitchison has lately collected it at Shéndloi and Síkarám, in Afghanistan, at an elevation of eleven thousand feet.

There is no difficulty in distinguishing *Asplenium fontanum* from any other member of

* "Phytologist," i. 1081. † *Id.*, 1143. ‡ *Id.* (1848), iii. 319.

the genus. Its small narrow twice-pinnate fronds at once distinguish it, coupled with the smooth, narrowly winged rachis. Mr. Newman once broached the theory that the Amersham plant was really *Cystopteris fragilis;* but we have never been able to find out upon what foundation he based this certainly inaccurate supposition. It is a pretty little plant, with evergreen fronds, from three to eight inches in length, springing from a short tufted caudex, which is somewhat scaly at the apex. The stipes is dark-purplish below, but becomes green in its upper portion; the green rachis is, as we have said, narrowly winged. The fronds are numerous, quite smooth, and upright in habit; they are of a pale, rather glaucous green, linear-lanceolate in outline, tapering at each end, especially towards the apex, and about an inch and a half in breadth at the widest part. The pinnæ, which are broadest below, are spreading, the upper ones being placed more closely together than the lower. The pinnules are oblong in form and more or less deeply cut; the sori are very numerous, at first distinct, but afterwards forming a dense mass on the back of the fronds; they are covered by a white indusium, which is usually straight, but sometimes more or less curved, and thus approaching the genus *Athyrium*, in which the species is sometimes placed under the name of *Athyrium fontanum*.

There are two forms of the plant, each of which is represented among the real or supposed British specimens; but the difference between them seems to be chiefly a questiob of size. The form which is considered typical—*fontanum*—is called "forma minor" by Milde, who places *A. Halleri*, the larger variety of the plant, as his "forma major." Under the latter form, too, the botanist first quoted includes a plant described by Mr. Moore, as distinct, under the name of *A. refractum*.* This is supposed to have originated from wild Scottish specimens; it came into notice about 1851. Mr. Moore writes concerning it: "Compared with *Asplenium fontanum*, the fronds of *Asplenium refractum* are longer and narrower in proportion, being seven or eight inches high, and not more than three-fourths of an inch wide. They have a dark-brown rachis throughout, which is not distinctly winged, as in *fontanum*, although there is a slight green decurrent line at the upper angle between the pinnæ. The outline is different, being equal and almost linear, not broader upwards; the lower pinnæ are scarcely more distant than the rest, and all the pinnæ are refracted in a remarkable manner, as well as much less divided. The habit of growth is spreading, and the fronds are proliferous. The little bulbils are formed principally at the junction of the pinnæ with the rachis." This is probably a plant of garden origin; we have already seen, when speaking of *Adiantum Farleyense* (p. 43), that ferns sometimes appear in this casual way, never having been found in a wild state.

(*a*) UPPER and (*b*) UNDER SIDE OF PINNA OF ASPLENIUM FONTANUM (ENLARGED).

Asplenium fontanum is often met with in collections; it is easily grown, requiring good drainage and a considerable amount of moisture. The crown of the root may be raised above the surface of the mould if the plant be grown in a pot. Mr. Moore says: "It is increased without difficulty by division, if the operation is carefully performed in the growing season, and the divided plants are kept close till established. We have seen exhibited by Dr. Young a magnificent mass of this plant, which could hardly have been less than a foot in diameter, with fronds eight to ten inches long. The species grows admirably in a shady hothouse."

* "Nature-printed Ferns" (8vo edition), vol. ii., p. 66.

ASPLENIUM LANCEOLATUM, *Hudson.*

This is a very pretty and uncommon fern of the Atlantic type of distribution, and thus having a somewhat restricted geographical range. In England we find it for the most part confined to the west side of the island, although it is recorded for Kent and Sussex. In Cornwall and Devonshire it occurs in numerous localities; in the former county it is found at (amongst other places) St. Michael's Mount, the Land's End, Penzance, and Helston, and at Hot-point, where it grows to a large size, some of the fronds being eighteen inches long. In Devonshire it occurs in numerous localities; about Plymouth it is usually a semi-moorland plant, or grows in places not far from the tidal waters. Somersetshire and Gloucestershire also produce it; and it is found more or less plentifully in some of the Welsh counties. In Merionethshire it is, or was until recently, very abundant, especially near Barmouth, where it has been much diminished of late years by the depredations of tourists. It is not found in Scotland; in Ireland it occurs very locally, being only recorded for the county Cork, near Kinsale and Cahirciveen.

If we cross to the European continent, and take the Channel Islands in our way, we are pretty sure to find *A. lanceolatum* in any of the islands, not only in wet and shady, but also in dry and exposed situations. Here, as elsewhere, it has a marked partiality for the sea air. It grows in Turkey and Greece, being represented here by the variety *obovatum*, of which we shall speak hereafter. In the Mediterranean islands, as well as in the countries bordering upon the sea, it is plentiful; it grows in Spain and Portugal, specimens from the latter country measuring about a foot in length. It is also represented in Germany, Belgium, and Switzerland, as well as in two or three parts of France. In the islands of Madeira and the Azores it is plentiful, and is found on the African continent, at Algiers and Tangiers.

The merit of having established this fern as a distinct species belongs to our countryman William Hudson, who named and defined it specifically in the second edition of his "Flora Anglica" (1798). It had been known to previous authors, but had always been looked upon as a variety of *A. Adiantum-nigrum*, with which it is even now not unfrequently confused. Its nearest relation among British ferns is certainly the species just named; Mr. Moore, however, thus sums up the differences between them. He says that *A. lanceolatum* may be known—"(1) by its lanceolate, not deltoid, outline; (2) by the presence of hair-scales on its principal and partial rachides; (3) by the form of the sorus, which is oblong, not linear: the sori in this species being nearly represented in appearance by the upper half of those of *Adiantum-nigrum*; and (4) by the position of the sorus, which is in this species produced above, and in *Adiantum-nigrum* below, the fork of the veins; in the latter, consequently, the sori are near the costa, and central with respect to the pinnules, whilst in *lanceolatum* they are submarginal. The texture also is thinner, and the pinnules are shorter, and more equable in size."* There are other characters which are perhaps a little difficult to define upon paper, although they are readily recognisable when the plant is seen. The shade of green, which is very striking and handsome, is very distinct from that of *A. Adiantum-nigrum*. Besides the generally much more divided pinnæ of *A. Adiantum-nigrum*, the lower pairs should be specially noticed; these are broad and again divided, and are always the largest, but this is not the case in *A. lanceolatum*, in which, indeed, the lowest pair of pinnæ are often shorter than the ones just above them.

The plant now under consideration sends up from a short, thick, scaly caudex a large

* "Nature-printed British Ferns," vol. ii., p. 69 (1859).

number of fronds. Mr. Moore speaks of a specimen which was found almost closing the mouth of a well in Jersey; this tuft bore one hundred and twenty fresh fronds, besides the remains of sixty or seventy others in various stages of decay. The stipes is short and dark below; the fronds are from three or four inches to a foot or a foot and a half in length, twice pinnate, smooth, and lanceolate, and are of a very beautiful and distinct green. The pinnæ, which are broadest at the base, are nearly or quite sessile; they taper towards the extremity, which is blunt, but twisted at the apex, and are covered beneath with small scattered deciduous scales. The fronds are evergreen, making their appearance in May, arriving at maturity about August, and continuing bright and fresh throughout the winter. The veins are forked, and the sori are attached along their anterior side, thus assuming a submarginal appearance; the sori are at first distinct, but afterwards become confluent, covering the whole under-surface of the frond with a dark brown mass, in the same style as *A. Adiantum-nigrum;* they are covered when young with a white membranous indusium, which disappears when the sori are mature.

This is not a very variable species. There is a variety, *obovatum*, which has even been raised to the rank of a species; it is found in the south of Europe, and is distinguished by its smaller fronds and less sharply-toothed pinnules. The variety *microdon*, described by Mr. Moore, is a strikingly distinct form; at first sight it would appear to belong rather to *A. marinum* than to the present species, but it passes into *A. lanceolatum*, and agrees with this in essential characters. It has simply pinnate fronds, the pinnæ being almost triangular in shape and (especially the lower ones) nearly as broad as long; the upper pinnæ are narrower and confluent. This has been found in Guernsey, and in Cornwall near Penzance. Another variety has quite recently been described under the name of *A. Sinclii.**

A. lanceolatum is not one of the easiest species to grow, although when potted in a mixture of peat, loam, and sand, with ample drainage, it will do well, if not kept too moist. But it will not stand any approach to cold, so that it is not a good rockwork plant except in very mild situations, or near the sea, for which it seems to have a predilection.

BLACK MAIDENHAIR SPLEENWORT: ASPLENIUM ADIANTUM-NIGRUM, *L.*

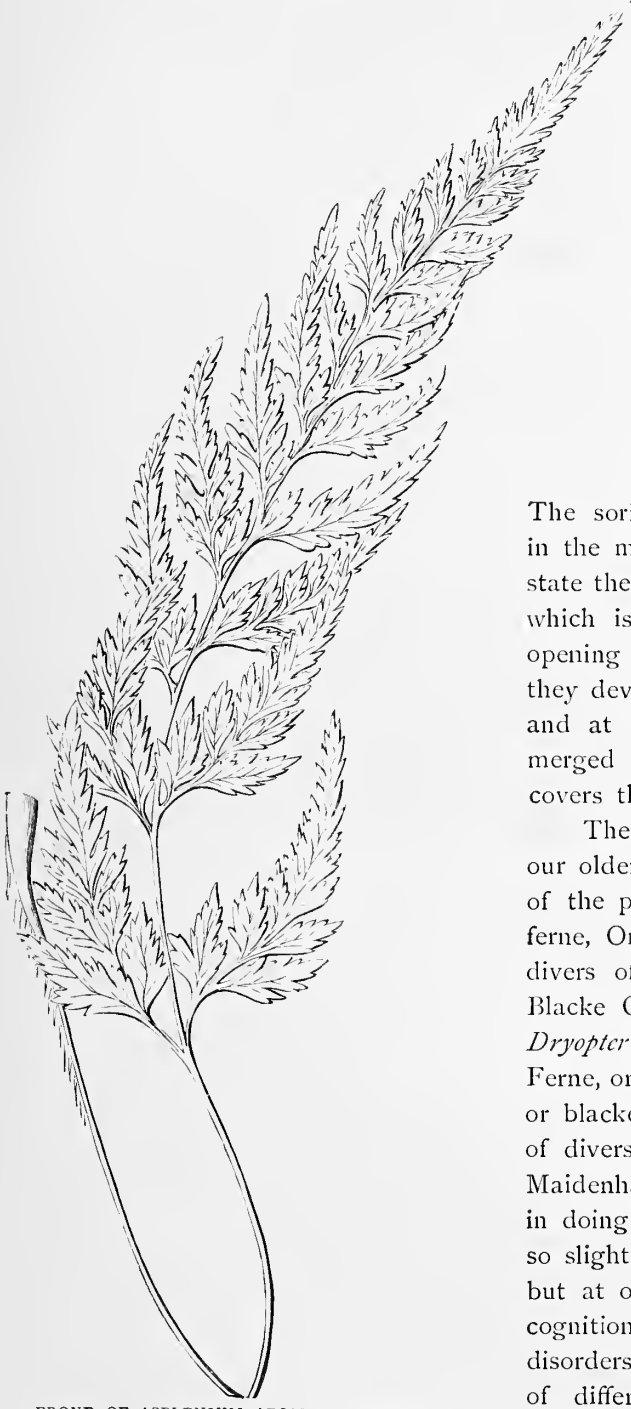
This is a handsome and well-marked species, which is found upon shady hedge-banks or on old walls in most of our English counties. Although very widely distributed in Britain, it can hardly be classed as a common plant; it often occurs, but sparingly, in the localities where it is met with, and many large tracts of country do not produce it. It is, as we shall see further on, a variable plant; its nearest ally is the much rarer *A. lanceolatum*, from which it differs in the ovate-triangular shape of the fronds, as well as in the linear form of the sori. Owing to the evergreen nature of the plant, and to the persistence of the fronds during winter, the Black Maidenhair Spleenwort attracts most attention during the winter months, its bright green, remarkably glossy fronds standing out very conspicuously among the dead and dying

PINNA OF A. ADIANTUM-NIGRUM, Var. ACUTUM.

PINNA OF A. ADIANTUM-NIGRUM (UNDER SIDE).

* Hardwicke's "Science Gossip," July, 1880.

herbage with which the hedge-banks are clothed. In its typical form it is a fern with tufted, short, stout, and scaly caudex, from which spring numerous fronds; the stipes, which is from six to nine inches in length (about as long as the leafy part of the frond), is of a dark shining brown hue, darker at the base, and smooth; the fronds are from half a foot to a foot long, and about half as broad; they are bipinnate or tripinnate, of elongated triangular outline, and with numerous pinnæ, all of which are much divided into narrow segments; the pinnæ are also triangular in outline, the two lowest, which are nearly opposite, are longer than the rest, and often pinnate or pinnatifid; the upper portion of the frond tapers into an elongated point. The sori are borne upon the veins of the pinnules in the manner shown in the figure; in their young state these are covered by a narrow white involucre, which is attached to the side of the lateral veins, opening towards the centre of the pinnule. As they develope, the indusium is pushed on one side, and at length disappears; and the sori become merged into a confused dark-brown mass, which covers the back of the entire frond.



FROND OF ASPLENIUM ADIANTUM-NIGRUM.

The Black Maidenhair Spleenwort was known to our older writers. Gerard gives a fairly good figure of the plant under the name of "the male blacke ferne, Onopteris major." He says it "is called of divers of the later Herbarists *Dryopteris nigra*, or Blacke Oke ferne, of the likenes that it hath with *Dryopteris*, which we have called in English Oke Ferne, or Mosse Ferne: of others *Adiantum nigrum*, or blacke Maidenshaire." He adds that it "is used of divers unlearned apothecaries for *Adiantum*, or Maidenhaire of Lumbardie, but these men do erre in doing so." Its medicinal properties, indeed, are so slight as to have almost fallen out of knowledge; but at one time they must have received some recognition, as Ray* mentions its efficacy in various disorders, such as coughs, asthma, and obstructions of different kinds, while he cites Matthiolus as testifying to its value as a vermifuge; Hoffmann prescribed its employment in scorbutic affections. In France an infusion of the fronds is sometimes employed as a diuretic.

* "Synopsis Stirpium" (3rd edition), p. 127 (1724).

Asplenium Adiantum-nigrum is a fern of wide distribution, and one which is represented by several forms, some of which are so distinct in character or appearance that they have been described by some writers as distinct species. The ordinary form is found in most of the English and Scotch counties, and it is also frequent in most parts of Ireland; it extends from the level of the sea to an elevation, in the Highlands, of about two thousand feet. The evergreen character of the fronds did not escape the attention of Gerard, who says of them: "They remaine greene all the yeare long, otherwise than Polypodie or Maidenshaire do: yet do they not cease to bring forth new leaves in summer: they are destitute of flowers and seede, as in the former." Varieties are occasionally met with in which the fronds are prettily variegated with white or whitish-yellow; but these forms do not appear to be permanent. Its European distribution is also very general, extending from Norway and Denmark through Belgium and Holland, Hungary, Italy, France, Switzerland, Germany, Austria, Spain and Portugal, the Mediterranean region, Turkey, and Greece. Passing out of Europe, we find it plentifully in most of the African islands — Madeira (where it is very common, ascending to an elevation of four thousand feet), the Cape Verd, the Azores, St. Helena, and the Mascarene Islands (Bourbon and Mauritius)—and also on the continent of Africa, both in the north (Algeria) and south (Cape of Good Hope and Natal), as well as in Abyssinia and on the Cameroon mountains. In Asia it has a considerable range, extending from Siberia to Northern India, Afghanistan, Persia, and Kashmir; it is found also in the East (Arabia, Syria, and Armenia) and in the island of Java. It was at one time supposed to have been found in America, but this seems to have been an error.

ASPLENIUM ACUTUM (REDUCED).

We have said that *A. Adiantum-nigrum* is a very variable plant: two varieties of it (each of which has been considered of specific rank, although now most authors agree in reducing them to this species) demand special notice. The first, *acutum*, is characterised by the extreme slenderness and gracefulness of all its parts—pinnæ, pinnules, and segments being extremely narrow, and usually acute or even acuminate. It is a singularly beautiful plant, the elegant form and bright shining surface of the fronds at once attracting attention. In the United Kingdom this has at present only been found in Ireland, where it occurs in several widely separated localities, being most abundant in the south and south-west; it has long been known as an Irish plant, if we are correct in identifying with it the "*Filix minor longifolia*" of Ray (1724), which was found "on the mountains of Mourn, in the county

of Down," and which is well described as "valde speciosa." This is the identification of most authors, including those of the "Cybele Hibernica"; but Mr. Moore would rather look upon the Mourne Mountain plant as a form of the Lady Fern (*Athyrium Filix-fœmina*). This form is extremely abundant and very luxuriant in the Azores

FORMS OF ASPLENIUM ADIANTUM-NIGRUM.

and the Canary Islands, and also occurs in Spain, Portugal, Italy, Hungary, France, the Tyrol, and Greece. When an extreme example is seen, the appearance would almost justify the retaining of *acutum* as a species; but however distinct the extreme forms may be, it is in many cases easy to trace the plant through a series of gradations until we are landed at typical *Adiantum-nigrum*. Our figure is drawn from a specimen in the Herbarium of the British Museum. A Mediterranean form, which seems to be about half-way between *acutum* and *Adiantum-nigrum*, has been described under the name of *A. Virgilii*.

SEEDLING FROND OF ASPLENIUM ADIANTUM-NIGRUM.

The other variety to which we have alluded is known as *obtusum* or *Serpentini*, although Milde considers that these names represent separate forms. This is the opposite of *acutum*, having comparatively straight spreading pinnæ, which are usually more or less obtuse at the apex. It is of a dull opaque green, very different from the bright shining hue of *acutum*. This is a plant of somewhat restricted range, being, so far as is known, mainly confined to Central Europe, but perhaps extending to South Africa and Abyssinia. There is only one locality for this in Britain: it was found in 1862, in the parish of Cabrach, on the serpentine range of mountains which divides the counties of Aberdeen and Banff. The name *Serpentini* refers to the fact that it is only known to occur upon serpentine rocks. It is neither as distinct nor as striking a plant as *acutum*; and Milde says that, having observed

it carefully for many years, he was enabled to find fronds intermediate between it and *A. Adiantum-nigrum* growing from the same rhizome as the typical *A. Serpentini*. Mr. Moore describes numerous other varieties, amounting in all to thirteen, but we do not purpose to dwell upon these.

The Black Maidenhair Spleenwort is not difficult to cultivate, the most easily grown form being the beautiful *acutum*. It will do well on a shady rockwork, especially if planted in sandy soil that is kept moderately moist, or among stones in a north aspect. It will grow well in a greenhouse; here the dark shining fronds carefully develope themselves, and the plant becomes very ornamental. It is only specimens from hedge-banks, however, that can be removed with any likelihood of success; when growing on a wall the roots are so firmly fixed that it is hardly possible to get out an entire specimen.

ASPLENIUM SEELOSII, *Leybold.*

This is a very curious little plant, and, according to Sir W. J. Hooker, is "assuredly the rarest and most circumscribed in locality of any known European fern." It has a small horizontal caudex, from which spring tufts of numerous fronds, the stipites of which are scarcely three inches long, while the leafy portion of the frond is not more than half an inch or an inch in length. This leafy portion of the frond is palmate or palmatisect, the segments being from three to five in number; they are elongate or wedge-shaped, and unequally cut or toothed; the few forked, nearly erect veins are sunk in the frond. The sori are few (four to eight) in number, and nearly parallel with the central vein, occupying the whole of the underside of the pinnæ, and are covered with a thin toothed indusium.

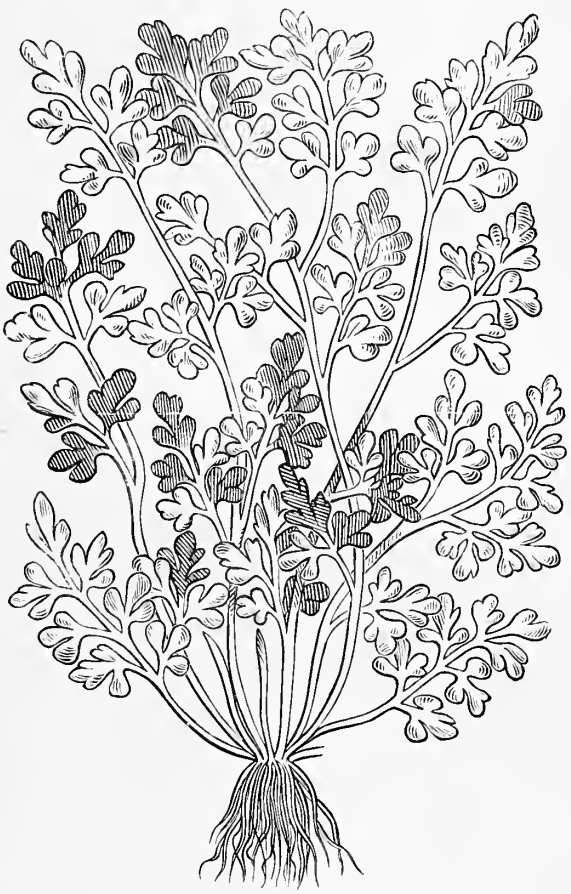
ASPLENIUM SEELOSII.

This curious little fern is confined to the dolomite region of Carinthia and the South Tyrol, at an elevation of from six hundred and twenty to six thousand feet, growing in small caves and on the vertical sides of barren dolomite rocks in the neighbourhood of water, in company with the Wall Rue (*A. Ruta-muraria*). It is found in several localities, but these lie close together; and the species has not been found away from the dolomitic region. Our woodcut represents a specimen of the natural size.

THE WALL RUE: ASPLENIUM RUTA-MURARIA, *L.*

"It hath very fine pale greene stalkes almost as fine as haires, set confusedly with divers pale greene leaves on very short foote-stalkes, somewhat neare unto the colour of Garden Rue, and not differing much in forme, but somewhat more like unto the true *Adianthum*,

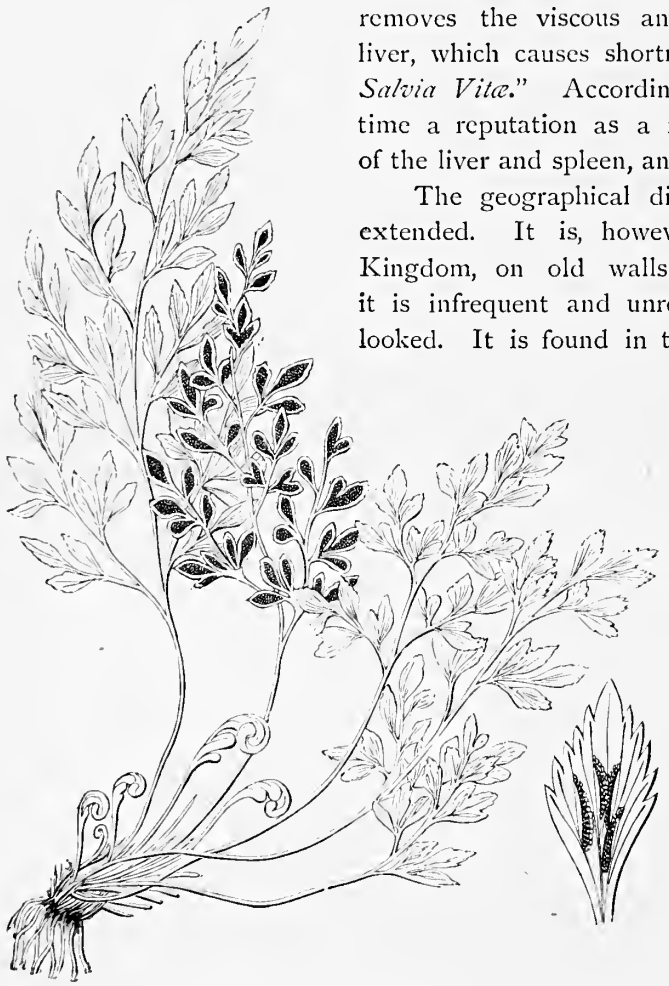
being more and more diversly cut in the edges, and thicker, smooth on the upper part, and spotted finely on the under." Such is the description which "John Parkinson, Apothecary of London, and the King's Herbarist," gives, in his ponderous folio published in 1640, of the fern we have now to take into consideration; and, if we except the remark on the fineness of the "stalkes," we shall find his description accurate enough. *Ruta-muraria* was the old name of the species, bestowed upon it by Rembert Dodoens in 1554, and retained as a specific title by the great Swedish botanist when he brought order into the chaos of scientific nomenclature, and placed our Wall Rue in the genus *Asplenium*. The name is an apt one, whether we consider it in its reference to the habitat of the plant or the appearance of its fronds: although not confined to walls, it is essentially a wall plant—more characteristically so than any other of our ferns; and the resemblance of the fronds to the leaves of Rue, although not always equally striking, is often conspicuous enough. The old author we have already quoted tells us that there were "foure or five speciall sorts of hearbes called by the name of Rue, having little likenesse thereunto, but only some shew in the leaves," and includes among them the little Asplenium of which we have now to speak. Certainly the two plants have not very much in common—one being a flowering shrub, the other a flowerless plant; but any one acquainted with the old herbalists will remember how very miscellaneous an assortment of plants is often classed under the same heading. The common Garden Rue having been, even in Saxon times, very extensively used as a remedy in all kinds of disorders—Langham, in his "Garden of Health," gives two hundred and sixty-five cases in which it is beneficial!—it was natural that the plant which shared its name should be partaker in its medicinal reputation; and this we find was the case.



ASPLENIUM RUTA-MURARIA.
(*From Gerard's "Herbal."*)

To the employment of the Wall Rue in the disease called "the rickets" it owes one of its old names—that of Tentwort, which we find employed by Merrett in his "Pinax," and which was for a long time a puzzle to botanical philologists; Dr. Prior, in the first edition of his "Popular Names of British Plants," calls it "an unintelligible name," though he has since been able to explain it by a reference to Threlkeld's curious little "Synopsis Stirpium Hibernicarum" (1727)—a work which, the author tells us, was "the first essay of this kind in the kingdom of Ireland." The passage explaining the name is sufficiently quaint to be worth extracting. "It is one of the capillary plants, and a specifick against the Rickets. For this reason our ancestors gave it the name of Tentwort, deeming it a sovereign

remedy against the narrowness of children's breasts, or the *Tabes Pectorea*, as Dr. Boot calls it, who was State-Physician in this kingdom in K. Charles I. reign; who observes that, according to the various symptoms of the same distemper, the English called it the Taint, doubling of the joints, and in a more general word, Rickets. According to very late observation, convulsions in children have been cured by this small herb boyled in sack-whey. It is to be used for forty days in powder, or decoction; for it removes the viscous and mucilaginous tartar in the lungs and liver, which causes shortness of breath. Hence L'Obel named it *Salvia Vitæ*." According to Lightfoot, the Wall Rue had at one time a reputation as a remedy "in coughs, asthmas, obstructions of the liver and spleen, and in scorbutic complaints."



ASPLENIUM RUTA-MURARIA.

The geographical distribution of the Wall Rue is not very extended. It is, however, found in most parts of the United Kingdom, on old walls or calcareous rocks; in some districts it is infrequent and unrecorded, but is likely to have been overlooked. It is found in the Hebrides, but is absent or rare among the Highland mountains, even down in their low glens and valleys. It is often met with upon old graves and decaying walls; and is, or was until lately, common in the neighbourhood of London. In the "Flora of Middlesex" it is recorded for, among other localities, Hampton Court, Brentford, Chiswick, Finchley, and Hampstead; and it was also found in the brickwork of a kitchen area in Bloomsbury Street, London, in 1866, though here it may of course have been planted. It extends throughout Europe, from Norway to Spain and Portugal, Italy, the Mediterranean Islands, Greece, and Turkey. It is found both in North and South Africa, and in many parts of Asia, from the Ural Mountains to Thibet and Kashmir, in the Caucasus and in Siberia. Dr. Aitchison has lately collected it in the Kuram Valley, and other parts of Afghanistan; it is curious to notice how many of the twenty-two ferns collected in that region belong to species found in Europe, and almost all of them in Britain: the list includes the names of *Woodsia hyperborea, Cystopteris fragilis, C. dentata, Adiantum Capillus-veneris, Cryptogramma crispa, Asplenium septentrionale, A. Ruta-muraria, A. viride, A. Trichomanes, A. fontanum, Ceterach officinarum, Lastrea rigida* (and vars.), *Polypodium Dryopteris*, and *Botrychium Lunaria*. In North America it occurs on rocks and limestone cliffs in many parts of the United States.

The Wall Rue is not a very variable plant, although it differs greatly in size and in the shape of its pinnules according to the circumstances in which it is placed. The fronds,

1 ASPLENIUM MARINUM NIGRUM. 2 ASPLENIUM LANCEOLATUM

3 & 4 UNDER SIDE OF FERTILE PINNA. (TWICE NATURAL SIZE)

which arise from a short tufted stem, and are often very numerous, vary from an inch, or even less, to six inches in length; they are smooth throughout, as is also the stipes, which is of about the same length, and have often a peculiar glossy appearance due to the dull, almost glaucous shade of green which they sometimes assume. In a young state these fronds are nearly or quite simple, passing afterwards through a trifoliate to a twice or thrice pinnate form, with wedge-shaped pinnules, which are sometimes acute at the apex, but more frequently rounded. When growing in the cracks and crevices of walls, the Wall Rue is usually extremely difficult to extricate, as the caudex can hardly be got out entire, and the fronds are very small, and usually separated from the stem in the attempts necessary to obtain the plant. Sometimes the fern is so extremely small that it is only detected after careful observation; we have met with such plants on a wall in a Buckinghamshire locality, which also produced minute plants of the Scaly Spleenwort (*Ceterach officinarum*). There is no distinct central vein to be observed in the pinnules, the venation consisting of a series of forked veins springing from the base of the pinnule, and extending to its margin. To the inner side of the veins are attached the narrow sori, which are at first covered by a white involucre: this disappears when the fructification is ripe, being pushed aside, and shrivelling up when its work of protection has been accomplished. The sori are at first distinct, but as they grow older and develope they become confluent, so that the back of the pinnules is often almost entirely and thickly covered with the dark-brown spores. The accompanying cut is from Deakin's "Florigraphia Britannica," and shows some variations in the form of the fronds and pinnules.

ASPLENIUM RUTA-MURARIA.

THE FORKED SPLEENWORT: ASPLENIUM SEPTENTRIONALE, *L.*

We are so accustomed to look upon a fern as synonymous with all that is pretty and graceful that when we come across a member of the family which has not these qualities, we are surprised and half-inclined to resent the appearance of an ugly interloper in our select parterre. Not that the Forked Spleenwort can fairly be called ugly; its defects are of the negative kind, and consist rather in the absence of beauty than in the presence of anything unsightly; but it must be confessed that it is not at all an attractive plant. It has, however, one qualification for admiration which must not be overlooked—that of rarity, for it is certainly an uncommon plant in Britain, and does not occur at all in Ireland. Gerard duly figures the Forked Spleenwort as a British plant, although he places it among mosses: his description, though not very detailed, is good as far as it goes. He tells us that it is found "upon the tops of our most barren mountains, but especially where seacoles are accustomed to be digged, stone to make iron of, and also where oare is gotten for tinne and lead; it riseth foorth of the ground with many bare and naked branches, dividing themselves at the top into sundrie knags, like the forked hornes of a deere, every part whereof is of an overworne whitish colour." Gerard's figure is not amiss; but his editor, Johnson, in the later

edition of the "Herbal," substitutes another for it, which he thought better; an opinion in which we hardly concur.

The geographical range of the Forked Spleenwort is somewhat remarkable; it is mainly confined to the Old World, but has been found in New Mexico, its only American locality. It occurs throughout Europe in mountainous regions, extending from Sweden, Norway, and Russia to Italy, Sicily, and the Spanish Peninsula; it is found also in Asia, in the Caucasian, Ural, and Altai regions; also in Kashmir, at an elevation of nine thousand feet, and lately in the Kuram Valley, Afghanistan, at a height of from seven to eleven thousand feet. In Great Britain it is, for the most part, a fern of local distribution; it is found in Devonshire, though, we believe, in only one locality (near Lynton), and also in Somersetshire in some abundance; in North Wales it is on record as having been found in several places in Denbighshire and Carnarvonshire, chiefly near Llanrwst and Llanberis; in the Lake District it is found in both Cumberland (Honister Crag, Scawfell, Helvellyn, etc.) and Westmoreland (Ambleside). In the East Lowlands and East Highlands of Scotland several localities are on record for the species in Roxburghshire and Perthshire, in the neighbourhood of Edinburgh and elsewhere.

ASPLENIUM SEPTENTRIONALE.

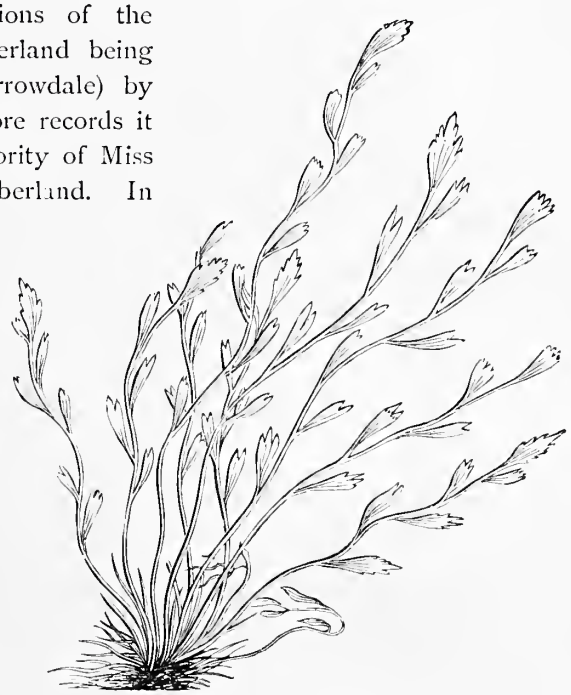
The two woodcuts which we give of this species will afford a good idea of the variation in size which the plant presents. Its long narrow grass-like fronds at once distinguish it from any other European Fern. The tufted rhizome forms a dense entangled mass, from which spring a large number of fronds—sometimes some two or three hundred—which are usually upright, but sometimes spread, or even droop. They are often quite simple, with a few narrow teeth at distant intervals, or forked, in which case each division is toothed in the same manner as the simple fronds; in height they vary, in extreme cases, from an inch to six inches, the usual altitude being about three or four inches. The sori are linear and oblong, covered with a pale thin membranous indusium; they are separate, but become confluent, so that when fully developed they usually form a thick mass which covers the entire back of the frond. Mr. Newman says that the superficial resemblance of the fern to the Buck's-horn Plantain (*Plantago Coronopus*) is so great that it might be mistaken for the latter by a casual observer.

ASPLENIUM SEPTENTRIONALE.

Except in size, *A. septentrionale* is one of the least variable of ferns; indeed, we do not find allusion to any form of it in any work upon the subject. *A. germanicum*, indeed, has sometimes been considered a form of it, but without sufficient reason, the simple or forked fronds at once distinguishing it. It is not easily cultivated, but may be grown successfully among masses of porous sandstone, in the crevices of which should be placed a little sandy soil; the plant should be shaded from too much sun, and does not require much moisture.

ASPLENIUM GERMANICUM, *L.*

This rare and pretty little fern is perhaps best placed between *A. septentrionale* and *A. Ruta-muraria;* differing from the former in having pinnate fronds, and from the latter in these being for the most part simply pinnate. It is confined to Europe, but is somewhat widely distributed in the northern and central regions of the continent. In England it is very rare, Cumberland being the only county recorded (Helvellyn and Borrowdale) by Mr. Watson as producing it, although Mr. Moore records it from Somersetshire (near Culborne), on the authority of Miss Payne, and also from Kyloe Crags, Northumberland. In Wales it is somewhat more abundant, as it is reported from two localities, not very far removed from each other, in the principality; it grows on high rocks, near the upper end of the Pass of Llanberis, in Carnarvonshire, and also on Glyder Vawr, intermixed with *A. septentrionale;* and in Denbighshire it has been found between Llanrwst and Capel Curig. It has been recorded from both the Highlands and the Lowlands of Scotland, the localities for it being near Kelso and near Hassendean, Roxburghshire; Arthur's Seat, near Edinburgh; near Dunfermline, Fifeshire; and near Perth and Dunkeld, Perthshire; and also near Airlie Castle, Forfarshire. It is not found in Ireland. On the Continent we find *A. germanicum* (which, by the way, is also known by the names of *A. alternifolium* and *A. Breynii*) occuring pretty generally in mountainous regions throughout western and central Europe.



ASPLENIUM GERMANICUM.

Asplenium germanicum is an evergreen or nearly evergreen fern, with a perennial tufted scaly caudex, from which numerous fronds are given off. The stipites are slender, as long as the frond, dark-brown or black at the base, but green above; the fronds (which are from two to six inches high) are very narrow, and linear in outline, with alternate ascending pinnæ; it is of a pale yellowish-green throughout. The lower pinnæ are the largest; they are notched at the apex, and have no central vein; there are, however, from two or three to five or six nearly parallel longitudinal veins, on which the sori are placed. The sori are covered with a thin narrow entire indusium; they are at first distinct, but ultimately become confluent. The alternately pinnate frond readily distinguishes *A. germanicum* from *A. Ruta-muraria;* the pinnules, too, are more wedge-shaped than they are in the latter species, of which some have considered it a variety—a view suggested by Linnæus. Others have suggested that it may be a hybrid between *A. Trichomanes* and *A. septentrionale,* or between the last-named species and *A. Ruta-muraria;* but this theory has not much to support it, especially as *A. germanicum* is found abundantly in many localities in the Tyrol and in Silesia, where none of the three species just named occurs. There is a variety

(*cuneatum*) of the Wall Rue which indeed somewhat approaches this, but it is a stouter plant, and of thicker texture, while the teeth, where they exist, are very different.

ASPLENIUM FISSUM, *Kit.*

This is a very distinct fern, which is confined to the European continent. It has a small woody creeping caudex, covered with black scales, from which rise the tufted fronds. The stipes is slender, dark-brown and shining below, and green above; the fronds are from two to five inches in length, and about half as broad, oblong triangular in outline; they are three or four times pinnate, with spreading deeply pinnatifid pinnules, the ultimate segments of which are extremely narrow. The sori, although small, occupy when mature almost the entire of the under-surface of the frond; they are oblong, and of a reddish-brown colour. The extreme fineness of the divisions of the frond is sufficient to distinguish this from any other Asplenium.

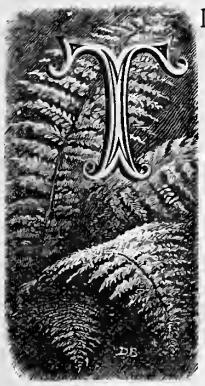
ASPLENIUM LEPIDUM.

This is a rare and local plant, occurring in alpine chalky situations at an elevation of from four to five thousand feet. Its most northern locality is the Island of Gothland; it occurs in several places in the Tyrol, and in Southern Germany, Dalmatia, Styria, Italy, Austria, Hungary, and Turkey.

Milde considers as distinct from this a plant which in the "Synopsis Filicum" is treated as a variety of it. This is *A. lepidum*, Presl, which is said to differ from *A. fissum* in the fimbriated (not crenate) indusium, and glandular (not dark-brown and smooth) stipes. This is a native of Sicily; it was said by Presl, its original describer, to have been collected in Bohemia, but some error may be suspected in this statement. In deference to Milde we have given this a separate place in our table;* but it seems scarcely entitled to specific rank.

* Introduction, p. 16.

ATHYRIUM.



THE genus *Athyrium*, which was established by Roth in 1800, is closely allied to *Asplenium*, and is indeed considered a section of it by many authors. The differences between the two are but slight, consisting chiefly in the shape of the indusium, which in the true *Asplenia* is straight or slightly curved, and attached to the upper side of the vein, while in *Athyrium* it is always more or less curved, being sometimes of the shape of a horse-shoe. There are between twenty and thirty species of *Athyrium*, distributed through different parts of the world, but for the most part natives of the Eastern hemisphere. They are all pretty plants, but none of them is more elegant and worthy of admiration than our common English Lady Fern. Among the more recent botanists who keep *Athyrium* as a distinct genus from *Asplenium*, Milde may be cited; and those interested in a more purely technical account of the differences between the two genera than it is our object to give in the present work cannot do better than consult the "Filices Europeæ" of this author (p. 48).

THE LADY FERN: ATHYRIUM FILIX-FŒMINA, *Roth.*

This is undoubtedly one of the most elegant as it is one of the most generally distributed and one of the most variable of European ferns. Few people who know British ferns ever so slightly are ignorant of this most graceful plant; and its claims to admiration have enlisted the sympathies of poets in a way which is unusual among the members of the fern tribe—for, as we have already said, there is a striking absence of any reference to ferns in the works of our poets. Sir Walter Scott (in "Waverley") may claim to have set the example of singing the charms of the Lady Fern; he did so in the well-known lines:—

> "Where the copse-wood is the greenest,
> Where the fountain glitters sheenest,
> Where the morning dew lies longest,—
> There the Lady Fern grows strongest."

It may be doubted whether other bards have been more successful than this in their allusions to the habits and localities of the Lady Fern; but they have expressed themselves at somewhat greater length.

But it is time that we should leave the realms of fancy for those of fact—that we should abandon the poetical consideration of the Lady Fern for some practical description of its distinguishing features. The subject cannot be said to be wanting in material, for, as if bent on affording an illustration of the not very gallant French proverb, "Femme souvent varie," the Lady Fern is one of the most variable of known ferns. Mr. Moore describes no fewer than sixty-six varieties (and the number has been since increased) as occurring in Britain; and we may form some idea of the length to which this sort of thing might be extended,

were ferns as fashionable in other countries as they are in our own, when we consider that *Athyrium Filix-fœmina* is a plant of a very wide geographical range, extending through both hemispheres, although absent from a good part of the old world. The extreme tendency of the plant to become what botanists term "monstrous" is one of its most striking peculiarities, and has rendered it very popular as a cultivated species. We shall refer farther on to some of the more remarkable of these "monstrous" forms.

If asked to say offhand how the Lady Fern might be most readily distinguished, it would probably not be misleading if we were to describe it as resembling a Male Fern, but with very finely divided pinnæ and a more delicate texture. No doubt it was this more delicate style of growth which caused Linnæus to apply the name *Filix-fœmina* to the species, in contrast to the more robust *Filix-mas;* but the original *Filix-fœmina* was not this plant, but the Bracken (*Pteris aquilina*). If we open any of the old herbals—Parkinson's, for example—we shall find the chapter headed "Filix foemina, the female Ferne" devoted mainly to the Bracken. Parkinson stated that it is this which "is generally by most authors called *Filix fœmina*," and he adds, "it is called in Italian *Felce fœmina*, and French, *Fougère femelle*." It is well to bear this in mind when referring to the earlier botanical authors, as the change of name is somewhat misleading.

The fronds of the Lady Fern spring from a large erect or ascending caudex, which often rises some inches above the ground; Mr. Newman says: "In one instance I have seen it more than a foot in height, thus exhibiting a considerable resemblance in habit to the tree ferns:" it is scaly at the top, and gives off many black fibrous, wiry roots. The fronds are of annual duration, appearing in May; they are at first circinate in vernation, but as they develope the top becomes free, and hangs down in a crosier-like fashion. The stipes is about a third or a quarter of the length of the whole frond; it is pale-green or dark-brown, or sometimes of a bright reddish-brown hue, when it forms a charming contrast with the delicate pale-green of the pinnæ; it is much swollen towards the base, and in its lower portion covered with dark narrow scales, which are more sparingly scattered on the upper portion. The fronds vary very much in shape and size, as well as in habit; in form they are generally lanceolate and regularly pinnate, varying a good deal in breadth; they are from one or two feet, or even more—we lately met with a record of a frond forty inches long—in height, and from six inches to a foot broad. The pinnæ are either alternate or opposite, sometimes very close together, especially in the upper portion of the frond, more distant in the lower portion. The pinnules are numerous, very close together, pinnatifid with toothed lobes, sometimes acute, the terminal pinnule being drawn out into a point, at other times obtuse. The latent veins are forked, the anterior branch of each bearing on its side a narrow cluster of sori, which are somewhat crescent-shaped or horseshoe-shaped, and it is upon this, as has been already said, that the claims of the genus mainly rest. This character being one of so much importance, we may be excused for quoting somewhat at length Mr. Moore's remarks upon it. He says: "The fructification of *Athyrium* will be found to consist of sori varying in form, and hence all parts of the frond should be thoroughly examined. Towards the extremities, that is to say near the apices of the pinnules or segments, the sori will generally be found to consist of short lines, in which the characteristic curve is very little or not at all apparent. Such sori are undoubtedly asplenioid, and indicate the actual relationship of the genus. Next to these occur others which Professor Mettenius calls hamate, and which in their less developed condition answer to the semi-lunate sori which have been generally ascribed to *Athyrium*. These curved or hamate sori are formed by the receptacle which

constantly occupies the anterior side of the vein, crossing at the upper end and returning more or less on the opposite or posterior side. When the receptacle only just crosses the vein, the result is that the back of the sorus becomes concave, and the slightly curved or semi-lunate sorus is produced. When it returns on the posterior side, to about one-fourth or one-half the length of the sorus on the anterior side, the hamate or hook-like sorus is formed. In addition to these forms of sori, in all the more divided forms of the species, others occur at the base of the segments, which are hippocrepiform or horseshoe-like in figure. These are produced by the receptacle becoming shortened and more completely returned, so that the portions on the anterior and posterior sides of the vein are nearly or quite equal. The occurrence of these hamate and hippocrepiform sori, more or less numerous, is abundantly distinctive, and absolutely separates *Athyrium* from *Asplenium*, by a manifest tendency towards the structure of the *Aspidieæ*, as represented in *Lastrea*."* So far as our British Aspleniums are concerned, the Lady Fern is sufficiently distinct in other than the technical characters presented by the sori; in the shape of the fronds, their delicate texture, which causes them to wither almost directly they are gathered, and their strictly annual duration, they differ from any species of Asplenium.

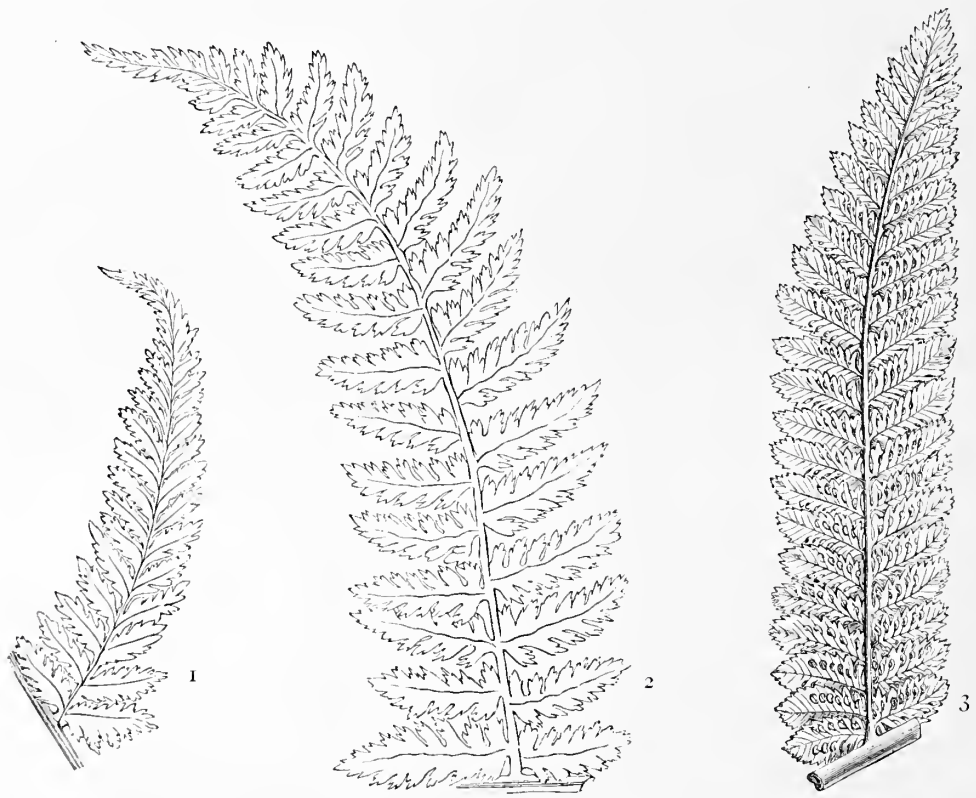
The geographical range of the Lady Fern is, as we have said, a wide one. It is found in nearly all the English and Scottish counties, and occurs also throughout Ireland, extending from the level of the sea to an elevation of about three thousand feet; in the last-named country, indeed, it is a common bog plant, and is employed in packing fruit and fish, in the same way as the Bracken is used in England. With us the Lady Fern is most at home in damp, shady woods; but it is a plant of varied habitat, and may be found either in the shady lane or upon the open hillside. It extends throughout the continent of Europe, from Lapland, Russia, and Scandinavia to Spain, Portugal, Italy, and Greece; it is found in Madeira, the Azores, and the Canary Islands; it occurs in Simla and in the Himalayas, at from ten or twelve thousand feet (*A. pectinatum*, Wall.); in the Neilgherries and at Ootacamund. In South Africa the Lady Fern is recorded from Natal, and in the north from Algeria; it is absent from Australia and Polynesia. In North America it is frequent, occurring in Labrador, Newfoundland, and New Brunswick, and throughout Canada to the Rocky Mountains, also in British Columbia; it is found throughout the United States, where it is very variable. In South America it is found in Venezuela and Caracas; and the island of Cuba is a tropical locality for the plant.

In a necessarily brief account of all the European ferns it would be impossible to attempt anything like a complete description of the forms of the Lady Fern; but we may draw attention to some of the more remarkable of them, beginning with those which have some more or less definite botanical characteristics apart from the "monstrosity" of the fronds, and then passing to those which owe their popularity to the singular malformations which they present. But we must admit that whether we study the plants in the living state, or pass through our hands a large series of herbarium specimens, it is far from easy to draw any very distinct line of demarcation between the forms, which pass one into the other almost imperceptibly, although extreme examples are distinct enough in appearance.

The variety *molle* has small ovate-lanceolate pinnate fronds; the pinnæ are also pinnate, with a winged midrib, the lower pair being distant from the rest; the pinnules are "flat, decurrent, united by wing of midrib, their margins toothed; the clusters of capsules are very

* "Nature-printed British Ferns" (8vo edition), vol. ii., p. 3.

distinct; there are five to seven pairs on a pinna."* With this may be combined two other varieties, *trifidum* and *ovatum* (or *dentatum*), also described by Mr. Newman; the first of these is about as large again as *molle;* the pinnules are not quite united by a wing of the midrib; they are also more deeply cut, and generally distinctly trifid at the apex; while the clusters of sori are smaller and even more remote than in *molle.* The variety *ovatum* is intermediate between *molle* and *trifidum*, resembling the former in size and habit, but the latter in the structure of the lobes. It is a stouter and more rigid plant than *molle*, and of a darker hue; our cuts will give perhaps a better idea of the differences between these closely allied forms



VARIETIES OF ATHYRIUM FILIX-FŒMINA.

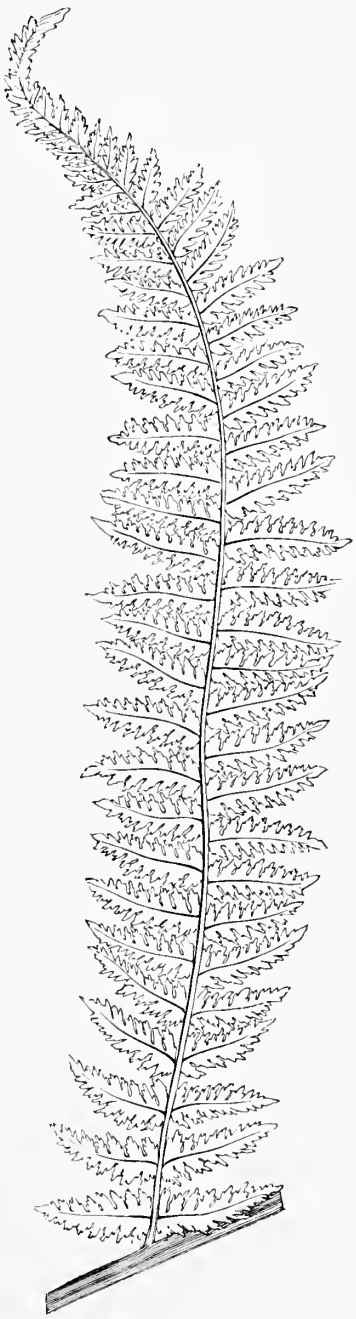
1. MOLLE. 2. TRIFIDUM. 3. OVATUM.

than a verbal description could convey. The variety *ovatum* seems to be identical with Mr. Moore's *latifolium;* Sir. W. J. Hooker refers to this as the most distinct looking of the forms "with the pinnules oval and broad subpetiolated and rather serrated than pinnatifid, the rachises of the pinnæ winged."† Mr. Moore describes and figures a variety *gracile*, with lax, slender fronds, the pinnæ being distant and drawn out into a long point at the apex, and the pinnules also distant; and a variety *dissectum*, the fronds of which, as the name would suggest, are very much cut. The variety *incisum* is one of the handsomest of the forms; Mr. Newman writes concerning it: "The fronds of this plant often attain a length of four and sometimes five feet, and a breadth of eighteen inches; its rhizoma grows to an immense size, and when perfectly undisturbed for many years, in a favourable situation, rises above the surface of the ground, and throws up a most striking and beautiful head of fronds, often

* Newman's "History of British Ferns" (1844), p. 242.

† "Species Filicum," vol. iii., p. 219.

thirty or forty in number."* The colour of the fronds is rather dull, as compared with that of *molle;* the pinnæ are very broad; the pinnules are distinct, sometimes pinnate, with flat diverging lobes. There are two forms of the Lady Fern, however, which demand rather more special attention than the foregoing. The first of these, variety *rhæticum*, is a very distinct plant, readily separated from the foregoing by the narrow lanceolate fronds and convex pinnules, in allusion to which Newman named it variety *convexum*. It is as well here to mention that there are two plants known by the name of *rhæticum*—one, that now under consideration; the other, a fern which we shall describe at length when we come to consider the genus *Polypodium*, where we shall refer to it under the name of *Polypodium alpestre*. The stipes of this form is often, though not invariably, of a bright reddish hue. It is of tufted habit, with upright, rigid-looking fronds, from two to four feet high, growing in exposed boggy places, and widely spread over the three kingdoms. "The pinnæ are distant, the lower ones most so, and these are also usually deflexed, though the majority have an upward or ascending tendency. The secondary rachides are slender, and without any herbareous wing, the pinnules being set as distinct from each other, and very commonly at a right angle with them; these pinnules are narrow, linear-lanceolate, becoming apparently linear, with the enlarged or prolonged interior basal lobe quite evident. This narrowed appearance results from the incurving of the points of the lobes into which the margin is divided, whence the pinnules become convex."† The sori are much crowded, and soon become confluent; the whole plant (except the rachis) is usually of a pale yellow-green, and is conspicuous by its hue on the bogs where it especially delights to grow.



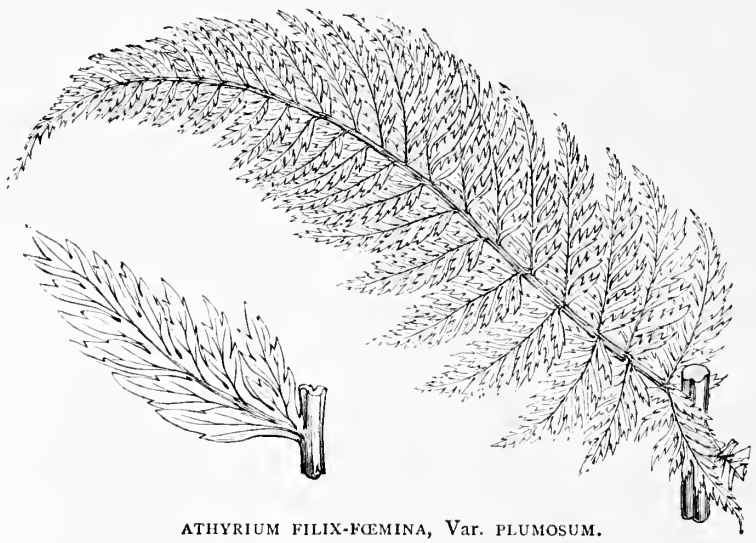
ATHYRIUM FILIX-FŒMINA, Var. INCISUM.

The variety *plumosum* is one of the most beautiful forms of the Lady Fern, and is not only the most elegant variety which has been discovered in England, but is also noteworthy on account of its peculiar fructification. Three plants of it were found in a wild state near Skipworth in Yorkshire, in 1857, and were placed in the hands of the Messrs. Stansfield of Todmorden, through whom it has come into cultivation. The fronds are two feet or more in height, and about ten inches in breadth; they are extremely delicate in texture, and of very beautiful bright green hue; the pinnules, which overlap each other, are divided to the rachis into distinct very narrow pinnules, and these again are divided into linear-toothed segments; this repeated division gives the whole frond a peculiarly light and feathery appearance, and renders the name *plumosum* extremely appropriate. The sori are very rarely produced, and

* "History of British Ferns," p. 243.

† Moore's "Nature-printed British Ferns" (8vo edition), p. 35.

are remarkable for the absence of indusia: this, of course, technically removes the plant from the genus *Athyrium*, and Mr. John Smith places it in *Phegopteris* on this account. He says: "Upon what grounds it was referred to *Aspleniæ* I cannot explain, as all the specimens I have examined of it have small punctiform naked sori, perfectly characteristic of the genus *Phegopteris*, with which it also agrees in habit. This leaves me no other alternative than to consider it a species of that genus, and consequently a new British species. In doing so, the question arises as to whether it represents an ancient species not before noticed, or the modern result arising from the power of nature to generate new forms, in accordance with the Darwinian theory of creation of species. It is, however, to be observed that in abnormal or difformed states of *Asplenium* and *Scolopendrium*, the sori are depauperated, in some instances having no vestige of an indusium; but such is not the case with this plant. The fronds are perfect in every respect, and if herbarium specimens had been received from some foreign country,



ATHYRIUM FILIX-FŒMINA, Var. PLUMOSUM.

no pteridologist, on seeing the naked sori, would refer it to *Aspleniæ*."* It is probable that the luxuriant development of the leafy portion of the frond accounts for the infrequency with which the sori are produced; when they do occur, however, they are fertile, and young plants have been raised from them, showing all the characteristics of the parent. This is one of the most beautiful hardy ferns in cultivation, and should find a place in every fernery.

Coming now to the "monstrous" forms of the Lady Fern, we shall find they present great variation in appearance, although it is difficult to systematise them, as there seems scarcely any limit to the number of odd and eccentric forms which they assume. We may, however, separate those which have simple fronds—branched, that is, only at the apex and at the end of the pinnæ—from those in which the fronds are distinctly branched. Whether science is in any way a gainer by the bestowal of names upon these almost countless forms is a matter open, we think, to question; Mr. Moore has so treated them, however, and his practical knowledge of the subject entitles his opinion to considerable weight. Among the unbranched forms we may notice the variety *multifidum*, the fronds of which

* "Ferns, British and Foreign," p. 289.

are normal, except that the apex of each pinnule is divided into numerous segments, thus possessing a tassel-like appearance. A less divided form attracted the attention of British botanists long since; it is figured by Plukenet in his "Phytographia" (1691), and was found by Sir Thomas Willoughby on Lichfield Minster. The variety *corymbiferum* is an exaggerated form of the foregoing; in this the terminal pinna is very much developed and divided into a large number of tassels, thus having a corymbose appearance, and resembling some-

ATHYRIUM FILIX-FŒMINA, Var. CRISPUM.

ATHYRIUM FILIX-FŒMINA, Var. MULTIFIDUM.

what in outline the well-known garden Cock's-comb, which is itself a monstrous state of *Celosia cristata.* Among the forms with distinctly branched fronds, two elegant dwarf plants may be noticed. The variety *crispum* is usually about six or eight inches long, having fronds which are branched in various ways, the apex of each pinna being tasselled; in appearance it resembles a tuft of fine curled parsley. The variety *acrocladon* much resembles this in habit, but the pinnæ, instead of being tasselled, are drawn out into slender points. It would be easy to extend our account of these and similar varieties, but enough has been said to indicate the direction which they take; their interest, too, is rather cultural than strictly botanical.

ATHYRIUM CRENATUM, *Ruprecht.*

This elegant fern resembles a *Cystopteris* rather than an *Athyrium* in habit, and has, indeed, been referred to the former genus, although it is properly an *Athyrium*. It differs from the Lady Fern in the shape of the fronds, which is triangular or deltoid, not lanceolate. *A. crenatum* has a creeping caudex, about as thick as one's finger, from which rise the erect stipites alternately at somewhat irregular intervals; these are from six inches to a foot in length, of a pale or tawny-brown hue, darker at the base, and clothed in its lower part with large brown pointed scales, the upper portion being smooth. The leafy portion of the frond is about equal to the stipes in length and of nearly the same breadth; it is membranous in texture, and three or four times pinnate with from seven to twelve pinnæ (of which the lowest are much the largest) on each side; the pinnules are narrow, and divided to the rachis into a few blunt segments. The fronds are somewhat hairy, though sometimes very slightly so, both below and above; the sori are small, fewer in number than in the Lady Fern, and either straight or curved—a variability which explains how it is that the plant has been placed in different genera by different authors; the indusium is pale-brown, and ciliate at the margin.

ATHYRIUM CRENATUM.

This is a fern of small geographical range. It occurs in various parts of Sweden, Norway, and Lapland, at altitudes of from six hundred to a thousand feet above the sea, and also in Amur-land, Dahuria, and Kamtschatka; it is also on record from Japan. It is a very pretty plant, of a beautiful light-green colour, and very distinct from its congener the Lady Fern in the triangular shape of the fronds; as we have already said, it resembles a *Cystopteris* in appearance, or, perhaps even more closely, the seedling form of the Bracken.

THE SCALE FERN.

CETERACH OFFICINARUM, *Willd.*

THERE are many ways in which a plant may become lost to a locality or to a country. We have already referred (p. 101) to an instance in which a species has apparently disappeared, and that quite recently, from the vegetable world; and it would not be difficult to cite others—for example, a species of Vetch (*Vicia Dennesiana*) which was discovered, by Mr. T. C. Hunt, in the island of S. Miguel, Azores, about 1845, and which shortly afterwards ceased to exist in that locality, owing to a landslip which destroyed the isolated spot on which it grew. The British botanist is justly indignant with the "mere collector," as he is called with well-deserved scorn, who will imperil the existence of a rare plant by collecting it in large quantities, in order that he may enrich his own herbarium by a judicious system of exchanging the plant in question for other species which he desires to possess. People of this class are fortunately becoming more and more uncommon as the real study of plants advances, and as a complete *hortus siccus* ceases to be the main ambition of the so-called botanist; but we are sure that all British botanists share in the feelings of alarm, of which we confess we are conscious, when we read that Professor ——— has taken a large class of students to the almost solitary habitat of some rare member of our flora. By drainage, again, we have been almost, if not altogether, deprived of some rarity which will only grow in boggy or marshy lands, and which flies before the approach of civilisation in the shape of drain-pipes. True, we gain plants from time to time; it is not losses alone that the student of our British wild flowers has to chronicle; the American Water-weed (*Anacharis Alsinastrum*), for instance—which the Cambridge undergraduates wickedly named *Babingtonia damnosa*, under the impression that it found its way into the Cam through the agency of the respected professor of botany at Cambridge—is as completely at home with us as if it had formed part of our flora since the time—

> "When Britain first, at Heaven's command,
> Arose from out the azure main;"

but one can hardly help regretting that, as civilisation and progress inevitably change the natural features of our country, so do they affect even our native fauna and flora.

It may fairly be asked, What has this to do with the Scale Fern, to which we ought at present to be directing our attention? There is more connection between the two subjects than at first meets the eye; much more than that between Tenterden steeple and the Goodwin Sands, which has passed into a proverb. In one of its localities, the Isle of Anglesey, the Scale Fern was, towards the close of the last century, in imminent danger of becoming extinct, and that in a way which was as remarkable as it was unusual. Indeed, we might safely assert that no one would ever guess the cause which threatened its extinction, or indeed would ever credit it, did it not rest upon unimpeachable authority; but the Rev. Hugh Davies,

in his "Welsh Botanology" (1813), tells us that upon the Holyhead mountain in Anglesea the Scale Fern had "become very scarce from being gathered for bait in rock-cod-fishing!" It must be admitted that this is an extraordinary use for a fern; but it is more intelligible than might be supposed. Gerard, in describing the plant, says that the leaves, "when they be withered, are folded up together like a scrole, and hairie without, much like to the rough beare-worme wherewith men baite their hookes to catch fish;" and it was to this, according to the same author, that the plant owed its old name of Scolopendria, "of the likenes that it hath with the beare-worme before remembered:" so that we may readily understand that this resemblance may have been noticed by the Anglesea fishermen, and turned to account in the manner above indicated.

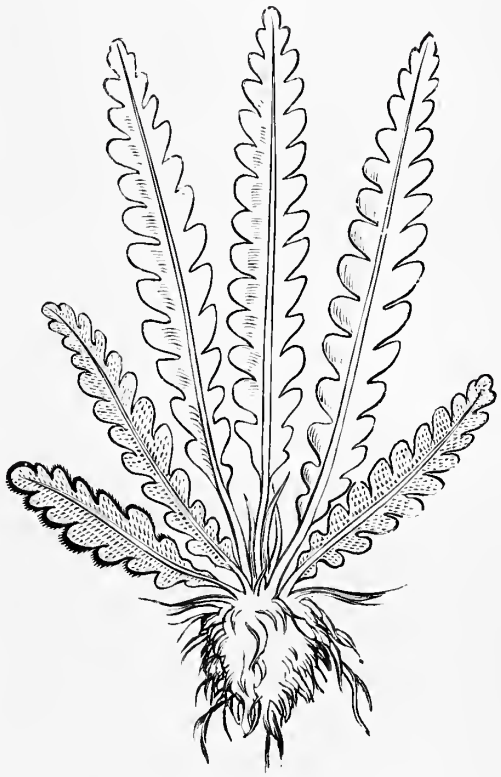
The old herbals contain a good deal of quaint matter concerning the Scale Fern, to some of which it may be interesting to direct attention. This was the original Spleenwort, although that name is now applied to the species of *Asplenium*, and it was so named on account of the curious effect it was believed to have upon the spleen. This belief may be traced a long way back; Vitruvius tells us that in the island of Crete, near the river Porterius, which flows between Gnosus and Cortyna, on the side towards Cortyna, the flocks and herds were found without spleens because they browsed on this herb, while on the other side, towards Gnosus they had spleens because it did not grow there. Bullein, in his "Book of Simples," says that "no herbe maie be compared therewith for his singular vertue to help the sickness or grief of the spleen;" and William Coles, in his "Adam in Eden" (1657), notes that "it is said that when asses are oppressed with melancholy, they eate thereof and so ease themselves of the swelling of the spleen." In the Anglo-Saxon Herbarium of Apuleius this fern is called Brownwort, and we there read of it: "For disease of spleen, take roots of this same wort, which . . . the Engle call Brownwort: pound it to small dust; give it to drink in lithe [soft] wine, therewith thou wilt observe a remarkable thing. Also it is said, that the wort was thus found, that is, it whilome happened that a man scraped intestines with the spleen upon this wort, then soon the spleen clave to this wort, and it quickly consumed the spleen, for which reason it is also designated as splenium by some men, which [spleen] in our language is called the milt. Hence it is said of the swine, which eat its roots, that they are found to be without spleen."* Du Bartas, as translated by Sylvester (1611), has the same idea in verse; he speaks of—

> "The Fingerferne, which being given to swine,
> It makes their milt to melt away in fine."

Dr. Prior thinks that the notion was probably suggested, on the "doctrine of signatures," by the lobular milt-like outline of the leaf.† Gerard, however, is rather severe in his remarks upon those who accept these marvellous stories; a fact which is a little odd, considering that the time-honoured fable of the vegetable origin of the Barnacle Goose owes its origin to his pages, and that the account of this marvellous occurrence is prefaced by the sentence: "What our eyes have seene and our hands have handled, we will declare." Gerard's criticism of the "empericks or blinde practitioners" runs as follows:—"There be empericks or blinde practitioners of this age who teach, that with this herbe not only the hardnesse and swelling of the spleene, but all infirmities of the liver also, may be effectuallie and in verie

* Cockayne's "Saxon Leechdoms," vol. i., p. 159.
† "Popular Names of British Plants" (3rd edition), p. 156.

short time removed, insomuch that the sodden liver of a beast is restored to his constitution againe, that is, made like to a rawe liver, if it be boiled againe with this herbe. But this is to be reckoned among the old wives fables, and that also which Dioscorides telleth of, touching the gathering of Spleenwoort in the night, and other most vaine things, which are founde heere and there scattered in the old writers' books, from which most of the later writers do not abstaine, who many times fill up their pages with lies and frivolous stories, and by so doing do not a little deceive yoong students." It is impossible to read these severe animadversions without being reminded of a certain proverb referring to the unsuitability of stone-throwing as an occupation for individuals whose abode is mainly composed of a certain transparent and brittle material; and it would be interesting to know, with regard to the Barnacle Goose, whether any explanation is forthcoming of the circumstances which induced Gerard to place on record his belief on ocular demonstration of so startling a phenomenon.



CETERACH (*from* TURNER'S "HERBAL").

There is a figure (which we here reproduce) and description of the Ceterach in William Turner's "Herbal" (1568); the latter is a good specimen of the quaint style of this old author, who has been called "the father of English botany," and we therefore extract it in full: "*Asplenum*, as Dioscorides writeth, is called also *Asplenium*, *Splenum*, and *Hemionium;* and though *Hemionites* be a farr other herb in Dioscorides than *Asplenum* is, and it is called of Asclepiades, in the nynth booke of Galenes worke of the composition of medecines after y^e^ places, *Hemionites*. Andromachus in the same boke gyveth the same names unto *Asplenum*. But Galene in y^e^ first boke of Simples, and the xii. chapter, semeth contrarye unto all these foure autentike autours, to make two diverse herbes of *Asplenum* and *Scolopendrium*, whilse he rehearseth these words: 'The greater diseases of the milte and liver require stronger herbes, that is to wit, the barkes of Capers, the rootes of Tamarisk, *Scolopendrion*, and Scilla, called Sea Onyon, and the herbe whiche representeth the same thing by his name, called *Asplenos*.' What a man should saye in this matter it is not very ready at hand unto al men, nether had it been redy unto me, if that I had not sene two kindes of *Asplenum*. Whilse I went by the Ryne [Rhine] syde, foure myles beneth Binge [Bingen], I chaunsed upon great plenty of *Asplenon*, and there dyd I se a herbe which had whyter leaves, deper indented, and sharper leaves than the other had: in so muche (as I remembre) it drew very nere unto the lykenes of a certayne kinde of a litle thistel, whiche is indented lyke *Asplenum*. This (as I suppose) was the herbe whiche Galene dyd separe [separate] from *Scolopendrion*. And yet is not *Scolopendrion* Hartes tonge, whiche agreeth nothinge nether in likenes nether in description with *Scolopendrion*. *Asplenos* groweth muche in Germanye in olde moiste walles and in rockes, it groweth also in England about Bristowe: it is named in Duche Steinfarn, in Frenche Ceterache, as the Potecarye call it. I have harde [heard] no

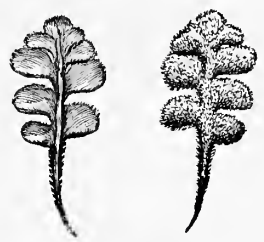
English name of this herbe, but it maye well be called in English Ceterache or Miltwaste, or Finger ferne, because it is no longer then a mannes finger; or Scale ferne, because it is all full of scales on the inner syde. *Asplenon* hath leaves lyke in figure unto *Scolopendra* y^e^ beste, which also called centipes, is not unlike a great and rough palmers worme. The leaves are some thinge lyke *Polipodium*, and are indented so that one indenting is not right over agaynst an other, but agaynst every division, cutting, or indenting, standeth a round halfe circle. The inner syde of y^e^ lefe is some thinge yelowe and rough, w^t^ small thinges lyke bran, or yelow scales, which w^t^ a light occasion fal of; y^e^ outer syde is grene: it hath nether flowre nor sede. If this description can not evidently ynough declare unto you *Asplenon*, take a braunche of *Polipodium*, and take a finger length of y^e^ middes of it, the nether ende, and the high ende cut awaye, cut of both the sydes, the toppes, and the leves awaye, and make then the remain round, and then shall ye se the very forme of *Asplenon*."

The word *Ceterach* is a form of Chetherak, the Arabic and Persian name for the plant. A few other of our plant-names are derived from Eastern languages, and some of these have even become anglicised. Barberry is a familiar instance of this; the mediæval name for the plant was *Berberis* (which is still retained as its scientific title), and this came from the Arabic *barbaris*. Barberries are said by some writers to have been introduced by the Arab into European medical practice, although the shrub which bears them is common enough in most parts of Europe; they were employed in fevers by the Egyptian practitioners. Our Scale Fern has one or two very characteristic English names—"Rusty Back," for example, which has so obviously been suggested by the brown back of the fronds as to need no further explanation; and "Brown-back," a Devonshire name for it, also speaks for itself. Its other English names—Scale Fern, Finger Fern, Miltwaste, and Spleenwort—have been already referred to.

The Scale Fern is so very different in appearance from any other fern, not only among the natives of Europe, but even including the ferns of the whole world, that a description of it seems almost unnecessary. It has a short tufted caudex, covered with dark brown scales, and giving off numerous short fibrous roots. The stipes is short, of a dark hue at the base, and covered with pale-brown pointed scales; the numerous, usually erect fronds are from an inch to half a foot or even more in length, and about an inch in breadth in the middle, their widest part; they are linear in shape, and pinnately divided into rounded segments, tapering towards the base and apex, which are sometimes entire and at others lobed. When young, before unfolding, the young fronds are nearly white on the under-surface; later on they become of a very beautiful rich green above, and brown beneath. This brown hue is due to the presence of very numerous brown scales, which lie closely one over the other, and when looked at under the microscope are seen to be very beautifully netted. The fructification covers the whole of the under-surface, although the dense scaly covering renders it comparatively inconspicuous. The sori, however, although at first concealed by the scales, ultimately make their way through; they are borne upon the lateral veins. The indusium is so very minute as to be almost imperceptible—indeed, some botanists have asserted that it is altogether absent. Those who detect it find it in the form of a slightly-elevated membranous ridge, which disappears when the frond is approaching its full development. The dense covering of scales is probably sufficient protection for the sori, and hence the indusium is suppressed. Those who look upon this organ as absent regard the Scale Fern as a *Gymnogramme*—in which genus the sori

are quite devoid of an indusium—and call it *Gymnogramme Ceterach;* but the affinity of the plant is undoubtedly with *Asplenium* rather than with *Gymnogramme.*

The Scale Fern is a plant which varies very much in size. We sometimes find it in old walls, where it escapes any except the minutest scrutiny, not only because the fronds are only an inch or even less in length, but because they lurk in the cracks between the stones or bricks of which the wall is composed, and so hide themselves from the passer-by. Within the last two or three years we have seen specimens brought from a place in the suburbs of London on the Middlesex side of the river—we purposely abstain from indicating the locality more particularly—which answered to the above description, where it had previously escaped the notice of the investigators of the flora of that county; and some years since we were enabled to add the same fern to the list of Buckinghamshire plants, having been fortunate enough to detect diminutive examples upon a wall near West Wycombe in that county. The accompanying cut of a specimen from the Middlesex locality will show how easily the plant might be overlooked. The distribution of the Scale Fern in Britain is rather wide; it is found in all or nearly all the southern, northern, and western counties, but is comparatively unfrequent in the eastern and midland counties. Its home would seem to be in the west; it is there that it attains the greatest luxuriance and is found in the richest profusion; in Somersetshire and Devonshire it is especially abundant, growing both upon rocks and upon walls. In Scotland it is much less frequent; the counties of Dumfries, Kirkcudbright, Ayr, Renfrew, Perth, and Argyle, with (more or less doubtfully) Lanark and Berwick, are recorded as producing it. In Ireland it is frequent, though local, on calcareous rocks and walls; in the west and south, especially the former, it is very abundant, forming a striking feature in the walls so richly covered with vegetation which seem characteristic of many parts of Ireland—as in the county Waterford and in Galway. The flora of one of these walls would, if catalogued, be found to be rather extensive, and the more important of the plants composing it contrast admirably with each other—such as the Wall Rue and English Maidenhair (*Asplenium Trichomanes*) with the fern we are now considering and the thick round glossy leaves of the Wall Pennywort (*Cotyledon Umbilicus*), while spreading over all is the elegant tracery of the Herb Robert, with its bright pink flowers, fresh green leaves, and red stems.



SMALL FRONDS OF CETERACH.

On the continent of Europe the Scale Fern is a plant of wide distribution. It is absent from Scandinavia, Northern Russia, Bohemia, and Austria, but is found in many parts of Germany, in Switzerland, the Tyrol, Hungary, Dalmatia, Greece, Italy, Belgium, France, and Spain. It also extends eastward to the Caucasus (it is absent from Siberia), Persia, and Palestine, and to North-Western India, being found in Afghanistan, Kashmir, and Tibet at an elevation of from six to eight thousand feet. On the African continent it seems to be confined to the extreme north (Algeria) and the extreme south (Cape of Good Hope); it is also found in Madeira, the Canaries, and the Cape Verd Islands. It seems to be absent from the New World, although it has been recorded from Brazil.

The Scale Fern is remarkably free from variation: the principal variety is *crenatum,* which is a larger plant than the common form, and has the margins of the lobes of the fronds distinctly crenate, or broadly toothed. Mr. Moore also mentions a variety *ramosum,* which has the fronds branched at the apex. The crenate variety is not very uncommon, especially in Ireland, from which country is likewise recorded a form in which the pinnules are notched and also overlapping.

A more distinct form is that which has been described as a species under the name of *Ceterach aureum*—a plant which, although usually regarded as a form of *C. officinarum*, is still retained as distinct by Milde. It differs from the type in its large fronds, which are a foot or more in length, and by the toothed scales. It is an extremely handsome plant, and is peculiar to the Canaries, where it is found almost exclusively in the region of the laurel woods, descending sometimes in the hotter valleys. It prefers to grow in the rich black soil under tall trees, although it is also found upon damp shady rocks.

The Ceterach is not a difficult plant to grow, if it be planted in rough porous soil; it likes to be kept moderately dry, and does well in pots or on rockwork, if not in too damp a situation. So distinct and handsome a plant should find a place in every collection of ferns; and if we cannot endorse the high estimate formed by our ancestors of its remedial properties, we may recommend it from another point of view, as being one of the most striking and interesting of European Ferns.

SCOLOPENDRIUM.

WE have here a small and very distinct genus, even if we understand it in the extended form proposed by Sir William J. Hooker, who includes in it the curious "Walking Fern," usually known as *Camptosorus rhizophyllus*, to which we referred at p. 65, where a figure of the plant will be found. Even on this estimate it contains only nine species, but these are widely distributed, so that the genus is represented in most parts of the globe. Besides the two European species, which we shall have to describe more at length, there is an eastern one, *S. pinnatum*, from the Philippines, which has large fronds from two to four feet long, which, as the name implies, are often (though not always) pinnate, with an entire terminal pinna, and from one to six pairs of lateral ones. Two are Brazilian, one, *S. Douglasii*, being a beautiful plant with fronds sometimes ten inches long and nearly half as broad, sometimes much resembling a large poplar leaf; one is a native of Ualan and another of Mexico, and the two species of *Camptosorus* (see p. 65) belong one to Kamtschatka and the other to the United States.

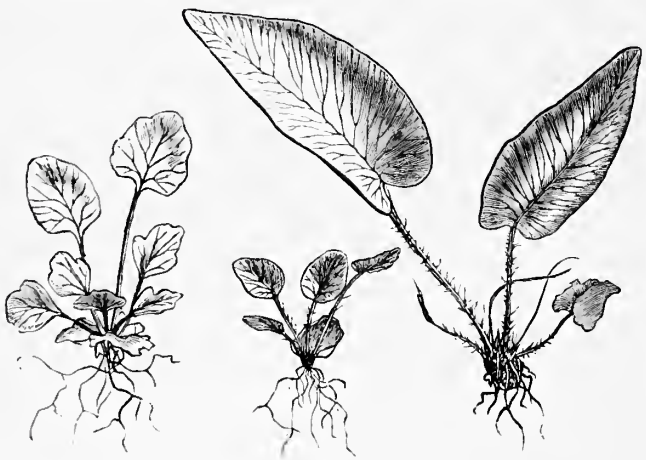
With the exception of *S. Hemionitis*, one of the two European species, which has lately been found in Algiers, the genus is not represented on the continent of Africa, while in Asia no species is recorded from India or China.

THE HART'S-TONGUE: SCOLOPENDRIUM VULGARE, *Sym.*

The common Hart's-tongue, although more abundant in some districts than in others, is one of the most generally distributed of British ferns; it is also one of the most variable, although in all its forms it is easily recognised. It is found in a variety of habitats, preferring those where it is exposed to abundance of moisture: thus it is often found fringing the mouth of an old well, its cool, green fronds hanging down for some distance. Occasionally, however, it chooses a very opposite situation, and small, stunted plants may be found in the cracks of an old stone-wall, seeming far from comfortable in their restricted abode. It is one of the easiest of ferns to cultivate, requiring no attention, and soon becoming an object of much beauty. The roots are black and long, and the rhizome is roundish, tufted, and sub-erect; the fronds are very variable in shape and size, but in a normal state are from a foot to a foot and a half in length, distinctly heart-shaped at the base, tapering into a point at the apex: when they first unroll in April or May they are of a bright light-green, and quite erect, but when quite uncurled they gradually assume a horizontal position, and ultimately hang down, if in a situation where this is possible. The venation of the fronds is very characteristic: from the prominent rachis or midrib, which runs down the centre of the frond, forked veins proceed, which are again divided into venules, and these are once or twice forked. The development of the sori is worth notice: in the mature plant they appear in the form of dark-brown lines on the back of the frond, and each line seems, at first sight, to consist of one sorus only; but closer examination and some attention to the growth of the plant shows that each line is really composed of two rows of sori, one row being attached to the outermost venules of each vein. The

uppermost venule of one vein is so close to the innermost one of its neighbour that the two indusia which are attached to the upper and lower sides of the venules respectively at first touch, and seem united into one. After a little time a line is seen between them, showing that the sori are really distinct; and at length the indusia are completely pushed back in opposite directions, and covered with the masses of brown sporangia. When the fronds are first unrolled, the sori appear only as slight greenish-white swellings, but they rapidly develope; their form has suggested the not inappropriate name of "Buttonholes," by which the plant is known in some parts of Sussex.

The stipes of the Hart's-tongue is short, one or two inches in length, of a dark colour below, which extends some way along the back of the rachis, and covered, especially at the base, with long, light-brown hairs or scales, which are very easily rubbed off. These hairs often extend in young plants along the whole of the rachis to the very apex; the fronds are sometimes hairy, at other times quite smooth, the older specimens being usually destitute of hairs. The mature fronds do not wither until those of the ensuing year are expanded, although in their darker hue and the withering of their tips they give indications of approaching decay. The fronds even when young have a curiously waved appearance, somewhat resembling that of some of the seaweeds belonging to the genus *Laminaria;* and this peculiarity has gained for the plant in some places the name of the "Seaweed Fern." In their seedling state the fronds are of a thin, almost transparent, texture, and waved at the margins; the accompanying figures show the plant in one or two of its earlier stages.



SEEDLINGS OF HART'S-TONGUE.

As we have already remarked, the Hart's-tongue is widely distributed in England; it is, indeed, recorded for all the counties, except those—principally Welsh—the flora of which is imperfectly known. In Scotland it is, perhaps, less frequent; while in Ireland it is very common. Its relative abundance in various districts is, however, very different; in many localities, although not altogether unknown, it is quite a rare plant; while in others we meet with it at every turn, and come to consider it as one of the commonest of plants. This is notably the case in some parts of the Isle of Wight, where it grows in the greatest luxuriance and profusion; the long glossy fronds hanging down from the hedge-banks, and in places completely covering them. On old walls it sometimes attains a good size, especially in damp localities; but it is usually a small and inconspicuous plant under such circumstances. It is somewhat remarkable as possessing a few genuine English names, an occurrence, as we have before observed, somewhat rare among ferns; one or two of these we have already named. In the county of Westmeath it is known as "Burntweed," on account of its being employed there as a remedy for burns; in the island of Guernsey it is called by the singular name of "Christ's Hair," the allusion being to the single, black fibrovascular bundle in the stipes. In some parts of Hampshire it has the very suitable name of "Longleaf," and it was the shape of the leaf that suggested the old Latin name,

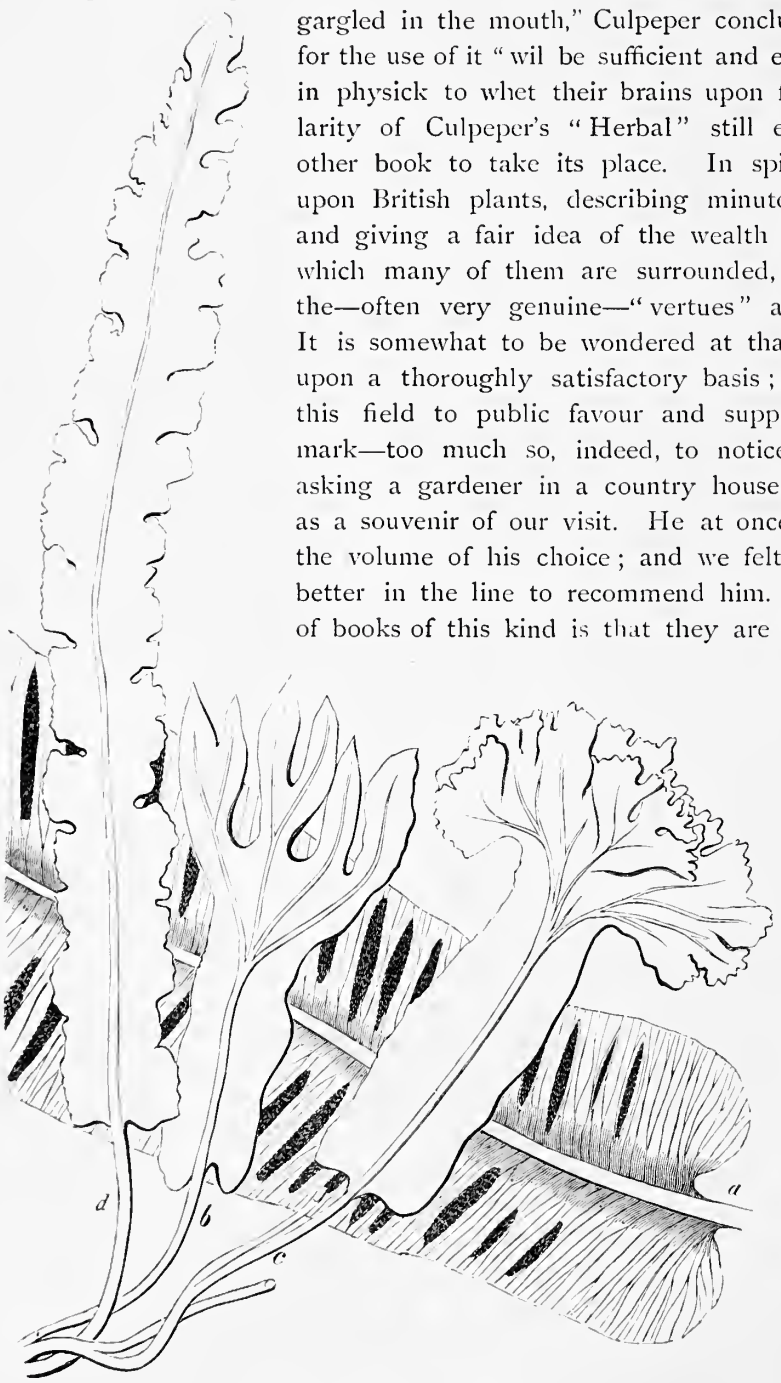
Lingua cervina, of which our English Hart's-tongue is merely an equivalent. This name occurs in the Grete Herbal, and in all subsequent authors, and is still the general name for the fern. Turner, in his "Libellus" (1538), speaks of a variety which was called Hind's-tongue in his day in Northumberland. His words are: "Vulgus cervinum linguam vocat Hert's tonge. Vidi et herbam cum agerem Northumbriæ, quam vulgus appellabat Hyndes tonge, et vulgus contendebat non esse Hertes tongue, erat enim minor et rectior." Gerard gives the above derivation of the name; he speaks of the form of the fronds as "resembling in shew a long toong, wherof it hath beene and is called in the shops *lingua cervina*, that is, Hart's toong." In Dorsetshire it is called "Horse-tongue," and in Somerset "Lamb-tongue" or "Lamb's-tongue." It is thought to be the plant of which Pliny says: "There is a herb called *lingua* which grows in the neighbourhood of fountains;" and certainly both name and habitat fit the *Scolopendrium* very well. *Langue de bœuf* and *langue de cerf* are among its French names, and it has similar synonyms in Italian and German.

As the specific name *officinale* implies, the Hart's-tongue was formerly credited with numerous "vertues." Indeed, it is still used locally, as in the Isle of Wight, where the fresh leaves are applied externally to erysipelatous eruptions on the legs as a cooling remedy. It is not wonderful that a plant which has an appearance so essentially suggestive of coolness should be employed in this manner. In France it is used in an infusion with milk, the slight but pleasant odour which the fronds exhale communicating itself to the infusion; and it also enters into the composition of a quack remedy known as the "Vulnéraire suisse." Its healing properties have, indeed, been celebrated by many authors; Ray speaks of it as cleansing wounds and ulcers;* and Lightfoot says it was used in his time by the country people in Scotland, who applied it to burns and scalds. We have already alluded to its name of "Burntweed," which finds its explanation in the above statements; and this use of the Hart's-tongue seems to have been very widely distributed. In the "Phytologist"† there is the following reference to the employment of the Hart's-tongue in Wales in similar cases. Speaking of the death of Lady Greenly, of Titley Court, Herefordshire, we read that she had paid great attention to the use of herbs in medicine, and that this, among others, entered into the composition of her pharmacopeia: "She used to cultivate a variety of herbs, and administered medicine to all those who needed it in her neighbourhood. Amongst the plants for which she evinced a particular regard was that called in Wales, Dail llosg y Tân: it is a species of evergreen fern, indigenous to Gwent and Morganwg; and Lady Greenly having ascertained from her excursions among the Welsh peasantry that it was (as its name denotes) of value as a remedy for burns, she took pains to make it grow in Herefordshire, and succeeded in getting it to flourish round her favourite well at Titley." It was at the time of its principal repute as a remedial agent reckoned as one of the five "capillary herbs," the remaining four being the Common Polypody (*Polypodium vulgare*), the Maidenhair (*Adiantum Capillus-veneris*), the Spleenwort (*Asplenium Trichomanes* or *A. Adiantum-nigrum*), and the Wall Rue (*A. Ruta-muraria*). Culpeper says—we quote from an early edition (1653), which is much more quaint and original than many of the more recent editions of this ever popular "herbalist":—"Jupiter claims dominion over this herb, therefore [it] is a singular remedy for the liver, both to strengthen it when weak, and ease it when 'tis afflicted, 'tis no matter by what: you should do wel to keep it in a sympal the yeer, for though authors say 'tis green al the yeer, I scarce beleev it." After enumerating various complaints in which it might profitably be employed, and telling us that

* "Synopsis" (3rd edition), p. 117.

† Vol. i., p. 521 (1844).

"the distilled water therof is very good against the passions of the heart, and to stay the hiccough, to help the falling of the pallat, and stay the bleeding of the gums, being gargled in the mouth," Culpeper concludes by saying that his directions for the use of it "wil be sufficient and enough for those that are studious in physick to whet their brains upon for one yeer or two." The popularity of Culpeper's "Herbal" still endures, and, indeed, there is no other book to take its place. In spite of the vast number of works upon British plants, describing minutely their botanical characteristics, and giving a fair idea of the wealth of tradition and association by which many of them are surrounded, there is no volume setting forth the—often very genuine—"vertues" and uses of our common plants. It is somewhat to be wondered at that no one has taken this in hand upon a thoroughly satisfactory basis; as it is, the only claimants in this field to public favour and support being ridiculously below the mark—too much so, indeed, to notice here. Not long ago we were asking a gardener in a country house what book we should send him as a souvenir of our visit. He at once named "Culpeper's Herbal" as the volume of his choice; and we felt reluctantly that we had nothing better in the line to recommend him. The most objectionable feature of books of this kind is that they are almost invariably mere *réchauffés* of previous works: there is no attempt to bring them up to date, or to include in them the well-authenticated cases of cures worked by means of common English plants—such, for example, as those which we have alluded to in our Introduction (p. xxvi.). If a herbal could be produced which should include only such common plants as had been proved to possess remedial properties, it would be hailed as a boon by many a dweller in the country, and would undoubtedly contain much information that even the regular practitioner need not despise.



SCOLOPENDRIUM VULGARE.

(*a*) NORMAL FROND, SHOWING VENATION AND SORI. (*b*) VARIETY MULTIFIDUM. (*c*) VARIETY RAMOSUM. (*d*) VARIETY POLYSCHIDES.

Having quoted somewhat at length the useful qualities of the Hart's-tongue, it may be well to devote a line or two to an account of the way in which it was formerly prepared. In the first place—we take for our guide William Langham, whose "Garden of Health" we have before had occasion to quote—the plant "must be gotten

earely or late, when neither the sunne nor moone doe shine on it." There are many ways in which Hart's-tongue was prescribed to be used, one of the simplest being "eate the herb," a form of cure which is recommended in "jaundise and griefes of the liver." It seems to have been very much used in the form of powder; one prescription (for "milt griefes") advises us to "make powder of it, and of the lungs of a foxe, maces, and sugar-candy, and drink thereof with wine or ale;" while in the case of "liver griefes" we are to "seethe it with fumiterre, and liverwort, of each one handful in clarified whey, and drink thereof first and last, especially in May, with a little rubarbe or chamepiteos." There are other similar remedies in which the powder figures as an important item, but it is unnecessary to multiply them. A conserve was also made of the green fronds, which was employed in cases similar to those above cited.

The Hart's-tongue is a fern of somewhat wide geographical distribution. It occurs throughout Europe, on shady banks or walls, or in woods, mostly in moist situations, from Scandinavia to Italy, Greece, and Spain. It occurs, though sparingly, in Madeira and the Azores, and also in North Africa (Algiers). In Asia it is represented in the region of the Caucasus, Asia Minor, and Japan, but does not appear in India or China, or in Australia; it is found in Mexico, and in the State of New York, as well as in Canada West.

We have said that the fern now under consideration is a very variable plant; this will at once become apparent when we say that Mr. Moore describes at length no less than a hundred and fifty-five varieties, and that this long list has been added to since his work was published. It would obviously be impossible, even if it were desirable, that we should give even an enumeration of these in the space at our disposal; those especially interested in them must consult the "Nature-printed Ferns" (octavo edition), pp. 148-197. Mr. Moore says truly enough that "a collection of Scolopendriums alone might be made sufficiently extensive to engage the interest of many an amateur cultivator, and yet thoroughly free from anything like monotony of character, though originating from one which in its normal state is the most simple among British ferns." The varieties may be classed under two heads—one containing the plants in which the normal strap-shaped form of the frond is preserved; the other including those in which the fronds are branched, or at any rate much divided at the apex. As types of these latter, we may take the varieties *multifidum* and *ramosum*, the former of which is many times forked near the apex, the divisions being curled and variously cut, the stipes being undivided; and the latter having a branched stipes with short irregular dense fronds, which are closely divided and curled at the apex. This is an old and not very common variety, which is sometimes met with in a wild state; it is quite constant in cultivation, reproducing itself from spores. It has been known for a very long time, as the accompanying figure, reproduced from Gerard, will show. His description of it is brief but sufficient, and it is interesting to notice that even as early as this period (1597) the variety was in cultivation. "The kinde of ferne called *Phyllitis multifida*, or *Laciniata*, that is iagged Hart's toong, is very like unto the former, saving that the leaves thereof are cut or iagged like a man's hand, or the palme and brow antles of a deare, bearing neither stalke, flower, nor seede. . . . [This] I founde in the garden of Master Cranwich, a chirurgion dwelling at Much-Dunmow, in Essex, who gave me a plant for my garden. It groweth upon Ingleborough hills, and divers other mountaines of the north of England." The variety *multifidum* is not unfrequently met with, forms with fronds more or less divided at the apex being not uncommon, even in a wild state. In the variety *polyschides* the fronds are undivided, but the margins are very deeply

and irregularly cut; this has been known since the time of Ray, and is constant in cultivation. It has been stated that the spores produced on the normal portions of these monstrous fronds produce normal plants, while those from the multifid or branched portions produce plants similarly multifid or branched; but we are not aware whether this has been thoroughly established. The variety *polyschides* is often very proliferous, the fronds producing little bulbils, by means of which the plant is increased. Some of the forms may be artificially propagated in this manner. If the plants be placed in a warm pit, near the glass, for some weeks, and then taken to a similar position in the coolest end of the propagating-house, they will soon produce small bulbils upon the margins of nearly every mature frond; these may be removed and planted out in small pans, and will be ready for transplanting into store-pots in about three months.

BRANCHED VARIETY OF HART'S-TONGUE.
(*From Gerard's Herbal.*)

Gerard describes what seems to be a small barren form of the plant in the following words: "There is a kind of ferne, called *Hemionitis sterilis*, which is a very small and base herbe, not above a finger high, having fower or five small leaves of the same substance and colour, spotted on the backe part, and in taste like Hart's toong; but the leaves beare the shape of them of *Totabona*, or Good Henrie, which many of our apothecaries do abusively take for Mercurie: the rootes are very smooth, blacke, and threddie, bearing neither stalke, flower, nor seede: this plant my very good friende Master Nicholas Belson founde in a gravellie lane in the way leading to Oxey Parke, neere unto Watforde, fifteene miles from London: it groweth likewise on the stone walles of Hampton Court, in the garden of Master Huggens, keeper of the saide house or pallace."

There is no difficulty in growing the Hart's-tongue; it will succeed in almost any situation, and increases very readily by spores. We recently heard of a locality in which this fern did not exist in a wild state, and the owner of a garden introduced some examples of it. In a very short time the Hart's-tongue had not only settled itself independently in various parts of the garden, but had passed beyond its boundaries, and established itself in a neighbouring lane. Mr. Moore tells us that the varieties may be increased by cuttings of the succulent bases of the fronds. "The fleshy bases of the stipes, which are the parts made use of, remain alive long after the fronds have decayed; these are cut asunder with a sharp knife, retaining a portion of the rind of the caudex, and planted like root-cuttings in a slight warmth, and under these conditions they soon organise buds from the cut edges, and so form young plants."

SCOLOPENDRIUM VULGARE SCOLOPENDRIUM HEMIONITIS

1/3 NAT SIZE

The Hart's-tongue offers us another example of a fern producing sori upon the upper as well as the under surface of the fronds, one case of which we mentioned as occurring in *Asplenium Trichomanes* (see p. 95). This happens, not only when by an elongation of the normal sorus on the under-side this is extended to the margin, and beyond it to the upper side, but the sori are sometimes produced on the upper side within the margin, when there are no corresponding ones beneath.

SCOLOPENDRIUM HEMIONITIS, *L.*

This is the plant to which we referred when speaking of *Asplenium Hemionitis* (p. 86), and any one who will take the trouble to compare the figure of that plant on p. 88 with that of *Scolopendrium Hemionitis* in our plate will at once understand how close is the resemblance between them. The cut given at p. 85 of a small portion of the frond of each of the two species shows clearly enough the technical differences between them. *Scolopendrium Hemionitis* is a fern of very limited geographical range. Until comparatively recent times it was supposed to be peculiar to the South of Europe, but it has been found in Northern Africa (Algiers and Marocco), in Asia Minor (near Aintab), and also in Syria. In Europe it is found in Central France, Spain and Portugal, Italy, Greece, and the Mediterranean islands, often, however, only in small quantity.

SCOLOPENDRIUM HYBRIDUM.

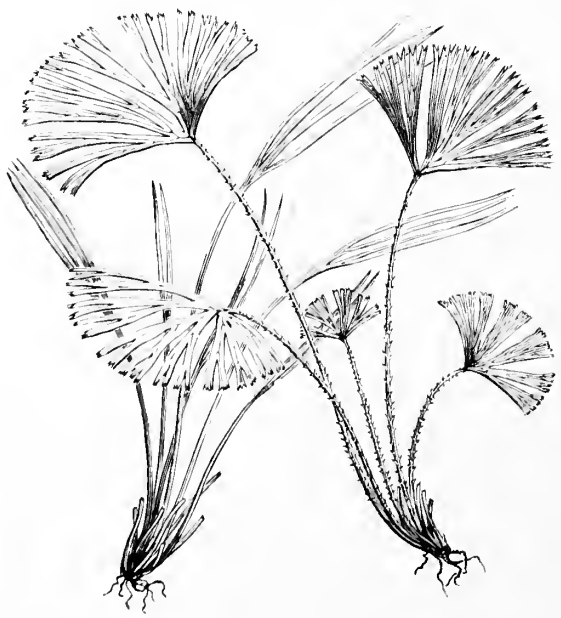
This is a variable plant, both in size and in general appearance. The stipes is sometimes smooth and without scales, at others, and more frequently, densely covered with them; it is sometimes very short, at others longer than the frond itself. The fronds are tufted, springing from a short scaly caudex; they are from four to six inches in length, somewhat broadly spear-shaped in general outline, the lobes at the base (from two to four in number) obtusely or somewhat sharply angled, or even rounded, sometimes very prominent, at others less noticeable; the texture of the frond is finer than in the common Hart's-tongue. The veins are all free, but more branched than in *S. vulgare*, and the sori are usually shorter and distant, rarely contiguous.

Milde describes, under the name of *Scolopendrium hybridum*, a very interesting plant which he considers a hybrid between *S. Hemionitis* (or *S. vulgare*) and *Ceterach officinarum*. Only one example of this seems to have been found, and that was on an old wall of a vineyard near Porto Zigale in the island of Lossin. Milde figures this specimen, and our woodcut is based upon his representation. This author says that at first sight the plant would be taken for a monstrous form of the Ceterach, but it is very different from this; the fronds are almost entirely

naked below, and are thus very unlike the densely scaly fronds of the Ceterach ; they are heart-shaped at the base, and elongated at the apex, as is the case with the common Hart's-tongue.

We have already had occasion, when speaking of the Aspleniums, to refer to cases of hybridity among ferns. It is usually between species of the same genus that hybrids are formed, but instances are not wanting where the parents of the hybrid belong to different genera, as in the present instance. Another example is offered by the North American fern *Asplenium ebenoides*, which is believed to be a hybrid between a species of Asplenium (*A. ebeneum*) and the "Walking Leaf" (*Camptosorus rhizophyllus*).

An extremely pretty and distinct little fern seems to demand a word of notice here. It is not a native of Europe, and thus, strictly speaking, has no claims to be referred to ; but it is one which is so frequently represented in collections of eastern plants that we feel that it deserves a word in passing. This is *Actiniopteris radiata*, a plant which is at once recognised on account of the resemblance of its fronds to the foliage of a palm-tree of the genus *Chamærops*. There is only one species of the genus, and our figure will give a better idea of the habit and general appearance of the plant than could be conveyed by a verbal description. The technical peculiarities of the genus, according to Mr. Moore, "consist in the simple distinct indusia, free veins, and linear elongate sori, which are marginal on the contracted rachiform segments of the small flabelliform fronds." The *Actiniopteris* grows from three to six inches high, the segments of the fan-shaped fronds being very narrow, divided about half-way down, and of a pale-green colour. It is rather widely distributed, being found in Tropical Asia and Tropical Africa ; it is recorded for Northern and Southern India, and occurs in Arabia and Upper Egypt, at the Cape, and in the Mascarene islands. It will succeed well if planted in fibrous peat and sand with small blocks of sandstone interspersed ; and deserves to be more frequently met with in cultivation than is at present the case.



ACTINIOPTERIS RADIATA.

THE SHIELD FERNS.

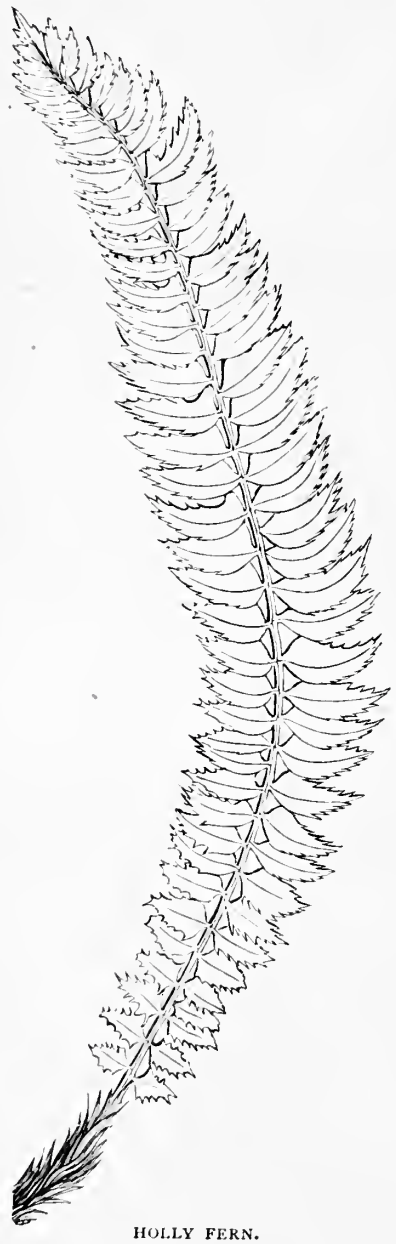
POLYSTICHUM.

WE have here a genus of ferns, the European members of which, taken as a whole, are sufficiently distinct from any other group, although it is not always easy to discriminate them from each other. It is often the case that plants which are generically very distinct and easily recognisable are extremely close in their specific relations; and, as we shall see later on, it is certainly so in the present instance. The genus *Polystichum* contains about fifty species, all of which have all the veins of the pinnules free; its peculiar characteristics, according to Mr. Moore, "consist in the punctiform sori being dorsal in the free veins, and covered by circular peltate indusia." They are almost all of them characterised by their rigid texture, which gives them a very distinct appearance: and, in the European species, by the spiny teeth with which the pinnules are bordered. They are distributed throughout the world, both in the tropical and temperate regions. None of them seem to call for any particular remark, unless perhaps *P. munitum*, a North American species, which deserves notice on account of its economic properties. The North American traveller, David Douglas, tells us that the fronds of this species are used as garlands by the Indians, and that the rhizomes form an article of food among them, being cooked and eaten. The name *Polystichum* signifies many-ordered, and was given in allusion to the numerous rows of sori which are regularly distributed over the fronds.

THE HOLLY FERN: POLYSTICHUM LONCHITIS, *Roth.*

This is one of our rarer British ferns, and one which is very liable to be falsely recorded, on account of the resemblance which a variety of *P. aculeatum*, known as *P. lobatum*, bears to it. It is, indeed, a trap for the unwary youthful botanist, and one which, in our younger days, we admit having been extremely near falling into, the superficial likeness between it and the true Holly Fern being very great. Those who have not seen the true *Lonchitis* are to be excused for such a mistake; the likeness when *lobatum* and *Lonchitis* are placed side by side is, however, not very striking. A knowledge of the distribution of the Holly Fern in England may assist in preventing mistakes; it is quite a northern plant, its most southern locality being in West Yorkshire and Carnarvonshire: it has been recorded for Glamorgan, but doubtfully. Of course this by no means implies that the species will certainly not occur farther south, but there is a very strong antecedent probability that any fern suggesting *P. Lonchitis* at the first glance will prove on investigation to be one of the forms of *P. aculeatum*. In Carnarvonshire it occurs in several localities, as on Snowdon and on Glyder Vawr, above Llanberis, and near Twll-du, "the Devil's Kitchen," but in almost inaccessible places. Durham and Westmoreland, with Yorkshire, already mentioned,

are the only English counties in which it has certainly been found; in the former of these it occurs on Falcon Clints, in Teesdale, where it attains a large size. In Scotland it is more plentiful, and more characteristically developed: the counties of Stirling, Perth, Forfar, Aberdeen, Banff, Elgin, Inverness, Dunbarton, Ross, Sutherland, and Caithness. In Ireland it is very local, occurring only in the west and north-west, and often in but very small quantity, ranging in altitude from about a hundred and twenty feet in Tyrone to two thousand five hundred feet on Brandon. It grows in clefts in the mountains, in exposed situations among rocks and loose stones, but is by no means common even in the localities which produce it most freely. On the European continent it is plentiful in the temperate and cool regions, especially on elevated mountains in the south. It reaches the extreme north, being found in great profusion at sea-level in Englishman's Bay, Disco. Besides Lapland, it occurs rather plentifully in Finland, Russia, and Sweden and Norway, coming down through Denmark and Gothland to central Europe: Carniolia, Tauria, Hungary, Germany, and Switzerland, and—more sparingly—Italy, France, Spain, Turkey, and Greece, and the Mediterranean region, all produce it. It passes over the European boundary, and is recorded from Asia Minor and Siberia, as well as from Northern India (the Himalayas). It is not known from Africa or Australia, and is but little found in America. In British Columbia it is found at the Cascade Mountains, at an elevation of from five to six thousand feet above the sea: here it attains very large dimensions, some of the specimens brought hence measuring two feet in length. Only one locality seems to be known for the Holly Fern in the United States, and that is in woods on the southern shore of Lake Superior and northwards. It will thus be seen that the extra-European range of the Holly Fern is decidedly limited.



HOLLY FERN.

The dark-green perennial fronds of the Holly Fern rise from a thick short upright or decumbent caudex, which is thickly covered with brown scales in its upper portion, and consists of the densely packed bases of the older and decaying fronds. The stipes, which is usually short, from an inch to two inches long, is also covered with large brown chaffy scales, which indeed also clothe the rachis, but are much smaller and of a less prominent hue than those of the rachis. The fronds are densely tufted, from six to eighteen (or in very luxuriant examples twenty-four) inches in length; they are of a singularly hard unyielding leathery texture, and sometimes droop, while at others they stand upright. They are simply pinnate, and in this way the plant can be at once distinguished from a mature specimen of *P. aculeatum*, although the variety *lobatum*, when young, has a

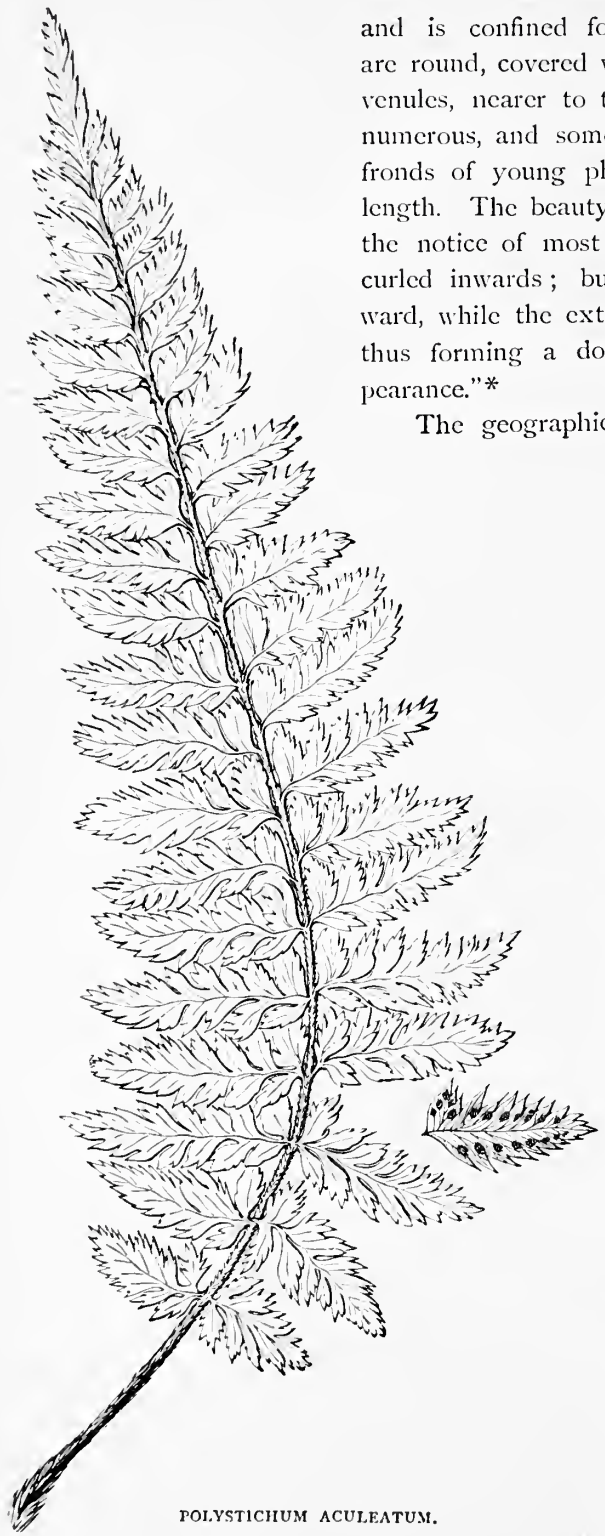
similar habit. The sessile pinnæ are numerous and crowded, the upper ones frequently overlapping; they are shortly stalked, or sessile, about an inch long in their widest part; the lower ones are almost deltoid or wedge-shaped, and auricled at the base, as shown in the figure. The margins of the pinnæ are serrated, the serratures being surmounted by bristly or spiny points. The sori are usually confined to the upper part of the frond; they are round, and placed in two or more rows, at first distinct, but often becoming confluent when fully developed. "The rigidity of texture, the strongly spinous margin, and the tendency to imbrication in the pinnæ," according to Mr. Moore, "offer the readiest marks of distinction between this plant and some of the forms of *P. aculeatum*."*

This is a singularly conservative species; there seems to be little or none of that adaptability to other forms which characterises several of our European ferns. It seems very strange that while the varieties of one fern may almost be counted by hundreds, another species should have none to record; but the latter is certainly the case with *P. Lonchitis*, if we except such occasional and unimportant variations as a forked apex to the fronds. Mr. Moore, in the place already referred to, says that the plants "sometimes produce small bulbils in the axils of the lowermost pinnæ, from which young plants spring up. This quality of producing bulbils," he continues, "seems to be the result in great measure of certain little understood peculiarities of cultivation or situation; for while with some cultivators many of the British species prove bulb-bearing, the peculiarity seldom occurs with others." The Holly Fern is not very easy to grow; it will do well in a cool moist frame, potted firmly in well-drained loamy soil, and freely supplied with moisture; but it does not succeed in the neighbourhood of towns, owing probably to the impurity of the atmosphere as contrasted with the native haunts of the plant.

POLYSTICHUM ACULEATUM, *Roth.*

We have here a handsome and a common fern; one, however, which is liable to be confused with its ally, *P. angulare*, on the one hand, while on the other it approximates, in one of its forms, rather closely to the Holly Fern just described. It is a stout-growing plant, with fronds from a foot to three feet in height, resembling a good deal in habit the common Male Fern (*Lastrea Filix-mas*), but at once striking the eye as different on account of the rigid habit and prickly or almost spinous aspect of the fronds. It has a thick upright or somewhat procumbent rhizome, which ultimately becomes woody, and is made up of the bases of the old fronds surrounding the axis. The roots are strong and tough, penetrating deep into the earth, and retaining a close hold. The stipes is from two to four inches long, thickly clothed with dense brown chaffy scales, as is also the upper part of the rhizomes, and the rachis throughout the greater part of its length. The fronds are smooth, lanceolate, and twice pinnate, of a tough, leathery texture, deep-green above, and paler beneath, of erect rigid habit, or at times slightly drooping, from one to three feet long, and about six or seven inches across in their broadest part. The pinnæ are given off from the rachis at nearly right angles; they are lanceolate, and formed of numerous nearly opposite or alternate lanceolate pinnæ; each of these terminates in a sharp, spiny point, and their margins are also serrated with sharp bristle-like teeth, to which the fern mainly owes its distinctive appearance. The lowermost pinnule is often longer than the rest and more distinctly

* "Nature-printed British Ferns," i. 119.



POLYSTICHUM ACULEATUM.

auricled. The fructification is as usual on the back of the frond, and is confined for the most part to its upper half; the sori are round, covered with a membranous indusium situated upon the venules, nearer to their base than their apex: they are often very numerous, and sometimes become confluent. The pinnules of the fronds of young plants are much broader in proportion to their length. The beauty of the vernation of *P. aculeatum* has attracted the notice of most authors. "It arises from the rhizome, closely curled inwards; but when it is more expanded, it droops backward, while the extremity still retains its tendency to curl inwards, thus forming a double curve, and having a most graceful appearance."*

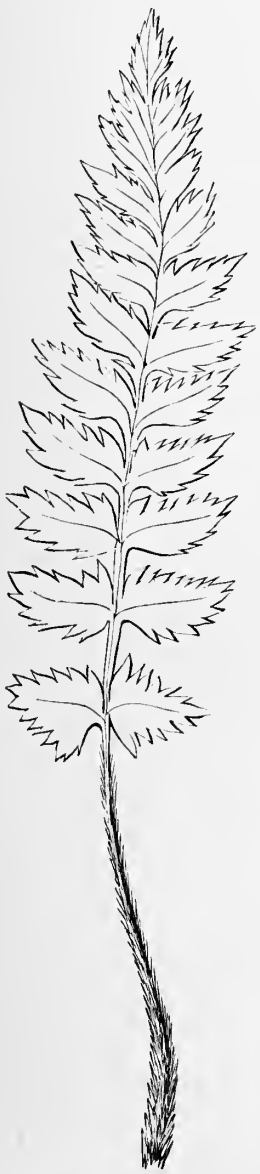
The geographical range of *P. aculeatum* is as wide as that of any European fern, as may be gathered from a glance at the table of distribution, where it is noted as occurring in seventeen out of the eighteen divisions, being absent only from the eastern peninsula and archipelago of Asia, including the Philippine Islands. It is found almost throughout Europe, although not always very abundantly, being however rare if not absent in the extreme north. It will probably be found to occur in all of the English, and most likely in all of the Scotch counties, although there are at present a few gaps in the list: the Scotch plant is for the most part the form *lobatum*. In Ireland, although it occurs in nearly all the districts into which the flora of that country has been divided, it is local and not common. If we go farther afield, beyond the European boundary, we shall find the distribution of *P. aculeatum* somewhat difficult to ascertain, as it is so often united by authors with the next species, *P. angulare;* but it seems to be very generally met with. A very exhaustive summary of the distribution of the species considered in a large sense, and including under the same head a large number of forms besides *P. angulare*, will be found in the "Species Filicum";† here it is traced throughout the world. Sir W. J. Hooker remarks that he has seen no well-pronounced form of it from the West Indian Islands, but is inclined

* Deakin's "Florigraphia Britannica," iv. 95. † "Species Filicum," vol. iv., pp. 18—22.

to refer to it *P. viviparum*, a plant found in Cuba and Jamaica, which owes its name to its habit of taking root at the apex of the fronds and producing fresh plants.

The useful properties of ferns being, as we have already shown, very limited, it may be well to point out that the present species has been utilised in protecting the fruit of the fig-tree — an employment which is sufficiently remarkable to induce us to extract an account of the *modus operandi*:—"Just before the buds begin to expand," says a writer in Loudon's 'Gardener's Magazine' for 1828, "I collect a quantity of *Aspidium aculeatum;* the stalk of the frond I introduce into a shred, and the point of it is brought to the point of the shoot; it is there wound once or twice round the nail near the point of the shoot, taking care to reserve an inch or two of the point of the frond to be turned in between the point of the shoot and the wall, which is a sufficient fastening, if properly done. A tree, when covered in this manner, has at a small distance the appearance of being in full leaf. As soon as the fruit is set, the fern is taken off, to prevent injury to the young foliage by confining it. This is a neat, light, and effectual covering, which I have practised these last ten years."

POLYSTICHUM ACULEATUM (PINNA).



POLYSTICHUM ACULEATUM (Var. LONCHITIOIDES).

One of the principal forms of *P. aculeatum* is that known as *lobatum*—a plant which Mr. Moore describes as having "narrow lance-shaped fronds one to two feet long; these are subpinnate, *i.e.*, a few only of the pinnæ develope pinnules. The anterior basal pinnule is always distinct, considerably enlarged, and strongly auricled; but the rest of the pinnules are either decurrent or confluent, and not auricled."* This is by no means an uncommon plant; indeed, it has been found in most districts, and in some, as in most parts of Scotland, is commoner than the type. Mr. Moore has not been successful in making

YOUNG FRONDS OF POLYSTICHUM ACULEATUM.

* "Nature-printed British Ferns" (8vo. ed.), i. 131.

this develope into the typical form of *aculeatum*, but is of opinion that it is a permanent variety of which various gradations exist in a natural state. The form known as *lonchitioides*—or *lonchitidoides*, for it is written in both these ways—is that which, as its name implies, most closely resembles the Holly Fern; it seems to be an immature and undeveloped state of *lobatum*, but is as a rule a small plant, simply pinnate, the pinnæ being more or less deeply toothed or lobed on the upper side at the base.

Taken as a whole, however, *P. aculeatum*, regarded as distinct from *P. angulare*, is not a variable species; Mr. Moore only describes five varieties, and these are not very marked. The author just referred to says that it is occasionally found with the apex of the frond multifid, and the pinnæ dichotomous, and that it has been known to produce bulbils in the axils of the lower pinnæ; but these are merely accidental variations, and do not deserve to be regarded as permanent. *P. angulare*, however, which we shall now proceed to describe, is a much more variable plant.

P. aculeatum is very easily cultivated, and is very useful as a rockery fern on account of its evergreen character. It should be placed in a situation where the roots can be well drained, and is rather partial to shade.

POLYSTICHUM ANGULARE, *Presl.*

As will have been gathered from the incidental references made to this species while *P. aculeatum* was under consideration, there is much in common between the two, and such authorities as Sir W. J. Hooker place them together as forms of one and the same species. On the other hand, Mr. Moore keeps them distinct; and although his acquaintance with the species of ferns is perhaps less extensive than that of the former director of Kew Gardens, we are inclined to prefer his estimate of the specific value of such forms as he has more particularly studied.

The difference in habit between this fern and the preceding is very striking, and indeed is sufficient to separate them at a glance. *P. aculeatum* is a stout rigid plant, with stiff upright fronds, having a bristly, and, if we may so speak, an almost defiant appearance. In *P. angulare*, on the other hand, the fronds are soft and lax, with smaller pinnules, which are more or less distinctly stalked. Mr. Moore, to whose opinion as to the distinctness of the two species we have already referred, says that the chief differences between the two consist in the obtuse-angled base of the stalked pinnules of *P. angulare*, and the acute-angled or wedge-shaped base of the sessile pinnules of the more divided states of *P. aculeatum*. He says also: "*P. aculeatum* has its sori medial, that is, attached at a point along the middle part of the venule, the apex of which is carried out to the margin of the pinnule, the sori thus being placed nearer the base of the venule than its apex, *i.e.*, nearer the point of furcation; while in *P. angulare* the fertile venule stops about midway across the pinnule, and the sorus is commonly placed at or almost close to its apex."

In habit and general appearance there is much in common between this species and *P. aculeatum*. Both have tough, strong roots, and large thick tufted rhizomes, covered with large brown chaffy scales. The fronds of both are of about the same length and size, and both plants frequent the same habitats—deep hedge-bottoms and shady banks, especially on the borders of woods. So far as our experience goes, they are not often found together, but they contrast very effectively with each other when planted on a rockery, the stiff, upright fronds of *P. aculeatum* towering above the softer and more drooping ones of

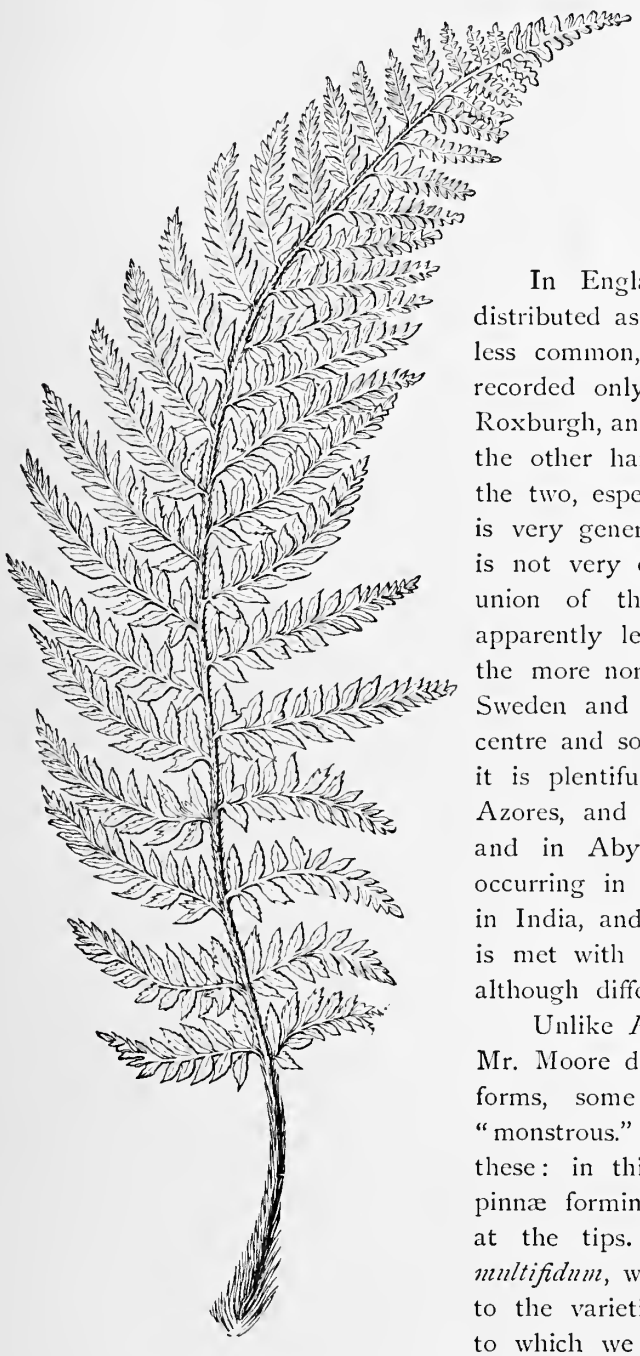
Vincent Brooks Day & Son. Lith

1. POLYSTICHUM LONCHITIS *(Roth.)* 2. POLYSTICHUM ACULEATUM, *(Roth.)*

(⅓ NATURAL SIZE.)

1A & 2A UNDER SIDE OF FERTILE PINNA. NATURAL SIZE.

P. angulare. Hedge-bottoms, where water may stand in very wet seasons for a time, but is not of permanent occurrence, are good places for ferns; the Hard Fern (*Blechnum Spicant*) luxuriates in such localities, growing among large tufts of rushes, and forming large patches, the fertile fronds standing up with sufficient curve to be very graceful above the nearly prostrate barren ones. It is on the bank above the bottom that we shall find the Shield Ferns, for they do not affect much moisture.



POLYSTICHUM ACULEATUM.

In England, *P. angulare* is about as generally distributed as *P. aculeatum*, but in Scotland it is much less common, being, indeed, but seldom met with, and recorded only from the counties of Ayr, Berwick, and Roxburgh, and the islands of the Clyde. In Ireland, on the other hand, it is much the more frequent plant of the two, especially in the province of Ulster, where it is very generally met with. Its European distribution is not very easily ascertainable, owing to the frequent union of this species with *P. aculeatum*, but it is apparently less frequent than that plant, especially in the more northern regions, although it is reported from Sweden and Norway, and also from Denmark. In the centre and south of Europe it is of frequent occurrence; it is plentiful in Madeira, the Canary Islands, and the Azores, and also occurs in North and South Africa, and in Abyssinia. In Asia it is widely distributed, occurring in the neighbourhood of the Black Sea, and in India, and the surrounding regions. In America it is met with both in the northern and central portions, although differing somewhat from the typical form.

Unlike *P. aculeatum*, this is a very variable species. Mr. Moore describes and names as many as forty-four forms, some of which are very striking, although "monstrous." The variety *Kitsoniæ* is the prettiest of these: in this the rachis is several times branched, the pinnæ forming the branches being crisped and curled at the tips. Less divided forms are *cristatum* and *multifidum*, which are similar in their mode of variation to the varieties of other ferns bearing the same name to which we have already alluded. The variety *proliferum* bears small bulbils at the point where the pinnæ join the rachis, or sometimes in the axils of the pinnæ. The variety *plumosum* has large, broad fronds of a thin delicate texture, with long-stalked, deeply-cut pinnules, the whole frond having a beautiful feathery appearance. For further information as to the varieties of *P. angulare* we must refer to Mr. Moore's enumeration,

where they are described at length, with full particulars as to distribution and the like. The accompanying figures illustrate the forms of pinnule most commonly met with.

When speaking of *Woodwardia radicans* (p. 78), and also of *Camptosorus rhizophyllus* (p. 65), we referred to the mode of increase from buds or bulbils which is noticeable in these and in many other ferns. Mr. Moore's remarks upon similar instances in *Polystichum angulare*, and in other ferns, are worth reproducing here, if only to show the views which he holds upon the point, and also as showing how largely this peculiarity is met with among our common British ferns. Speaking of *P. angulare*, he says:—

"A remarkable proliferous or viviparous character has been observed in several of the

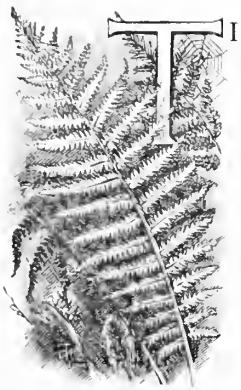
PINNÆ OF VARIETIES OF POLYSTICHUM ANGULARE.

varieties of this species, as well as in many other British Ferns, including *Polystichum Lonchitis; P. aculeatum*, with its variety *lobatum; Lastrea Filix-mas*, two varieties; *L. æmula; Asplenium lanceolatum; A. Ruta-muraria; Scolopendrium vulgare*, several varieties; *Blechnum Spicant*, etc. Some of the varieties of the present species propagate extensively by means of these bulbils, which form either towards the base of the stipes or along the rachis in the axils of the lower pinnæ, or, in some instances, on the veins of the fronds. Although among exotic ferns instances of this viviparous growth were known to occur frequently, yet our acquaintance with so many bulbil-bearing British ferns is due to the scrutiny of a few zealous cultivators, especially Mr. Wollaston, of Chislehurst, Dr. Allchin, of Bayswater, Mr. Clapham, of Scarborough, and Mr. Baxter, of Oxford. Most of the instances above referred to were observed during the summer of 1854. Mr. Baxter has suggested that it may be a result of pot-culture, all the instances in which it has been observed having been on potted plants. We think it may be the combined result of the check caused by the cramping of the roots incidental to pot-culture, and the excitement arising from the very moist

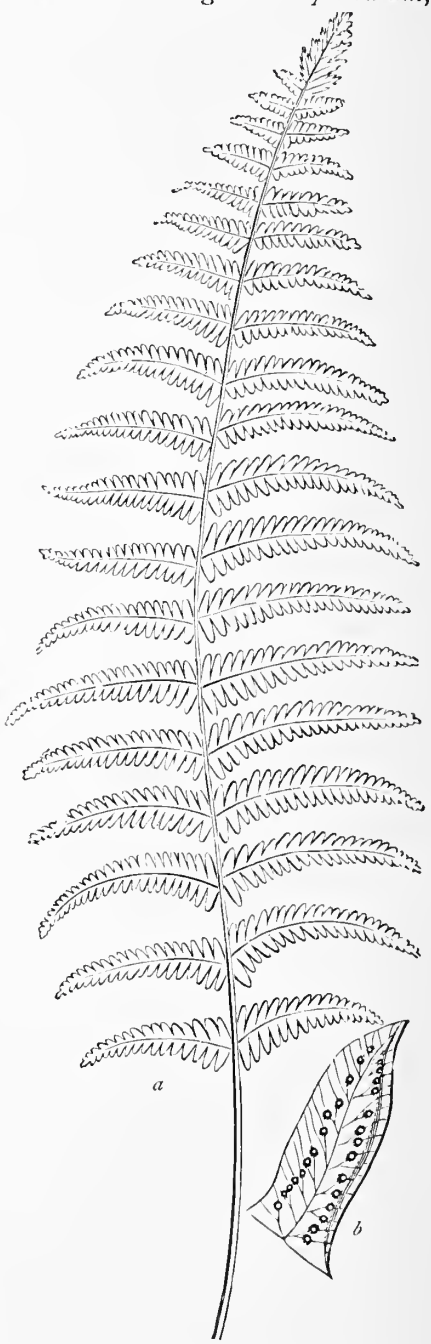
atmosphere which is kept up in most fern-houses. The instances thus observed, however produced, appear to afford additional evidence that the fronds of ferns are not leaves, as some would call them, to which, however, the fact of their normally bearing the fructification seems repugnant; but that they at least include something of the nature of branches. Another fact may be mentioned as militating against the opinion that the fronds of ferns are mere leaves. Leaves, it is maintained by physiological botanists, have their points first formed, the perfected apex being, as it were, pushed forward by accretion from below. Now, in the fronds of ferns it may often be seen to demonstration that the lower parts are perfectly developed and bear mature sori, whilst the apex is still unrolling; this is very obvious in the genus *Nephrolepis*. Besides the bulbilliform mode of increase above adverted to, Mr. Wollaston has observed a different kind of what is supposed to be viviparous development in the *Polypodium vulgare* var. *omnilacerum*, on a plant communicated by Mr. E. T. Bennett. In this case, the development consisted of prothalloid growths on the apices of the serratures of the lobes; these had every indication of being capable of further evolution, though, unfortunately, the frond was broken off before they were observed, so that their vital energy could not be fully tested."*

* "Nature-printed British Ferns" (8vo edition), vol. i., pp. 142-3.

LASTREA.



THIS is a large genus, and one of almost universal distribution. In the "Synopsis Filicum" it is considered as a section of the genus *Nephrodium*, differing from the typical species of *Nephrodium* in having the veins all free, and about 200 species are enumerated as belonging to it. Of these only seven come within the scope of the work, although our list will be found to include nine species of *Lastrea*, this discrepancy being due to the fact that we take a somewhat more liberal estimate of what constitutes a species than the authors of the "Synopsis," and hence regard as distinct three plants—*Lastrea spinulosa*, *L. remota*, and *L. dilatata*—which are united under the former specific name in the work in question. Although varying a good deal in size, texture, and cutting, there is a general resemblance among the species of *Lastrea*, and we do not find among the extra-European species any that call for special notice. The general habit and style of the genus will be gathered from the detailed descriptions of the species which fall within our limits; and as all the European species are also British, and some of them very common, our readers will not find it difficult to make their acquaintance in a living state. The genus was named *Lastrea* (or rather *Lastræa*, which was its original form, that now in use being adopted when its application was somewhat changed), and commemorates a French botanist, M. Delastre.

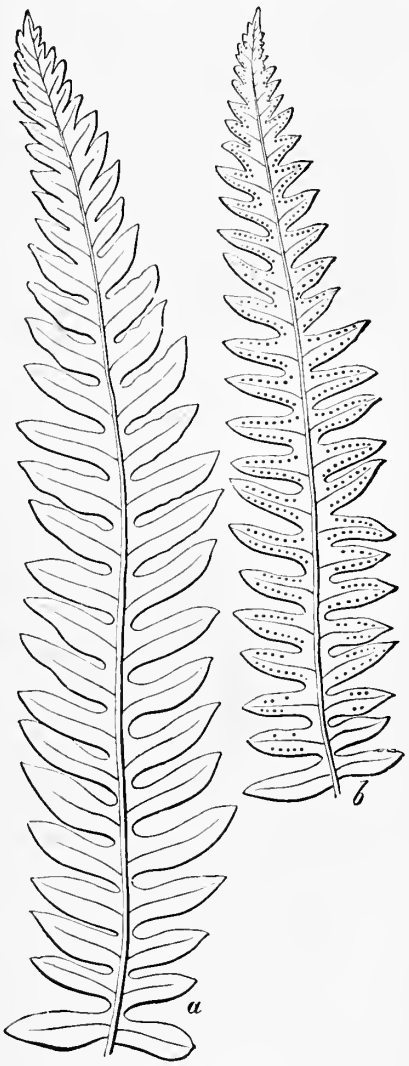


(*a*) FROND OF LASTREA THELYPTERIS
(*b*) UNDER-SIDE OF FERTILE PINNA.

LASTREA THELYPTERIS, *Bory.*

This is a fern of boggy and marshy ground, which, although very widely distributed in England, cannot be considered a common plant, while in Scotland it is unfrequent, and in Ireland rare and local, although found in many widely-separated localities. It is a delicate-looking plant, with soft, membranous pale-green fronds, and a long, very slender branched rhizome, by which character it is distinguished from the species most nearly allied to it. Our coloured figure, which is much reduced, shows this rhizome, upon which the fronds are produced at irregular

intervals. The fronds are of two kinds; the barren ones, which are developed about May or early in June, are usually from one to two feet high, although often much smaller, smooth or slightly hairy, the lower pair of pinnæ being a little, but only a little, shorter than those above them. The barren fronds have narrower pinnæ, this difference in appearance, which is easily recognisable, being due in no small degree to the incurving of the margins over the sori. The stipes in the fertile fronds, which is developed a month or more later than the barren ones, is longer in proportion, and the whole frond is taller and stouter. The small round sori are produced in large numbers upon the back of the frond, being situated near the base of the venules, as shown in the figure; these venules proceed from the central vein, or midrib, becoming forked, and terminating at the margin of the pinna. The accompanying figures—which are of the natural size—will show the difference in form between the barren and the fertile pinnules.



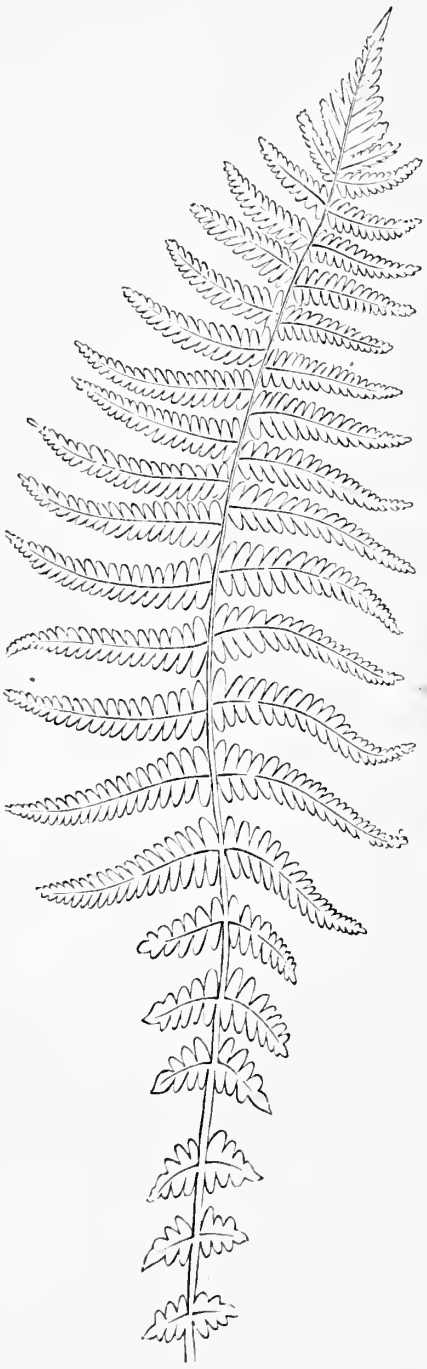
(*a*) PINNULE OF BARREN FROND.
(*b*) PINNULE OF FERTILE FROND.

This species is by amateurs sometimes confused with the next, *L. Oreopteris*, but is very easily distinguished from it, not only by its slender creeping rootstock, but by the form of the fronds, the pinnules of which, in *L. Oreopteris*, become gradually smaller towards the base; *L. Thelypteris* is also quite destitute of the pleasant balsamic odour which characterises *L. Oreopteris*. It is widely distributed throughout northern and central Europe, but becomes rarer towards the south; it is absent from the Spanish peninsula, and is rare in Italy. In northern Asia it occurs in Amur-land and Mandschuria; in northern India it is reported from Khasia and Kashmir, at an elevation of from five to six thousand feet. It is found also in New Zealand; and in Africa it is reported from Angola, Cape Colony, and Natal. It is common in Canada, and extends throughout the United States to Florida.

Lastrea Thelypteris is known in books as the Marsh Fern; in the Isle of Wight it is called Ground Fern, but, like many more of its class, it has no generally recognised English name. Its specific name is a Greek compound, signifying Lady Fern, and was probably originally bestowed upon the plant on account of its delicate appearance. It is not a difficult plant to grow, but requires a very great quantity of moisture; indeed, it is cultivated to the greatest advantage in the neighbourhood of water, as on the boggy margin of a small pond, if such a situation can be obtained for it. The fronds are annual, and are cut off by the early frosts. It is not at all a variable plant. Milde distinguishes two forms, one of which has the segments of the pinnæ deeply and irregularly pinnatifid, while in the other the fronds are somewhat glandular; but no marked deviation from the type exists.

LASTREA OREOPTERIS, *Bory* (L. MONTANA, *Moore*).

We have here a fern which has much in common both with the last and the following species, but which a very little examination will enable us to distinguish from either of them. The pinnules gradually narrowing towards the base of the frond, and a certain peculiar yet pleasant balsamic odour, which has gained for the species the name of the Sweet-scented Fern, will suffice to distinguish it from either *Lastrea Thelypteris* or *Lastrea Filix-mas*. It has a short, tufted, scaly rhizome, from which very numerous fronds are given off. The stipes is very short, or almost wanting, the extremely small portion of the rachis which can bear this name being almost hidden by broad, pale-brown scales. The frond is elongate and lanceolate, regularly pinnate, the narrow acute pinnæ being sessile upon the rachis; they gradually diminish in length from near the middle to the base, where they are extremely short, obtusely triangular, and almost rudimentary. The whole of the under-surface of the pinnæ is covered with small yellowish, glandular globules, which adhere to the fingers when the plant is touched, and exude a powerful odour, which some think unpleasant, but which is very generally considered rather agreeable. The lobes of the pinnæ have a distinct central vein, from which other simple or forked veins are produced; the round sori, which, although small, are larger than those of the preceding species, are produced near the end of the venules upon the back of the pinnæ, being most numerous upon the upper half of the fronds.



FROND OF LASTREA OREOPTERIS.

PINNULE OF FERTILE FROND.

This is rather a common fern, although it is often overlooked on account of its resemblance to the Male Fern—a resemblance which, as has been shown, does not exist when a frond is gathered. It grows upon open hill-sides in rather elevated districts, but is sometimes found in moist woody situations. In England, especially towards the north, and in Scotland it is frequent enough, while in Ireland it is rather less common, though still widely distributed. On the continent of Europe it has a wide range, extending from Lapland to Spain and Greece; but it does

not appear to spread beyond the European borders, although it has been recorded from the Azores and North America.

Although not one of the most interesting or remarkable of European ferns, the Mountain Fern, as *L. Oreopteris* is sometimes called—a translation of its (Greek) specific name—is well worthy of cultivation, although it is not particularly amenable to this mode of treatment. It is recommended to pot or plant it in fine loam, and to keep this soil wet through the winter, this being done, when the plants are in pots, by keeping a feeder full of water beneath them. Mr. Moore suggests that "a continuous supply from a syphon, allowing the superfluous quantity to overflow, so that there might be a constant change going on, would be a still better arrangement; it would, at least, assimilate more exactly with the ceaseless percolation which must be going on on its native hills.* It produces a large number of seedlings, which do not bear fruit until they are about three years old; the fronds are annual, and soon cut off by frosts; they are usually fertile.

Like the last, this is not a very variable plant. There is a form (*caudata*) in which the pinnæ are prolonged into long tail-like points, and another (*cristata*) in which they are crested at the apex, after the manner of some of the varieties of the Lady Fern and the Male Fern; but there are no deviations of any importance from the ordinary type.

THE MALE FERN: LASTREA FILIX-MAS, *Presl.*

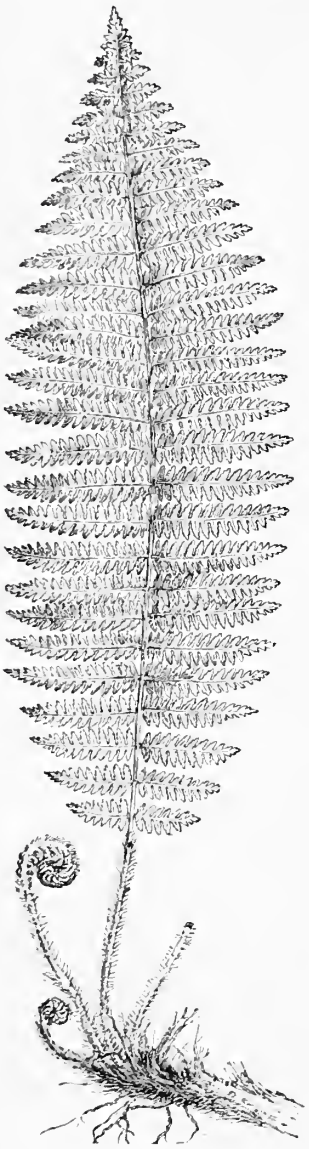
Next to the Bracken, the Male Fern may fairly take rank as the best known and most commonly met with of European ferns. It is also, assuredly, one of the handsomest; indeed, there are few objects more beautiful than a well-grown specimen of this plant, the tall fronds rising up in a circle, slightly leaning backwards at their tips, or quite erect, and joining each other so closely as to form a basket-like appearance, in the centre of which the young fronds develope in crosier-like fashion, the rich brown hue of the scales with which they are covered forming an effective contrast with the bright, yet subdued green of the fully expanded fronds. To this basket-like form of the plant it is indebted for the name "Basket Fern," by which it is known in parts of Cornwall and Hampshire; in the Border Country it is called "Dead Man's Hand," in allusion to the appearance of the young fronds before they begin to uncoil, when they not inaptly resemble a closed fist. The graceful curve of the uncoiling fronds is shown in the accompanying figure.

These fronds rise from a short unbranched rhizome about an inch thick, which, however, appears to be of more than double that bulk, owing to the fact that it is closely covered by the hard, fleshy, persistent bases of the fronds of previous years; the black, wiry roots spring from among these. When cut open with a knife, the rhizome is found to be of a fleshy texture, and of a pale, yellowish-green colour; it is to this that the Male Fern owes its reputation as an anthelmintic, which, as we shall see further on, it has long possessed, and which has obtained for it a place in the British pharmacopœia.

The fronds of the Male Fern are from two to three feet, or even more, in length; they rise from the extremity of the rhizome, forming a circle, and are nearly, or quite, upright. The stipes of each is densely covered, especially in its lower portion, with large chaffy, thin, light-brown scales and hairs, interspersed with smaller ones; these extend, more or less, along the rachis. The pinnæ are very numerous, alternate, or nearly opposite, long and narrow, often overlapping, though sometimes comparatively distant; the pinnules are distinct at the base of

* "Nature-printed British Ferns" (8vo ed.), vol. i., p. 175.

the pinnæ, but more or less combined above; they are smooth, deep green, and toothed or serrated, the texture varying a good deal in different examples, but usually rather thin and soft; the sori are small and numerous, roundish in shape, confined, for the most part, to the upper portion of the frond, forming two regular lines, and having the kidney-shaped indusium which is characteristic of *Lastrea*.



MALE FERN (REDUCED).

The Male Fern is a plant of very wide distribution, both in the old and new worlds. It extends throughout Europe, and over a large part of Asia; it is found in North and South Africa, and in Abyssinia, as well as in the Cape Verde Islands, the Azores, the Canaries, and other African islands; it is found in North (California, Florida, Newfoundland), Central (Mexico, Guatemala), and South America (Peru, Brazil, Ecuador), but not in the United States. Its habitat, too, is varied; it grows either in wood or plain, on common or hedge-bank, or in moist and sheltered spots.

In former times a good deal of belief was manifested in the mysterious properties of the Male Fern, many of which were similar to those of the Bracken, already described. The following notice by John Parkinson sums up the ideas then current on the subject:—

"Of the ashes of Ferne is made a kind of thicke or darke coloured greene glasse in sundry places in France, as in the Dutchey of Maine, &c. (and in England also as I have beene told by some) out of which they drinke their wine. The seede which this and the female Ferne doe beare, and to be gathered onely on Midsommer eve at night, with I know not what conjuring words is superstitiously held by divers, not onely Mountebankes and Quacksalvers, but by other learned men (yet it cannot be said but by those that are too superstitiously addicted) to be of some secret hidden vertue, but I cannot finde it exprest what it should be: for Bauhinus in his Synonimies upon Matthiolus saith, those tales are neither fabulous nor superstitious, which he there saith he will shew in his History: but Matthiolus, Lugdunensis and others declaime against such opinion: experience also sheweth that they beare seede, although Theophrastus, Galen, Dioscorides and Pliny following him, say they neither beare flowers nor seede: for if about Midsommer (for then usually it is ripe) you gather the stalkes of Ferne and hang them on a thread with some faire white paper or cloth under them, you shall finde a small dust to fall from them which is the seede, and from them doe spring plants of the same kindes, and such young plants risen from the fallen seede have beene seene growing about the old plants, for as I said before no herb growing on the earth or in the water (except some with double flowers which are encreased by the roote) but doe beare seede, &c. Dioscorides relateth a great contrarietie in nature betweene the Ferne and the Reede, that each one will perish where the other is planted, as if it were by a natural instinct, which thing I thinke happeneth rather from the soiles, a Reede not joying in a dry ground

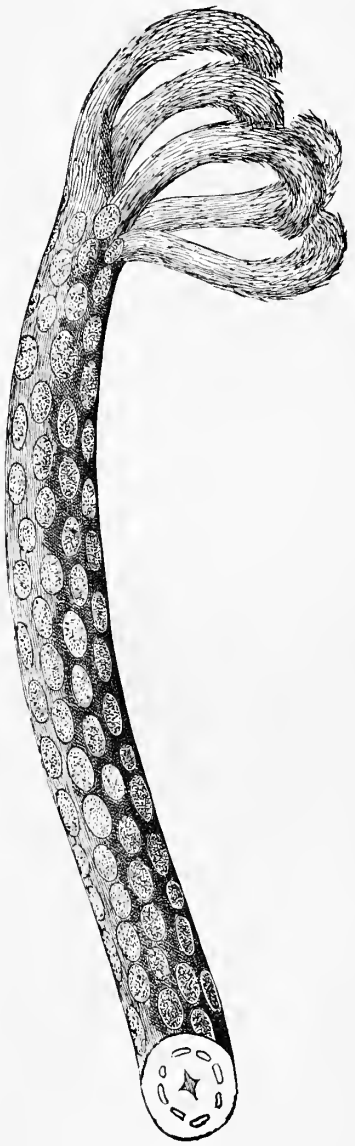
2. ASPIDIUM THELYPTERIS. (S.w.)

2A FERTILE PINNA, UPPER SURFACE, NATURAL SIZE.
2B D° D° D° D° 2½ TIMES NAT. SIZE.
2C FERTILE PINNA, UNDER SURFACE, 2½ TIMES NAT. SIZE.
2D BARREN PINNA, NATURAL SIZE.
2E D° D° 2½ TIMES NAT SIZE

1. ASPIDIUM OREOPTERIS. (S.w.)

1A UNDER SURFACE OF PINNA, NATURAL SIZE
1B D° D° D° TWICE NATURAL SIZE.
1C UPPER SURFACE OF PINNA, TWICE NATURAL SIZE

nor a Ferne in a wet. Pliny in his 24. booke and 4. Chapter saith that the roote of the Reede laid to the Ferne driveth it forth, as the roote of the Ferne in like manner doth the Reede: and Celsus before him sheweth that each of them is a remedy against the other, and Theophrastus sheweth that whereas corne and other herbes doe delight and are furthered by dung, the Ferne onely perisheth thereby."*



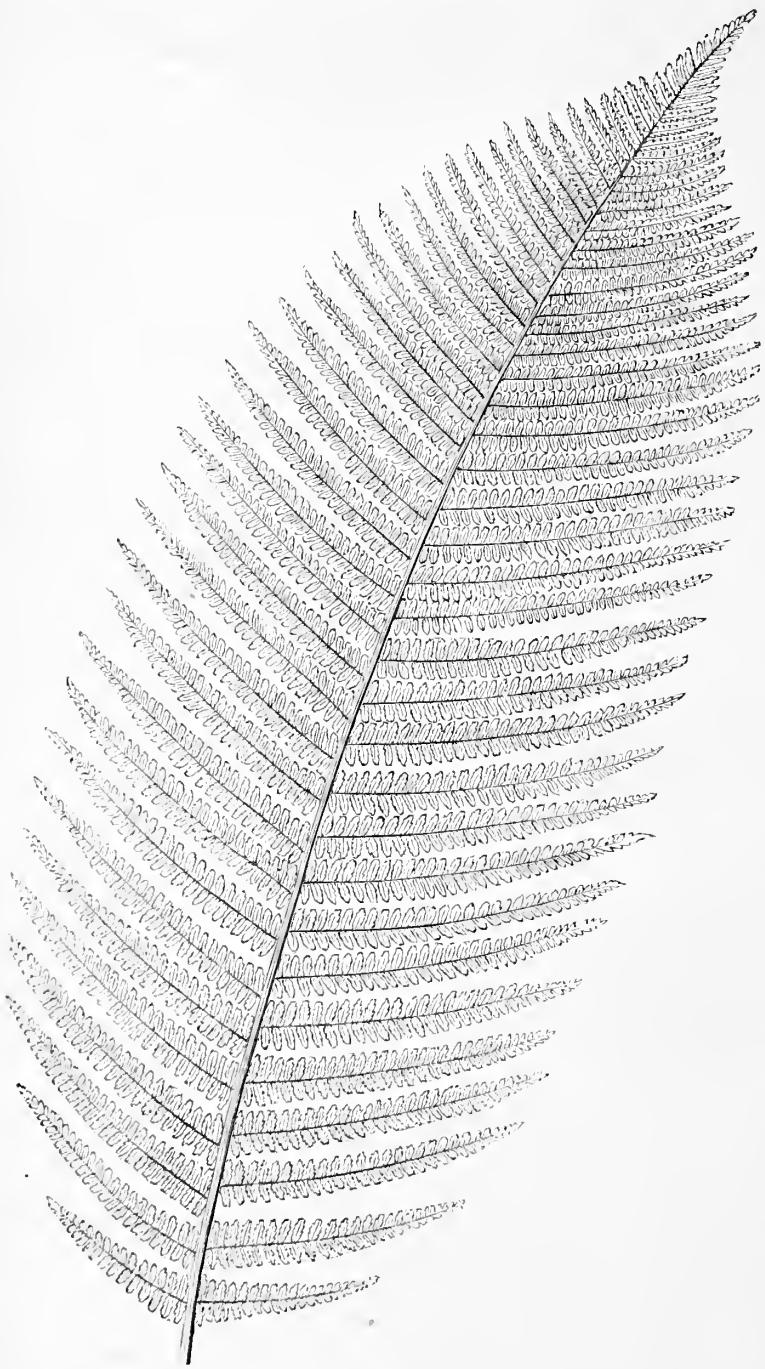
"ST. JOHN'S-HAND."

According to Schkuhr, the rhizome of the Male Fern was in Germany associated with superstitious beliefs and practices in quite recent times. This author states that in former days the so-called Lucky-hands, or St. John's-hands, were made out of the rhizome and unexpanded fronds of this species, and sold to credulous people as preservations against sorcery and witchcraft. Writing in 1809, Schkuhr says that quite recently a clergyman's wife in his neighbourhood bought one of these "hands;" others purchased for a few groschen small pieces cut off from such a hand, which they gave to their cattle in their drink, believing they would thus be preserved from magic and witchcraft. The accompanying figure of one of these hands is copied from that given by the author quoted. He adds that a similar deceit is practised with the root of *Pteris aquilina*, which is called St. John's-root; and also with the so-called "lucky dwarf," which is made from the root of the Plantain (*Plantago major*). In our own country it has been customary since the time of Gerard, and probably long before it, to manufacture rough figures of men out of the large fleshy root of the White Bryony (*Bryonia divica*), and to sell them as Mandrakes, although, of course, they have no affinity with the true Mandrake (*Mandragora officinalis*). Gerard† says that "the idle drones that have little or nothing to do but eate and drinke, have bestowed some of their time in carving the roots of Brionie, forming them to the shape of men and women; which falsifying practise hath confirmed the errour amongst the simple and unlearned people, who have taken them upon their report to be the true Mandrakes." These things are made and sold to country-people at the present day, and the Bryony is on this account known by the name of Mandrake in many English counties.

The Male Fern is, probably, the only representative of the order which has received official recognition as a remedial agent, the ethereal extract of the rhizome being a recognised preparation which is employed, with satisfactory results, in cases of tapeworm. The rhizome is collected between late autumn and early spring, and, the dead portions having been removed is split open and dried at a gentle heat; it is then reduced to a coarse powder, and exhausted with ether. The rhizome has but little odour, and a sweet astringent taste. Although the anthelmintic properties of the Male Fern were known to such early writers as Theophrastus and Pliny, the plant had, until a comparatively recent period, fallen into disuse. Towards

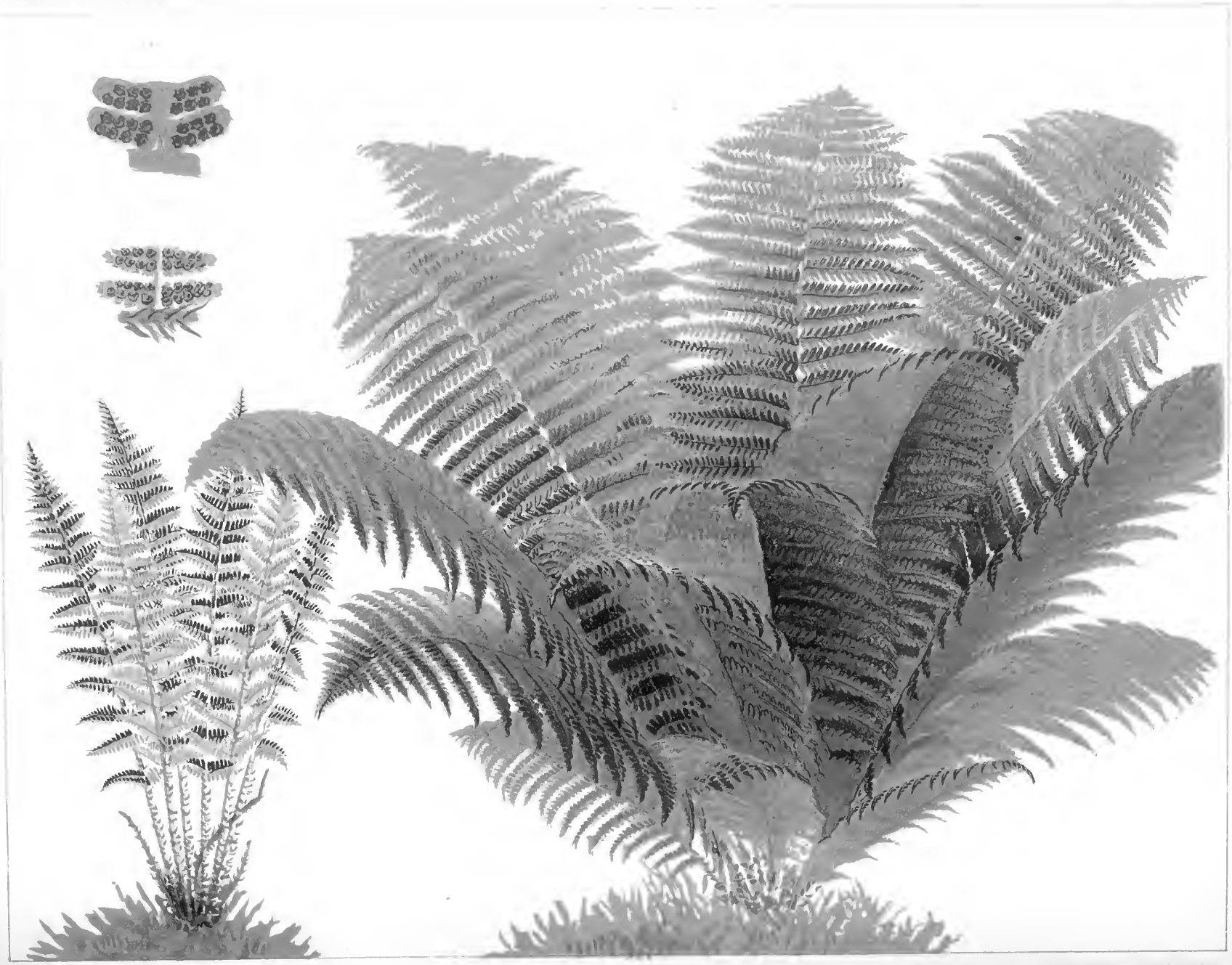
* "Theatrum Botanicum," p. 1037 (1640). † p. 281.

the close of the eighteenth century, its remedial value was brought forward both in Prussia and France: in the former country by a Swiss apothecary named Mathieu, whose treatment of tapeworm was so successful that his secret was purchased by Frederick the Great for an annuity of two hundred thalers; and in France by a Madame Nuffler, the widow of a Swiss surgeon, who obtained from Louis the Fourteenth no less than eighteen thousand livres for her remedy, which was first subjected to an investigation by *savans* of the period. In both of these cases it was found that the active principle of the remedy was supplied by the powdered rhizome of the Male Fern; and it was always employed in the form of powder until about 1825, when a chemist of Geneva suggested the substitution of the more convenient ethereal extract, in which form the drug is now always administered.



FROND OF LASTREA EROSA.

We have already said that the Male Fern is a very variable species. Mr. Moore describes twenty-five of these at length, and gives botanical diagnoses of twelve of them. There are, indeed, certain differences—in the duration of the fronds, for example—which cannot fail to strike any one who knows the plant in its native habitats, although, perhaps, they are not such as are usually reckoned of botanical value. In some plants the fronds die down in the winter; in others they remain green and fresh through the coldest weather, and are thus invaluable for winter bouquets or for home decoration of various kinds. They also vary considerably in form, and this variation is especially marked in the case of the barren fronds. One of the most distinct forms is the variety *incisa*, which was considered by Deakin as a species, and is figured by him under the name of *Lastrea erosa*. This is a very large and handsome form, with tall



1 NEPHRODIUM RHEUM

2 NEPHRODIUM FILIX MAS

1/4 NAT. SIZE

1ª & 1ᵇ UNDER SIDE OF FERTILE PINNULES NATURAL SIZE

drooping fronds as much as six or even eight feet in length, the pinnules being deeply cut, with serrate lobes, as shown in the accompanying figure. The stipes is much enlarged at its base, and, like the typical form, is thickly clotted with light-brown scales. It is a very widely distributed plant, being found in most parts of the United Kingdom which have been carefully searched for ferns. The variety *paleacea* is another very large and handsome form, which is noticeable for the abundance of shining golden scales with which the stipes and rachis are covered. As a contrast to these large varieties, two may be referred to which are in the opposite extreme. One of these, the variety *pumila*, is described by Mr. Moore (who is strongly inclined to accord it specific rank) as "a permanently small dwarf erect plant, remarkable, among other characteristics, for the rounding of the points of its pinnæ and of its pinnules, which gives to its upper surface a concave appearance." This does not often exceed from nine inches to a foot in height; the fronds, when fresh, have a pleasant odour. It is not at all a common plant, being almost confined to North Wales, and there found only at a considerable altitude. The other dwarf form, *abbreviata*, is rather larger and coarser than *pumila;* and the pinnules are large, broad, obtuse, and concave, while in *pumila* they are small and convex. The variety *cristata*, which has the fronds and pinnæ divided and curled at the apex, is, according to Mr. Moore, "doubtless the most beautiful, all points considered, among the British Ferns"; there are a good many forms of this, in which the multifid and crisped peculiarity is developed in a greater or lesser degree, to be found in the collections of the curious, but we do not think it necessary to refer to them more particularly.

LASTREA REMOTA, *Moore.*

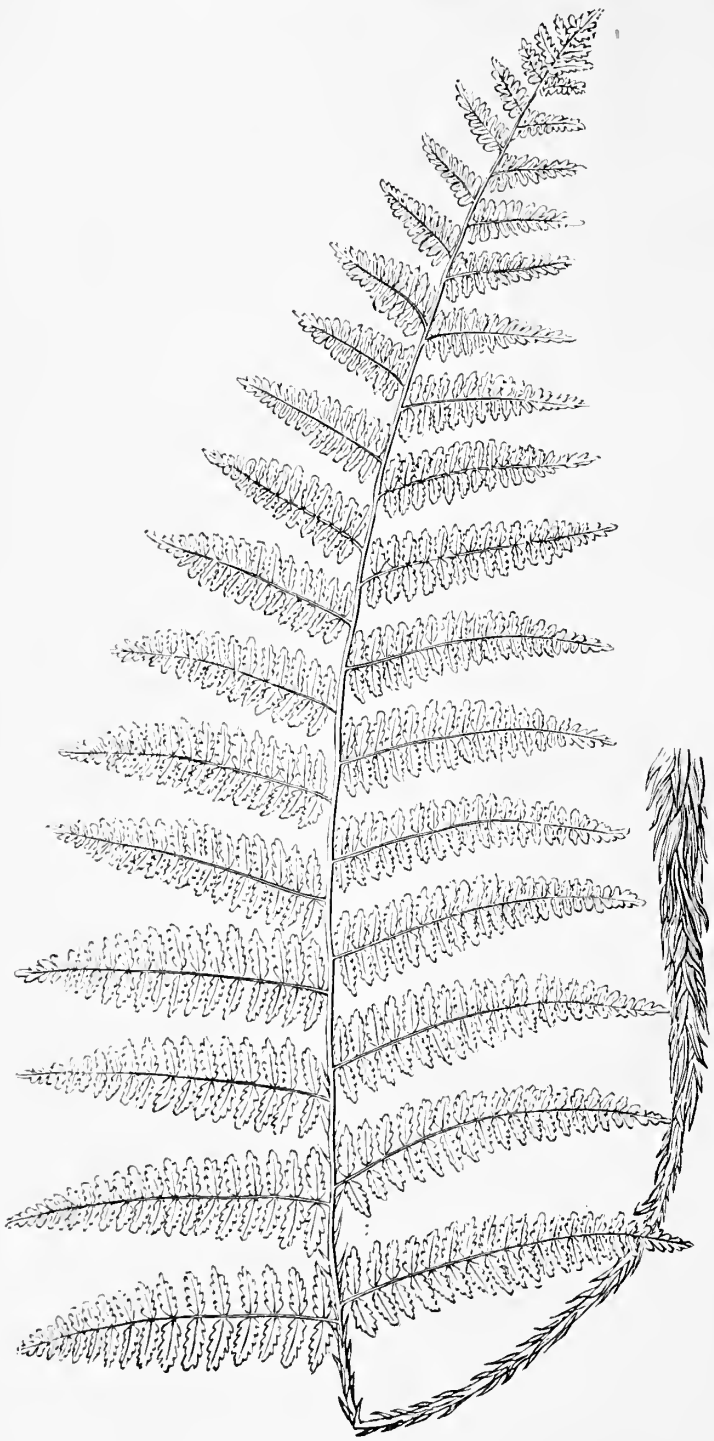
It is a matter of opinion as to how far this plant is entitled to specific rank. The authors of the "Synopsis Filicum," as well as Prof. Babington, consider it a variety of *L. spinulosa;* Mr. Moore, on the other hand, holds it to be distinct from that species as well as from *L. Filix-mas*, to which it has been allied by some botanists. It certainly much resembles those vigorous examples of *L. spinulosa* which have narrow, nearly upright fronds; while its tripinnate, not bipinnate, fronds separate it from the incised forms of *L. Filix-mas.* When first described, it was thought to be a variety of *L. rigida*, but its resemblance to this species is by no means striking. It is a plant of very limited range, its only places of growth, so far as we are aware, being southern Germany and the English Lake district, near Windermere.

L. remota has a tufted scaly caudex, with erect elongated pinnate fronds, having stalked pinnæ which are longest in their middle portion. The fronds are without glands, and the spores are borne upon the whole of the under-side. These are situated nearer the midvein than the edge of the pinnule, to which circumstance the plant owes its specific name. From its extreme rarity this fern is but little known, and its position, as has already been remarked, is somewhat uncertain; we have not succeeded in finding any easily recognisable characters by which it may be separated from the allied species. Milde considers it to be a hybrid between *L. Filix-mas* and *L. spinulosa*, between which species it holds an intermediate position.

LASTREA RIGIDA, *Presl.*

This is another rare fern, confined, in the British Islands, to a few localities in Lancashire, Yorkshire, and Westmoreland, at an elevation of from twelve to fifteen thousand feet above the

sea, among craggy limestone rocks. It has been recorded from Cornwall and Somersetshire, but either some error is to be suspected, or the fern was planted where found; the latter was doubtless the case in its sole Irish locality—a wall at Townley Hall, co. Louth. On the Continent, too, its distribution is rather circumscribed. It has been recorded as occurring sparingly in Norway, and also from Spain, Greece, Sicily, South Germany, Switzerland, Dalmatia, and Hungary; while out of Europe it occurs in Asia Minor, Siberia, and Asiatic Russia.



FROND OF LASTREA RIGIDA.

This fern produces from a thick scaly, tufted caudex numerous firm upright fronds, from one to two feet high, having a densely scaly stipes about a third of the frond in length. The fronds are of a peculiar dull-green hue, with more or less crowded pinnæ, those at the base being sometimes more distant than the rest, and as long or even longer than the rest; the outline of the fronds is either lanceolate or elongated triangular, the latter form being especially noticeable in the young plant. Both fronds and rachis are covered with small short-stalked roundish glands, to which is due the slight but pleasant odour given off by the plant. The lobes of the pinnæ are toothed, the teeth being broad and scarcely spiny; this character is considered of importance by Mr. Newman, as being one by which this species may be readily distinguished from its congeners. Milde distinguishes three forms of *L. rigida*, which he characterises by the shape of their fronds: the first, *pinnatisecta*, has short, simply pinnate fronds, and is an uncommon plant, having been only collected by Boissier in the Sierra Nevada, and published by him as *Aspidium nevadense:* the second, *bi-pinnatisecta*, is that to which many, perhaps most, of the European plants belong, and is also found in California; it has bipinnatisect fronds, and somewhat resembles *L. spinulosa* in habit:

the third, *tripinnatisecta*, is often known in books by the name of *pallida;* this is a large plant, with tripinnatisect, somewhat leathery fronds, to which most of the Southern Europe stations for *L. rigida* belong; besides these, it is also found in Northern Africa (Tunis). Apart from these forms, *L. rigida* is by no means a variable species. It is not difficult to cultivate, as it will do quite well in ordinary garden soil, requiring no shade, but plenty of moisture. In a box it will do well in a mixture of peat and loam, with which pieces of limestone are mixed; it should be kept well watered. Although, perhaps, not one of the most distinct or striking of our ferns, nor one of those most frequent in cultivation, *L. rigida* is a handsome plant, and one well worthy of a place in an outdoor fernery.

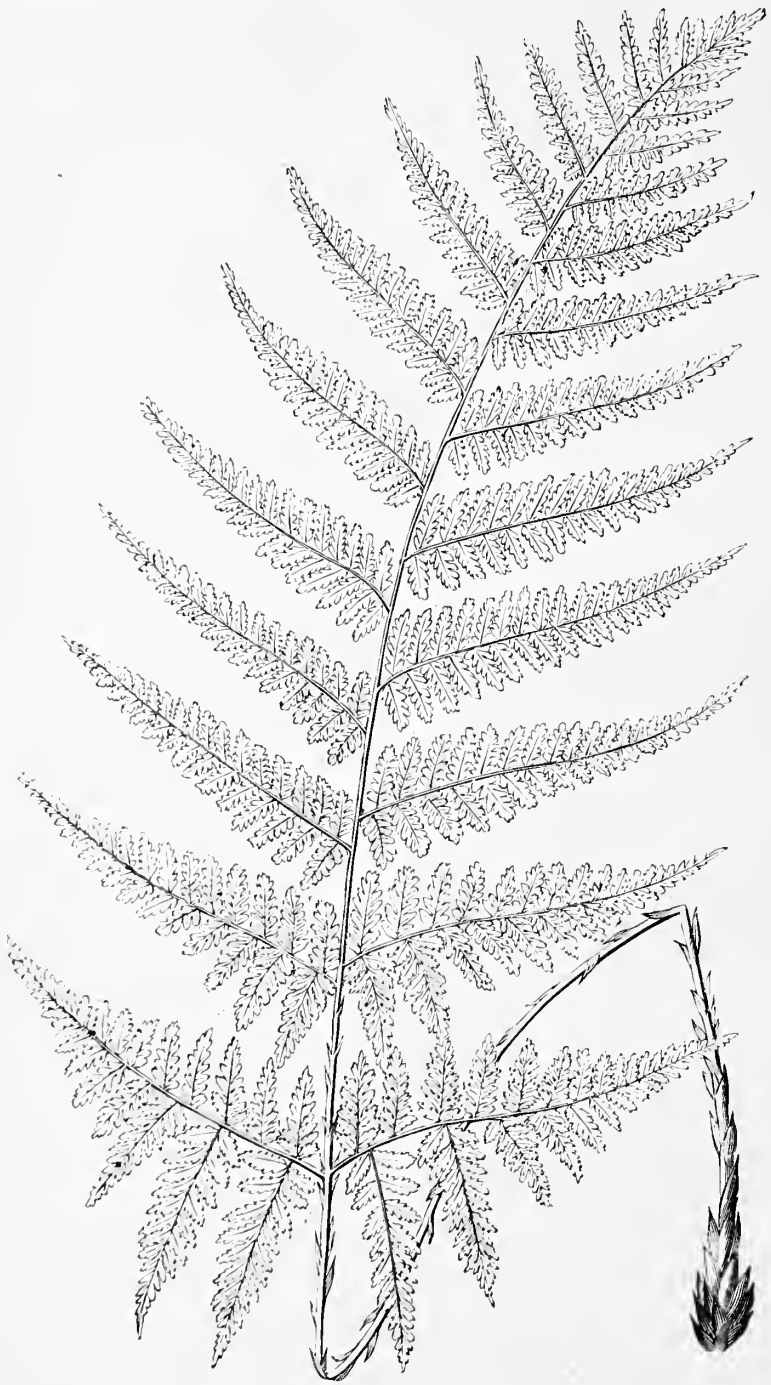
LASTREA CRISTATA, *Presl.*

Although a plant of wide distribution on the continent of Europe, this is one of our rarer British species. It is admitted by Mr. Watson as a native of East Anglia (South Suffolk, and East and West Norfolk), Huntingdonshire, Nottinghamshire, Cheshire, and Yorkshire, as well as of Renfrewshire, in Scotland: it has been recorded for other counties, but not upon trustworthy authority, and it is not known to occur in Ireland. It is found throughout northern and central Europe, extending from Scandinavia to Moscow, and occurring in Spain and South Italy; it is, however, less common in the south of Europe than in the other portions. In the Old World the range of *Lastrea cristata* is restricted to Europe, but it is frequent in swamps in the United States, and occurs abundantly in Canada and the Rocky Mountains.

This fern has been a good deal confused with the two or three following species, nor is it always easy to separate them. With *L. spinulosa*, indeed, it is connected by a form named *uliginosa*, of which Milde says that, after examining a large number of specimens, he considers it to be truly intermediate between *cristata* and *spinulosa*, connecting the two so closely and so gradually that it is impossible to find any definite limits to either species. It is an upright growing plant, with narrow, oblong, pale-green fronds from a foot to a foot and a half in height, the pinnæ being short, rather distant, and the lower ones being broadly triangular or deltoid in outline, about two inches long and an inch or so broad, diminishing in size as they approach the apex of the fronds. This narrow outline gives the plant a very distinct appearance; it is, however, an interesting rather than a striking species, and is not very frequently met with in cultivation; it grows easily in peaty soil, being propagated by the separation of the caudex, which sometimes gives off lateral branches. Like several other ferns, this produces two kinds of fronds, barren and fertile; the former being broader, and of a more flaccid texture than the fertile ones.

LASTREA CRISTATA.

In the variety *uliginosa*, to which allusion has already been made, we have three kinds of fronds—the spring or early ones, which are fertile; other, smaller ones, produced about the same time, which are barren; and later ones, appearing in the summer, the pinnules of which are broader and blunter, and either fertile or barren in different examples. This is a rare British plant, occurring in Norfolk, Nottinghamshire, Derbyshire, and Cheshire. So truly intermediate does it appear between *L. cristata* and *L. spinulosa* that it is placed under the former by some writers, and under the latter by others. The pinnules of the entire fronds are more acute and more conspicuously toothed than in typical *cristata.*



FROND OF LASTREA SPINULOSA (ONE-SIXTH NATURAL SIZE).

LASTREA SPINULOSA, *Presl.*

This is one of the commonest, and certainly one of the handsomest of our ferns; its large gracefully drooping fronds at once attract the eye in the marshy places and damp woods where it delights to grow, and its distribution throughout Britain is very general, although it becomes rare as we go north, and does not occur at all in the more northern parts of Scotland. It is very difficult to give any very clear idea of *L. spinulosa* by means of a figure, on account of its large size; the accompanying figure is drawn one-sixth of the size of a moderate-sized plant; while we give also a pinna drawn of the natural size. The stipites are tufted, about a foot long, covered sparingly throughout their length with short, pale-brown scales. The fronds are usually from a foot to two feet long, but sometimes of greater length, and from half a foot to eight inches across in their lowest

portion; the lowest pinnæ are also very broad, measuring as much as three inches across. This is one of the ferns which in its young stages causes much bewilderment to young pteriologists, on account of its being often taken for a fully developed species, although the absence of

PINNA OF LASTREA SPINULOSA (NATURAL SIZE).

SEEDLING OF LASTREA.

fructification should guard against this error: the accompanying figure of a seedling of this or the next species (*L. dilatata*) will give an idea of these young forms.

Although so different in habit from *L. cristata*, Mr. Moore and other careful botanists consider *L. spinulosa* as a form of that species; others, on the other hand, unite it with *L. dilatata*. The different appearance of the wide-spreading fronds of *L. spinulosa* from the upright, narrow ones of *L. cristata* is striking enough; but there are undoubtedly connecting links, although the two plants are not usually much alike.

We have already referred to the general distribution of *L. spinulosa* in Britain; it is not very common in Ireland. On the continent of Europe it is most abundant in the northern and central parts; it seems, however, to be absent from Spain, Greece, and Central Italy. It occurs in Lapland, Manchuria, and Amur-land, and also in Arctic America, at Kotzebue Sound.

Owing to the somewhat brittle nature of its fronds, *L. spinulosa* can hardly rank as one of the best ferns for cultivation, especially as these are only annual, dying down in the autumn. But the botanical fern-lover may find some interest in cultivating this and allied

forms with a view to forming some opinion as to their specific distinctness. It is not difficult to cultivate, growing best in peat or in a peaty compost, care being taken to supply it with an unstinted amount of moisture.

FROND OF LASTREA DILATATA (Var. *Dumetorum.—Maculata*, Deakin).
(*a*) PINNA; (*b*) PINNULE.

LASTREA DILATATA,
Presl.

This species has been much confounded with the preceding, nor is it always easy clearly to distinguish them. Mr. Moore gives as its distinguishing marks the colouring of the scales upon the stipes, which is dark in the centre and pale at the margins, and the indusia being fringed with glands; in *L. spinulosa* the scales are pale throughout, and the indusia are devoid of glands. The last-named has also a creeping caudex, while in *L. dilatata* the caudex is erect or somewhat decumbent, but not creeping. It is a large, handsome plant, the fronds being in very luxuriant examples five feet in length, their average length being one or two feet, and from half a foot to a foot in breadth. The general outline of the fronds is ovate-lanceolate or somewhat deltoid; they are more deeply cut, and of a brighter and darker green (lighter below) than those of *L. spinulosa*, and the pinnæ are placed more closely together.

Lastrea dilatata is a plant of wide European distribution, extending to Madeira, and appearing in Canada and in the United States. It is found also in the Azores, and occurs in Kamtschatka. In Britain it is more common than *L. spinulosa*, being found in most counties, affecting shady situations, such as moist woods and hedge-banks; while in Ireland it is much more abundant, being widely spread throughout the country, while *L. spinulosa*

Vincent Brooks Day & Son Lith.

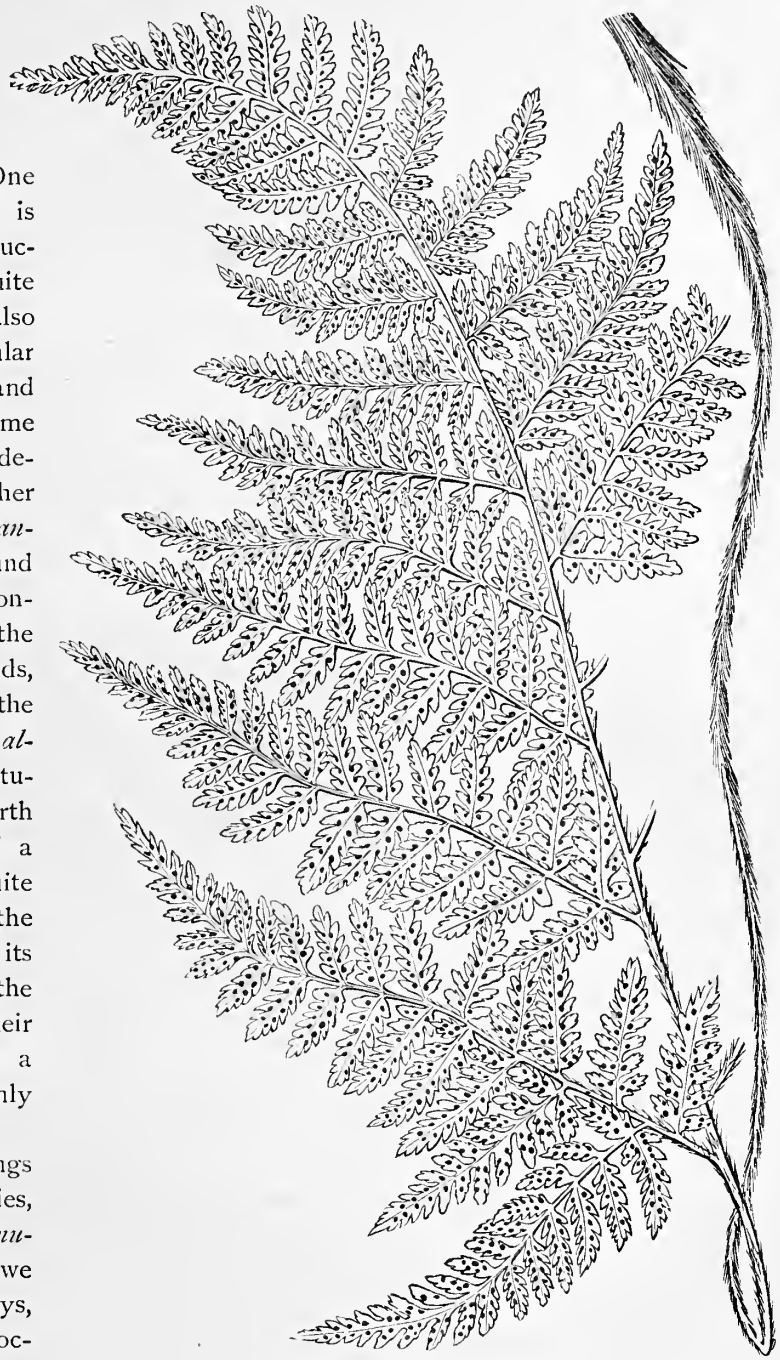
1. ASPIDIUM FŒNISECII 2. ASPIDIUM CRISTATUM.

(1/6 NATURAL SIZE.)

1A UNDER SIDE OF FERTILE PINNA. 2A UNDER SIDE OF FERTILE PINNA. NAT SIZE

occurs in comparatively few localities. It is a very variable plant, but space will not permit us to do more than glance at one or two of the principal forms.

The variety *dumetorum*, of which a figure is appended, is a small plant with oblong-ovate, bipinnate fronds, their underside as well as the stipites being covered with glands. One remarkable feature in this form is the profusion with which the fructification is produced upon quite young plants; the fronds are also often marked with dark, irregular blotches upon both the upper and under surface, and to this the name *maculata* (under which Deakin described the plant) refers. Another distinct form is the variety *Chanteriæ*, which has only been found in one or two localities in Devonshire; it is distinguished by the narrow, slender apex of the fronds, the pinnæ being distant and the pinnules blunt. In the variety *alpina*—which occurs in elevated situations in Scotland and in the north of England—the fronds are of a delicate, membranous structure, quite exceptional in the forms of the species; the variety *nana* is, as its name implies, a dwarf plant, the whole length of the fronds, their stipites included, not exceeding a foot, and occasionally being only two inches.



FROND OF LASTREA FŒNISECII.

Sir William Hooker* brings together as forms of one species, not only *L. dilatata* and *L. spinulosa*, but also *L. æmula*, which we have next to consider. He says, "Perhaps no group of ferns has occasioned more difference of opinion than the supposed species I have here brought under the *Aspidium spinulosum*." The confusion that exists with regard to these forms is indeed almost endless; and they are so closely connected, and at the same time

* "Species Filicum," vol. iv., p. 129.

present so much variation, that it would be impossible in a sketch like this to give any account of them. *L. dilatata* is easily grown, attaining a large size in moderately moist and shady situations, and remaining green during almost the whole year when slightly sheltered from the weather.

HAY-SCENTED FERN: LASTREA ÆMULA, *Brack.*

We have here a fern, resembling in many points the two species last described, and, indeed, united with them by some botanists, which is easily distinguished from them by its pleasant odour of new-mown hay. One would not usually consider the scent of the plant as likely to form a specific character; but both in a living and in a dried state this odour is so powerful in *L. æmula* as at once to distinguish it. The rich evergreen fronds have a curiously incurved or curled appearance which is very characteristic, and their outline is usually more distinctly triangular than in the foregoing species. It is a smaller plant than either *dilatata* or *spinulosa;* Mr. Moore draws attention to a character furnished by the manner in which the fronds decay: "Whilst the fronds of *cristata* [in which he includes *spinulosa*] and *dilatata* decay first near the base of the stipes, so that the fronds often fall while they yet appear green and fresh upwards; in *æmula* the stipes continues firm while the frond itself is undergoing decay, the disorganisation going on from above downwards, and not from below upwards."

L. æmula (which is also known as *L. fœnisecii*) is abundant in some parts of Britain, although its distribution is somewhat local: it is mainly confined to the south and west of England, being recorded from the counties of Cornwall, Devon, Somerset, Dorset, Sussex, Kent, Glamorgan, Pembroke, Carnarvon, Anglesey, York, Westmoreland, and Cumberland, and less certainly from Herefordshire and Shropshire. In Scotland it is found in Dumbartonshire, the Orkneys, and the islands of the Clyde. It is very abundant in the west of Ireland, attaining a height of nearly three feet in some of the shady thickets about Killarney. It is not known in Europe beyond the limits of the United Kingdom, but is abundant in Madeira and the Azores, although absent from the Canaries: its distribution is thus extremely limited. *L. æmula* is easily cultivated, if planted in a porous soil, being readily increased by the separation of the crowns: it is a handsome plant, and deserves a place in every collection of ferns.

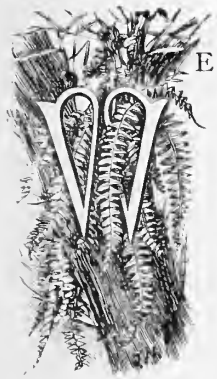
Vincent Brooks Day & Son Lt.

1. POLYPODIUM VULGARE (COMMON POLOPODY. 2. POLYPODIUM PHEGOPTERIS, (BEECH FERN)

($\frac{2}{3}$ NATURAL SIZE.)

3. PINNA OF P. VULGARE (UNDER SURFACE) NATURAL SIZE
4. PINNA OF P. PHEGOPTERIS D° D°
5. PINNULE OF P. PHEGOPTERIS D° 4 TIMES NATURAL SIZE

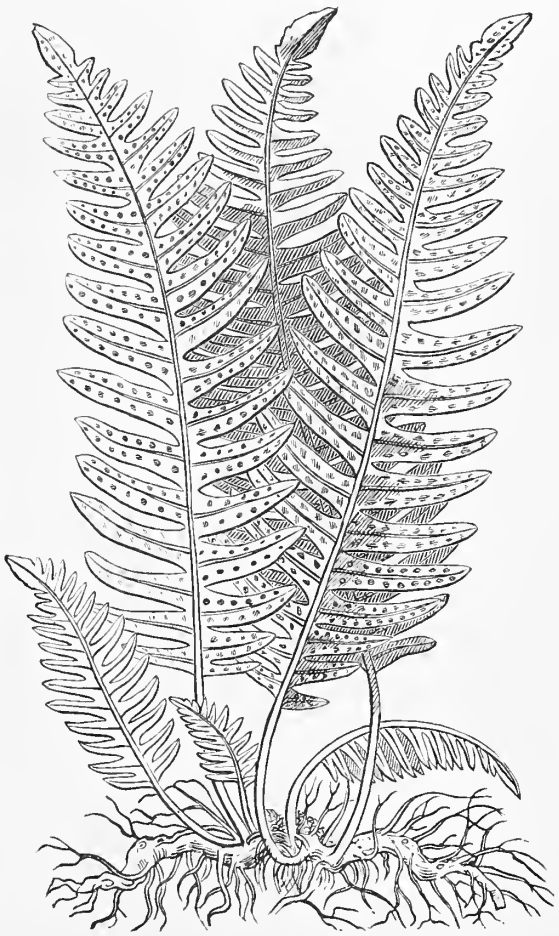
POLYPODIUM.



WE have here one of the largest genera of ferns, the members of which are of very varied size and habit, and of wide distribution. The authors of the "Synopsis Filicum" enumerate about 450 species, and the number has since been increased. Our European species will be found to differ sufficiently from each other in general appearance; but there is a group not represented among them in which the fronds are quite simple and entire, of narrow outline, the round sori being disposed in rows, one on each side of the midrib. The limits of this work will not allow us to point out in detail the features of interest connected with the members of the genus; and we will therefore pass at once to the consideration of

THE COMMON POLYPODY: POLYPODIUM VULGARE, *L.*

Although it cannot take rank among the more graceful of our ferns, the common Polypody is one of the most characteristic as well as one of the most cheerful in aspect, owing to the bright yellow round patches of sori which enliven the back of the mature frond. It is a common plant, found, however, in very different habitats — now extending along the trunk or branches of a knotted oak, now forming large tufts and patches in the hedgebank overhanging some pool or stream, now peering out from the crevices, or forming a thick covering to the top of some old wall. The figure reproduced from Gerard's Herbal gives a good idea of the plant, as well as of the style of engraving used in our old books. Although the name of Oak Fern is in our books bestowed upon another species (*P. Dryopteris*), the common Polypody was certainly the original owner of the title, and in the old herbals is known as Polypody of the Oak, or Oak Fern. It is widely diffused throughout Great Britain and Ireland, and also throughout Europe, as well as in most of the cold and temperate regions of the world: in Asia we find it in Siberia, Turkey, and Japan; in Africa, in the north (Algiers) and south (Cape Colony); and it is widely spread in the United States, extending in America as far north as Sitka, and occurring in California and Mexico.



POLYPODIUM VULGARE. (*From Gerard's Herbal.*)

As a remedial agent in various disorders, particularly those connected with the lungs, the

Polypody, especially when growing on the oak, has long endured a high reputation, which, indeed, is not yet entirely extinct. Drayton speaks of it as the "rheum-purging Polypody," and such herbals as Langham's "Garden of Health" devote a good deal of space to the record of its "virtues." Mr. Newman says that he has seen women collecting it in Herefordshire as a specific against whooping-cough. It was gathered late in the year, when the sori were fully developed, barren fronds being rejected; having been hung up to dry the whole plant was slowly boiled with coarse, raw sugar, a mucilaginous decoction of the fronds being the way in which it was most frequently ad-

PORTIONS OF FROND OF POLYPODIUM CORNUBIENSE.

ministered. In the Arran Islands, in Galway Bay, Mr. Hart met with a strong belief in its properties, which, indeed, savour somewhat of the marvellous.* An old woman thus prescribed its use: "It was to be pulled in the full moon, and the roots of it buried in porridge, and left there for the night; but if you do place the root as it grows, it will work you downwards, and if you place it upside down it will work you upwards; but if you put it both ways it

* "Journal of Botany," 1873, p. 339.

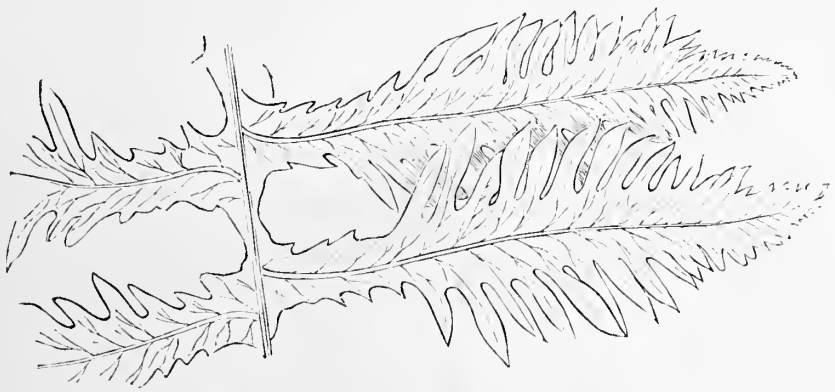
2. POLYPODIUM ROBERTIANUM

4. PINNA OF P. ROBERTIANUM (UPPER SURFACE)
1½ TIMES NATURAL SIZE

5. PINNULE ENLARGED 7½ TIMES

will work you up and down, and it is the best physic that grows!" It seems to have been formerly imported into Ireland; Threlkeld, writing in 1727, says: "The roots are used for purging in antiscorbutick diet-drinks; Ireland is so miserably bereft of woods, that most of what we use is imported." In France, a preparation of the root is still sometimes used as a purgative for children, and it is also thought beneficial in colds. In Hampshire it is known under the name of Adder's Fern; in Herefordshire, under that of Golden-locks and Golden Maidenhair.

The fronds of the Common Polypody rise from a branched, creeping rootstock, which is thickly covered with brown scales; these fronds have a naked stipes, often nearly as long as the leafy portion. The fern varies a great deal in size: sometimes the fronds are as much as a foot, or even a foot and a half in length; at others they do not exceed a couple of inches, this latter being the case with specimens growing on walls. They are somewhat tough or leathery in texture, dark-green above, and paler below, their general outline being narrowly ovate or oblong; the segments are simple, sometimes rather serrated, and usually blunt at



PORTION OF FROND OF POLYPODIUM CAMBRICUM.

the apex. The veins are prominent, the central one being alternately branched, and these branches being again divided. Each sorus originates at the apex of a veinlet. The bright yellow sori are conspicuous and well known. Mr. Moore points out that the common Polypody differs from all the other British species associated with it in the character of having its fronds articulated with the rhizome—that is, attached in such a manner that they separate spontaneously as they approach decay.

The Polypody is a very variable species, and a large number of varieties have been named and described, many of which are based on the various ways in which the pinnæ are cut and divided. The most elegant of these is named *cornubiense;* of portions of a frond of this variety we give figures on page 164. Another very striking form is that known as the Welsh Polypody (*cambricum*), of which the figure of a portion of a frond is appended. This, as its name implies, was originally found in Wales; the regularly bipinnatifid fronds are divided into narrow segments, very variable in shape, and they are always barren. This form has been met with several times in a wild state; in cultivation it is not uncommon. The form *semilacerum*, often called the Irish Polypody, having been first found in Ireland, although it has since been met with in many other localities, is the most divided of all the fertile forms of the plant; it bears a general likeness to *cambricum*, except in its fertility, and like it is

constant in cultivation. Mr. Moore enumerates and describes sixteen varieties in all, including a pretty plant having the points of all the segments crisped and tasselled, known as *cristatum*.

THE OAK FERN: POLYPODIUM DRYOPTERIS, *L.*

Although *P. Dryopteris* is so generally known, both in books and in ordinary conversation, as the Oak Fern, this title, as we have already said, belongs of right to the species last described. The present is one of our most delicate and beautiful ferns, attracting attention at once by its graceful light-green fronds. In the south of England it is rare, North Devon and East Cornwall being the only counties in which it is found south of Gloucestershire. In the centre and north of England it is widely distributed, as also in Scotland. In Ireland it is very rare, its only certain stations being on Benbo mountain, in co. Leitrim, at an elevation of eight hundred feet, and sparingly on Knochlayd mountain, co. Antrim, at the height of about eighteen hundred feet; other recorded Irish localities require confirmation. It is widely distributed through Europe, from the extreme north to Italy, Spain, and Gibraltar; in Asia it has been found in Siberia and Kamtschatka, the Himalayas, and quite lately in the Kuram Valley, Afghanistan; and it is reported from Africa, although we do not know from what region. In America it is widely spread, occurring in Arctic Greenland and Labrador, Sitka, the Rocky Mountains, the United States, and Newfoundland.

POLYPODIUM DRYOPTERIS.

From the slender-branched perennial caudex of the Oak Fern arise three-branched fronds from four to twelve inches, or even more, in height, and about half as broad proportionately, including the stipes. In vernation the fronds present a curious appearance, each branch forming a compact little ball, apparently supported on green wire; when the fronds unfold they are of a pale, but very exquisite green, and this hue is perhaps the greatest charm of the plant. Being of but annual duration the fronds die down completely in the winter, leaving a gap upon the rockwork which does not altogether satisfy the cultivator. The branches of the frond are pinnate or sub-pinnate, the pinnæ on the lower side of the two lateral branches being larger than the rest: the pinnules are blunt and wavy. The fructification consists of numerous small sori scattered all over the surface of the back of the fronds.

To appreciate the beauty of the Oak Fern it is necessary to see it growing in profusion among the rocks and stones of the lake district, or in the mountains of North Wales, where its bright, delicate hue lightens up the stony masses in a charming manner. Unfortunately it withers very readily, so that unless seen in a growing state it is difficult to form any idea of its extreme elegance. It is not a difficult fern to grow, succeeding well in a mixture of

two-thirds of fibry peat to one of leaf-mould, mixed with sand and rubble. Water must not be allowed to settle about the roots, free drainage being essential.

THE LIMESTONE POLYPODY: POLYPODIUM ROBERTIANUM, *Hoffm.*

This species, which is also known as *P. calcareum*, Smith., is by some writers considered as a variety of the preceding—an opinion in which, after the examination of a large series

FROND OF POLYPODIUM ROBERTIANUM.

of specimens, we do not feel inclined to concur. It is a plant of rigid, upright habit, and is altogether a more stiff-growing, upright species than *P. Dryopteris;* the shape of the fronds, as is shown by the figures, differs a good deal from that of the fronds of *P. Dryopteris.* The last-named plant, too, although soft to the touch, is perfectly smooth; *P. Robertianum*, on the contrary, is covered throughout with a glandular pubescence, which is especially noticeable upon the rachis and stipes.

The distribution of the Limestone Polypody in England affords some very curious problems. It is now some twelve or fourteen years since we were shown two specimens which had been gathered in a wood near High Wycombe, in Buckinghamshire; the bona fides of the collector was above suspicion, but the most careful searching in the wood failed to detect other specimens; and this appears to be the only occasion upon which it has been found in that county. In Oxfordshire it was, we believe, once found in Wychwood Forest, but this was many years ago. The other English counties recorded for it are Somerset, Wiltshire, Gloucester, Hereford, Stafford, Worcester, Shropshire, Derbyshire, Yorkshire, Lancashire, Durham,

and Westmoreland; in Wales it is found in Glamorgan, Brecon, and Denbigh. Carnarvonshire is also recorded, but on doubtful authority. From Scotland and Ireland it is entirely absent; a circumstance the more remarkable as in Ireland, at any rate, the rocky limestone districts seem to afford a suitable habitat. It is met with over a good part of Europe, especially in the northern regions, and in Asia it was collected in the Himalayas by Hooker and Thomson at an elevation of from five to eight thousand feet. Its North American distribution is limited, though it is found in Canada and the United States.

It will be seen from this that *P. Robertianum* is a far less common plant than *P. Dryopteris*, nor is it at all as ornamental a species. It is easily cultivated, care being taken to keep the plants well drained; they may be exposed to moderate sun without fear of unfavourable results.

THE BEECH FERN: POLYPODIUM PHEGOPTERIS, *L.*

This is a pretty and graceful fern, readily distinguished from all other European species by the downward direction of the lowermost pair of pinnæ; a glance at the plate will illustrate this peculiarity better than any verbal description. By no means a common plant, it is nevertheless one of general distribution in Britain, being recorded for most of the English and Scottish counties; in Ireland it is local and rather rare. It is found throughout the greater part of Europe, extending from Scandinavia to Spain, North Italy, and Greece, and occurring in most, if not all, of the intervening regions. In Asia it is recorded for Siberia, Mandschuria, and Kamtschatka, and also for Japan. It is not certainly known to occur in Africa, and has not been found in Australia; in North America it occurs near the sources of the Columbia river, throughout the United States, and in Greenland, Labrador, Newfoundland, and Canada.

The fronds of the Beech Fern rise from a black, slender caudex, which is creeping and branched: this is perennial, but the fronds are annual. The stipes, which is often twice as long as the frond, and always exceeds it in length, is dark-purple below and greenish above, having in its earlier stages a few scattered scales near the base, which, however, soon fall off and disappear. The entire frond, including the stipes, varies from four inches to a foot and a half in length, its usual length being about a foot; it is hairy, and its hue is a soft rather dull green; its general outline is ovate, somewhat triangular, and much elongated towards the apex. The lowest pair of pinnæ is, as has already been said, deflexed, diverging from the remainder; all are sessile, being attached to the rachis by the entire breadth of the base, and thus united to each other. The upper pinnæ are more or less directed upwards; the lobes are obtuse, entire or slightly crenate, the venation consisting of a slender central vein from which proceed numerous smaller veins which extend to the margin of the lobe. The small circular sori are scattered over the back of the frond, more especially near the margins of the lobes.

The Beech Fern—a name, by the way, which is inappropriate, although it is a translation of the scientific one, inasmuch as the plant does not grow under the shade of beeches—is not difficult to cultivate. It is best grown in pots under glass, as when exposed to the weather the fronds soon become shabby owing to their delicate texture. Although requiring plenty of water, care must be exercised to prevent anything approaching stagnation about the roots. The pot should be filled in its lower portion with small lumps of charcoal or rubbly material through which the moisture can readily percolate; on this should be placed peat earth with a slight admixture of sand and leaf-mould; in this the fern will grow and flourish.

This is one of the least variable of ferns. The apex of the frond or of some of the pinnæ

POLYPODIUM ALPESTRE.

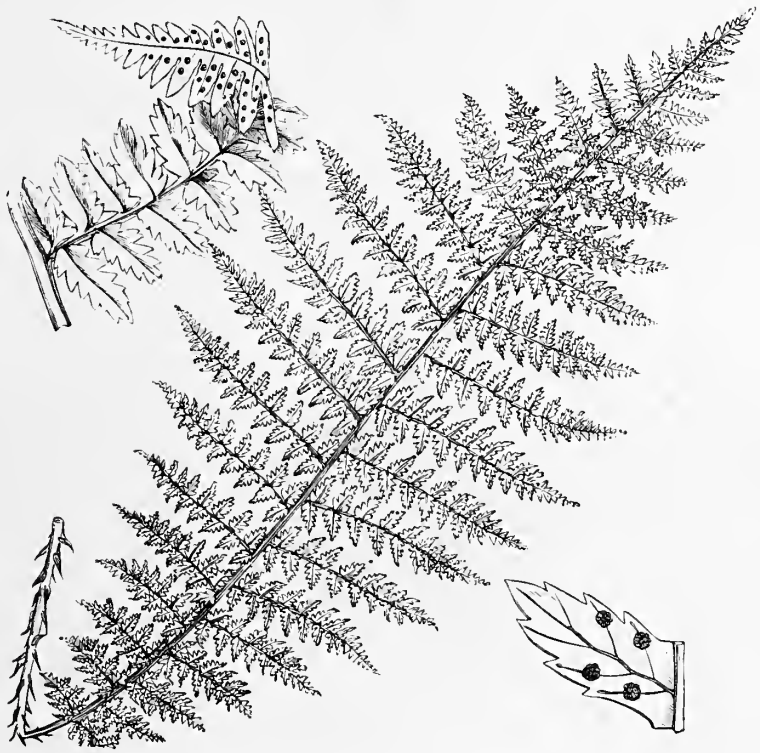
1/5 NAT. SIZE.

1. PINNULE NAT. SIZE. 2. PINNULE, TWICE NAT. SIZE. 3. UNDER SURFACE OF THE SAME.

is occasionally divided; but this is an abnormality common to most ferns, and no form of the species has been considered worthy of a name.

POLYPODIUM ALPESTRE, *Hoppe.*

This is a species regarding which different views have been taken, the result of which is that it has been placed in various genera. Different authors have regarded it as a Polypodium, an Aspidium, and an Athyrium; and Mr. Newman regarded it as the type of a distinct genus, which he called *Pseudathyrium.* We follow Mr. Moore in placing it in *Polypodium.*



POLYPODIUM ALPESTRE (REDUCED).

Besides the various generic names, its specific one varies, it being often referred to as *Polypodium rhæticum*, under which name we have included it in our preliminary list (Introduction, p. xvii.).

Although considered as a *Polypodium* by the best authorities, it must be admitted that this fern has little resemblance in appearance to the other members of that genus. It is, indeed, far more like the Lady Fern (*Athyrium Filix-fœmina*); so much so, indeed, as to be frequently confounded with it. The short thick tufted caudex and the general form and style of the fronds remind one at once of *Athyrium* or *Lastrea;* but the fruit usually at once distinguishes it from either of those genera. Those who have regarded it as a *Lastrea* or as a separate genus have done so on account of the indusium which they supposed to exist. On this point it may be well to extract what Mr. Moore has said: "The supposed 'indusia' ascribed to this plant, which may be noticed both in the species itself, and in the variety *flexile*, are

only occasional, or even rare, and they appear never to be seen in company with the more perfect sori, but only where the spore-cases are much fewer in number than usual. Now they have the appearance of lacerated membranaceo-filamentous expansions of those points of the veins which form the receptacles, and appear to arise from some abnormal condition, perhaps inherent, which limits the power of producing spore-cases to the side or base of the receptacle, while on the upper side its cells are directly prolonged into the indusioid membrane. In no case have we seen what could be considered as a perfect and fully developed indusium."

The stem or caudex of *Polypodium alpestre* is short and stout, with a broad scaly crown, the fronds being arranged in a shuttle-cock-like fashion. These are from a foot to three feet or more in height, the stipes being about a sixth of the whole frond; this is clothed rather sparingly with long light-brown scales. The habit of the fronds is somewhat stiff, upright or ascending; they are lanceolate and taper both to the base and to the apex, measuring about six inches or so across in their widest part. The pinnæ, of which there are from twenty to thirty pairs upon the average frond, are ascending and narrow, with ovate oblong acute pinnules, which are connected at the base by a narrow wing; they are deeply cut or lobed. The sori are placed on the back of the lowermost venules, and appear as though placed in a notch between two lobes of the pinnules; they are confined to the upper half or two-thirds of the frond.

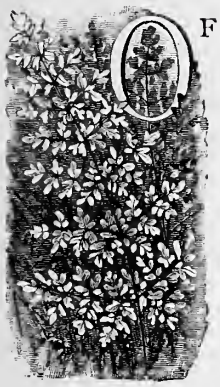
The distribution of *Polypodium alpestre* is by no means wide. In Britain it is mainly confined to the east Highlands of Scotland, where it is abundant, often growing with the Lady Fern; and it occurs also sparingly in Inverness-shire and Sutherlandshire. It is apparently much relished by sheep, and collectors have said that it is difficult to obtain specimens which have not been cropped by these animals. It has not been found in Ireland, and its European distribution is limited. It is most frequently met with in the north, being abundant in Norway, Sweden, and Lapland; it is found in the Carpathian Mountains, the Black Forest, and in the Pyrenees, but is rare in the south; it is recorded from the Caucasus, and from Lazistan in Asia Minor. In the New World it is found in Sitka, California, and Oregon.

POLYPODIUM FLEXILE, *Moore.*

This is a plant nearly allied to the preceding, and probably only a well-marked variety of it, although it is kept distinct by Newman. It is a more slender and delicate plant than *P. alpestre;* in general outline it is much narrower, the pinnæ being shorter, and the stipes very short or even absent; the sori are borne upon the lower portion of the fronds. Dr. F. B. White has published a paper upon these two plants, in which, after contrasting a series of specimens of each, he considers the narrow base of the pinnules, the somewhat narrower frond, and the general habit of the plant as the only characters by which *P. flexile* can be separated from *P. alpestre.* This being practically all that can be found in the way of specific character, it is rather strange to find Dr. White advocating the maintenance of the two as distinct species. *P. flexile* is even more restricted in geographical range than *P. alpestre.* Its best known locality is Glen Proven, Forfarshire, and it is said to have been found in Sutherlandshire; Milde records it as occurring in Lithuania.

The two plants are not difficult to grow. The first will do well in an open border in bog-earth; in a greenhouse it flourishes in similar soil, in a large pot, plenty of water being supplied, which must not be suffered to stagnate. *P. flexile* makes a very pretty pot-plant in a cool greenhouse, requiring similar treatment to that advised for *P. alpestre.*

NOTHOLÆNA.



OF this genus we have two representatives in Europe, which may at once be roughly distinguished from any other European fern by their soft dense woolly or scaly covering. The genus is not a large one, comprising between thirty and forty species, which range over the tropical and warmer temperate regions of both hemispheres. It is characterised among European ferns by linear or long-oblong dorsal sori, coupled with the dense scaly clothing of the fronds; the latter character separates it from *Gymnogramma*, to which it is otherwise nearly allied, and with which it is united by Milde. The species have tufted rhizomes, with small pinnate or bipinnate fronds, which are often, as in the European examples, hairy or woolly, and in other cases covered beneath with a farinose or silvery-white powder, as in some of the species of *Gymnogramma*. Many of them, although small, are very ornamental: among them may be noted *N. Hookeri*, a plant with bright-green bipinnate fronds, covered beneath with a shining white powder; *N. tomentosa*, which, as its name denotes, is woolly, the segments of the pinnules being very small and fringed with brown hairs; and *N. argentea*, the silvery back of which is made more striking by the margin of dark-brown fructification with which it is bordered.

The name *Notholæna* is often written *Nothochlæna*. This is an error; Robert Brown, the founder of the genus, wrote *Notholæna*. Mr. C. B. Clarke regards it as derived from λῆνος, "pseudo-wool," in reference to the scales on the back of the fronds.* Mr. Bentham says "the contraction of χλαῖνα into *læna*, after the example of the Romans, has been too generally sanctioned by botanists in many other cases, such as *Diplolæna*, *Eriolæna*, *Microlæna*, etc., to be here rejected." †

NOTHOLÆNA MARANTÆ, *Br.*

This is a plant with a densely scaly stout woody rhizome, the scales being of a bright reddish-brown. The stout stipites, from three to six inches in length, grow closely together, and, like the rachis, are densely hairy; the bipinnate fronds vary from four to ten inches, or even to a foot, in length; they are bipinnate and narrow—from an inch and a half to three inches across—with lanceolate pinnæ composed of small entire pinnules. The fronds are somewhat leathery in texture, pale-green and smooth upon the upper surface, but bright-brown below, owing to the ferruginous scales with which they are densely covered. The sori form a broad border extending some way from the margin, and much concealed by the scaly covering of the fronds.

N. Marantæ is found upon the continent of Europe throughout the Mediterranean region, extending to Botzen in the Tyrol, and Hungary, and to Ardêche and Portugal; in Spain it ascends upon the mountains to the height of three thousand feet, growing among stones and in the fissures of rocks in shady places. It occurs also in North Africa (Barbary) and Abyssinia, as well as in several of the African islands, such as the Cape de Verde Islands, the Azores, Madeira,

* Trans. Linn. Soc. 2nd series (Botany), i. 567.
† "Flora Australiensis," vii. 773.

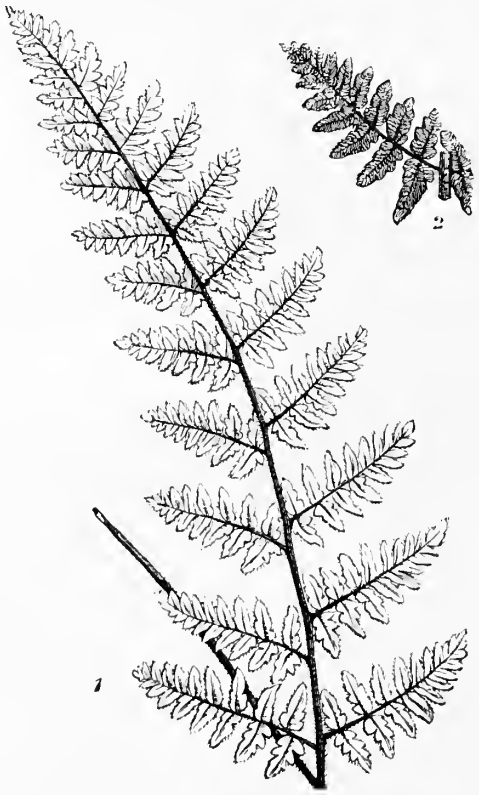
and the Canaries. It is reported also from Tauria and Syria, and ascends in the Himalayas to an elevation of between fourteen and fifteen thousand feet.

Although not often met with in cultivation, *N. Marantæ* is a very pretty fern, and will grow well under greenhouse treatment.

NOTHOLÆNA LANUGINOSA, *Desv.*

This, as its name implies, is a woolly plant, and is at once distinguished from its congener by the dense soft woolly coating with which it is covered throughout, although this coating is less dense upon the upper side. It is a smaller plant than *N. Marantæ*, the bipinnate fronds being about eight inches long and an inch or a little more broad; they are broadest in the middle. The pinnæ are lanceolate, placed closely together. It is a very handsome little plant, suitable for greenhouse cultivation.

Like the last, *N. lanuginosa* is a plant of Spain and the Mediterranean region, extending to North Africa, the Cape de Verde Islands, Madeira, and Teneriffe, and also to temperate and tropical Australia. This occurrence of a Mediterranean species in Australia is a somewhat remarkable fact in plant distribution.



(1) FROND OF NOTHOLÆNA MARANTÆ.
(2) UNDER-SIDE OF PINNA.

1. NOTHOLÆNA LANUGINOSA *(Desv)*

NATURAL SIZE

1A UPPER SURFACE OF PINNULE } 4 TIMES
1B UNDER SURFACE OF PINNULE } NAT SIZE

3 GYMNOGRAMMA LEPTOPHYLLA *(Desv)*

(NATURAL SIZE

3A UPPER SURFACE OF PINNULE } TWICE
3B UNDER SURFACE OF PINNULE } NAT SIZE

2 NOTHOLÆNA MARANTÆ *(? Br)*

(NATURAL SIZE)

2A UPPER SURFACE OF PINNULE } 4 TIMES
2B UNDER SURFACE OF PINNULE } NAT SIZE

GYMNOGRAMMA.

THIS is a genus of about a hundred species, containing plants of varied habit, natives for the most part of tropical regions. Under the name of Gold Fern and Silver Fern some of the species are among the most favourite ferns of stove collections, owing their English name, and the beautiful appearance to which they are indebted for it, to the bright mealy powder with which the underside of the fronds is covered. *G. chrysophylla*, a West Indian species, is perhaps the best known of the golden-fronded group; the fronds vary from less than a foot to two feet in length, being light-green above and of a golden hue on the under-surface; *G. sulphurea*, another West Indian species, is similar in hue, but is a much smaller plant. The best known of the Silver Ferns are *G. calomelanos*, which is also West Indian, and has large bipinnate fronds one to three feet long, dark-green above and white beneath; and *G. tartarea*, from South America. There is a great amount of variation in the species, and some very handsome forms, either hybrids or "sports," are in cultivation. *G. chærophylla* is a pretty little plant which does well in a Wardian-case, and, once established in a fernery, will readily reproduce itself by spores: like an ordinary European species hereafter to be described at length, it is of annual duration—a somewhat exceptional occurrence among ferns. It is a small plant, from six to ten inches high, with very finely-divided bright-green triangular fronds, and is a native of Tropical South America. There are many other species of *Gymnogramma* in cultivation, all of which are deservedly admired.

GYMNOGRAMMA LEPTOPHYLLA, *Desv.*

This pretty little fern is a plant of wide geographical range—found, indeed, in each of the great divisions of the world, although in America it is far from widely distributed, occurring at Vera Cruz, in Mexico, and in Ecuador. In Europe it is confined to southern and central regions, finding its north limit in Switzerland and France; in the latter country Jersey should be included for purposes of botanical geography, for the including of Jersey plants in the British flora has always seemed to us very unscientific. It has, indeed, been recorded from a Scottish locality—by the road leading from Braemar to Ballater, in Aberdeenshire—but some error must have occurred. In South Europe we find it in abundance in Spain, Portugal, and Italy—indeed, it is one of the characteristic species of the Mediterranean region, growing freely upon walls and rocks in rather moist situations; Sicily, Corsica, and other Mediterranean islands produce it, and it extends to Turkey and Greece. It occurs in the north of Africa (Algiers, Barbary, Morocco, etc.), and likewise in the south (Cape of Good Hope), as also in Abyssinia and in the Atlantic islands—the Azores, Cape Verde Islands, and the Canaries—where it is abundant. In Asia it is recorded from Ghilan and Lazistan, from an island in the Persian Gulf, and from the Neilgherries, as well as from other Indian localities; it also occurs in Australia (Victoria, Swan River, and Tasmania) and New Zealand.

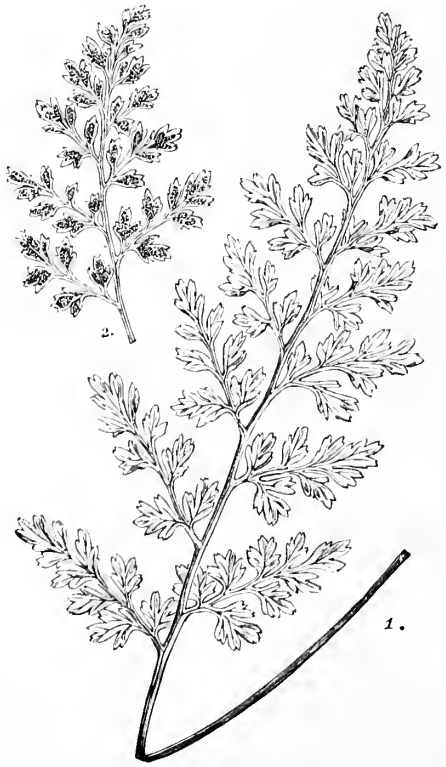
The fronds of *Gymnogramma leptophylla* are few in number, rising upright from the small tufted caudex, and from three to six inches high, the stipes being short; in shape they are ovate or somewhat triangular, twice or three times pinnate. These fronds are fertile, the

clusters of spores appearing at first like lines upon the under portion, but afterwards opening and covering the whole of it. There are also other and shorter fronds, of a more membranous texture, and less divided, which produce little or no fruit; the principal fronds are cut into very slender segments.

This fern, which is sometimes called the Annual Maidenhair, grows readily under a bell-glass in a mixture of light loam and sand, scattering its spores freely, and becoming almost a weed under favourable circumstances. It is a pretty little species, and well worth cultivating.

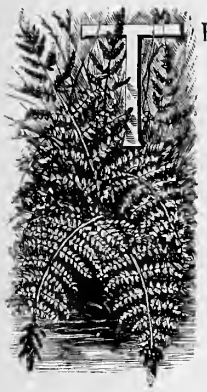
GYMNOGRAMMA POZOI, *Kunze.*

This is a very rare little fern, found only in the fissures of shady rocks in the mountain regions of Cantabria, where it was collected by a Spanish botanist named Pozo (from whom it takes its name), and in two localities in Granada, at an elevation of three thousand feet. Although described as a distinct species, most authors are agreed in regarding it as an outlying form of *G. rutæfolia*, Hook., a common Australian species, occurring also in Chili and New Zealand. It is a small plant, with tufted pinnate fronds from three to six inches in length, the pinnæ being covered below with brown scaly hairs, which are also scattered over the upper surface. The sori are in linear rows in the centre of the under-side of each pinna, sometimes spreading over almost its whole surface. In the Spanish plant the fronds are of a thinner texture and greener hue than in the type. It has been placed by some authors in the genus *Ceterach*, in which it is placed in our introductory list (p. xvi.).



(1) FROND OF GYMNOGRAMMA LEPTOPHYLLA.
(2) UNDER-SIDE OF PINNA.

OSMUNDA.



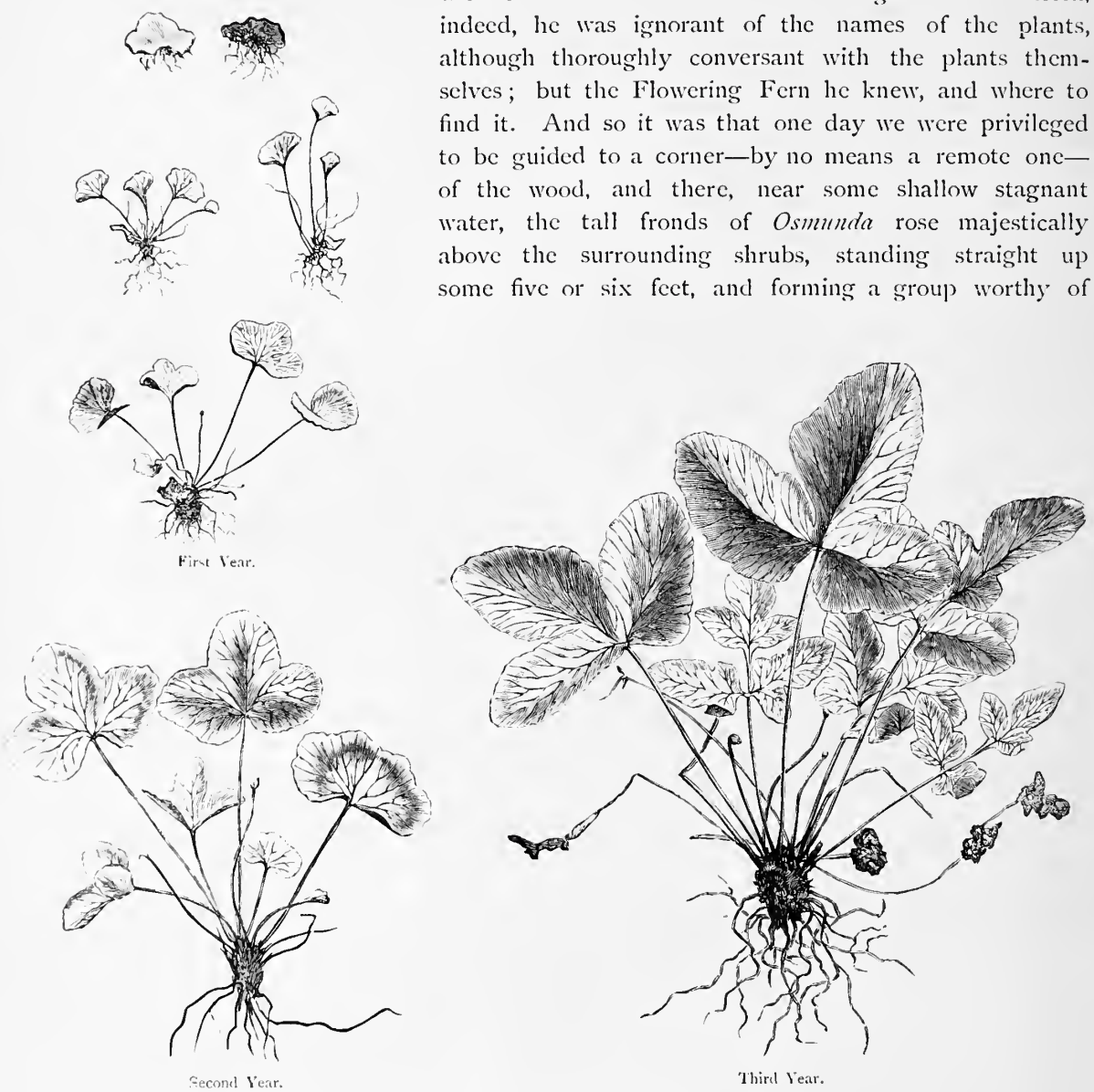
THE genus *Osmunda* is the type of a suborder of ferns, the *Osmundaceæ*, distinguished from the *Polypodiaceæ* by the technical characters given in our sketch of the classification of ferns (p. xiii.), and consisting of two genera: *Osmunda*, in which the sori are quite distinct from the leafy portion of the frond, forming a clustered panicle; and *Todea*—a small genus of large ferns which are almost confined to Australia and New Zealand, although one (*T. barbara*) extends to South Africa—in which the sori are, as usual, borne on the back of the leafy part of the frond. The authors of the "Synopsis Filicum" admit only six species, several which had been considered distinct by Presl being placed "without hesitation" under *O. regalis*. One species, *O. bipinnata*, is confined to Hong Kong, and another, *O. lancea*, to Japan; in the former of these it is the lowermost pinnæ that are fertile, the upper being barren, contrary to the order observed in a British species; the latter has distinct barren and fertile fronds. Two others, *O. Claytoniana* and *O. cinnamomea*, are common North American ferns, which were introduced to cultivation in England in 1772; the latter of these has separate barren and fertile fronds, the fertile ones, to the cinnamon-coloured sporangia of which the species owes its name, are produced from the centre of the tuft, perfecting fruit as they unfold, and withering long before the barren ones—which are at length four or five feet high—attain their full dimensions. In *O. Claytoniana* there is only one kind of frond, the sporangia being produced usually upon the middle pinnæ, but sometimes upon the upper or lower ones. It is a very pretty plant, and well worth growing. This extends to the Himalayas, ascending to ten thousand feet, while *O. cinnamomea* is of wider distribution still, extending in the New World to Mexico, New Granada, the West Indies, and Brazil, and in the Old World occurring in Japan, Amur-land, and Mandschuria. We will now proceed to describe our European species.

THE FLOWERING FERN: OSMUNDA REGALIS, *L.*

The handsomest and most striking of our European ferns is the one which we have now to consider. It is one of the best known and most sought after—one of which the English name seems to imply a contradiction, for a fern which could produce flowers would be no fern at all. We can understand, however, when we see the tall fronds topped by the rich reddish-brown panicle which is formed by the upper pinnæ covered with fructification, that a plant so different-looking from the ordinary ferns of humble growth, with the spores upon the back of their fronds, may have seemed in comparison to produce flowers; and so it obtained the name of *Filix florida* or *florescens*.

Very variable in habit is the Flowering Fern, much depending upon its place of growth; and it is quite likely that if first met with upon a moor or heath, where it attains only a small size, the impression will be one of disappointment. Our own introduction to the plant took place under singularly favourable circumstances. We had long heard rumours of its occurrence in or about a certain wood, and had hunted in vain for it in almost every direction, when we were fortunate enough to make the acquaintance of one of those naturalists in humble life

whose knowledge and practical work has only lately been recognised by the appreciation shown to some of their leading representatives. We soon found that our friend was fully acquainted with the flora and fauna of his neighbourhood—often, indeed, he was ignorant of the names of the plants, although thoroughly conversant with the plants themselves; but the Flowering Fern he knew, and where to find it. And so it was that one day we were privileged to be guided to a corner—by no means a remote one—of the wood, and there, near some shallow stagnant water, the tall fronds of *Osmunda* rose majestically above the surrounding shrubs, standing straight up some five or six feet, and forming a group worthy of



YOUNG PLANTS OF FLOWERING FERN.

an artist's pencil. There were not many specimens, but those that there were were singularly fine ones; and, although we have since so often seen the Royal Fern in abundance, we have never seen it to such advantage as in this quiet corner of a Buckinghamshire wood. Mr. Newman speaks of the impression which the Flowering Fern, fringing the river between the lakes at Killarney, made upon the great Scottish novelist. "One of the boatmen employed by Sir Walter Scott," he says, "on the occasion of his visit to Killarney, told me that Sir Walter scarcely uttered a syllable in praise of the scenery until he came to this spot; and here he stopped the rowers, and exclaimed, '*This* is worth coming to see!' The boatman

evidently thought very meanly of Sir Walter's opinion, whom he considered in duty bound to be in raptures with the lakes and mountains. I do not wonder at the great man's taste:

YOUNG PLANT OF FLOWERING FERN. (FOURTH YEAR.)

to me it appeared the most wonderfully beautiful spot I had ever beheld, and this beauty is mainly owing to the immense size and number of these pendent fronds."

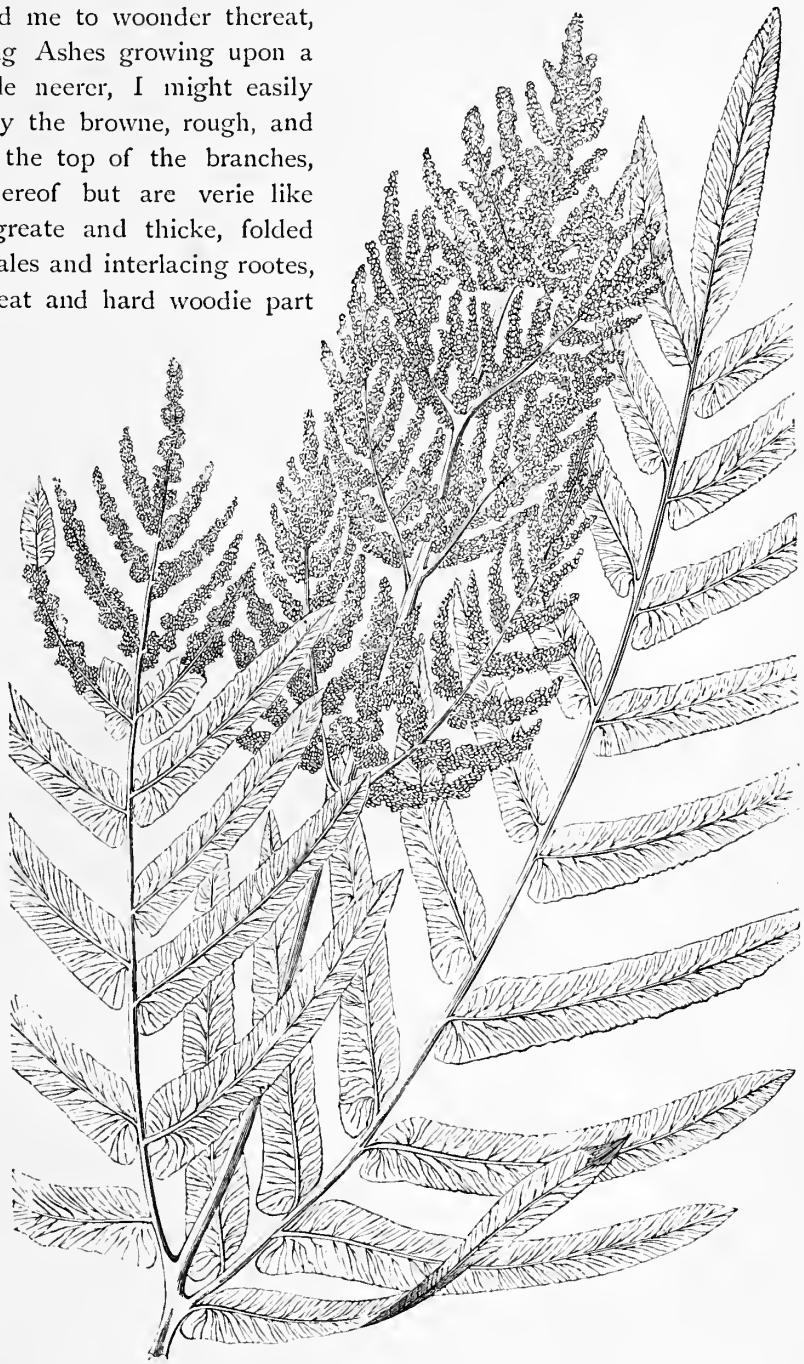
Although much sought after, and regarded as uncommon, the Flowering Fern is very generally

distributed in Britain, extending from the extreme south to the Hebrides and the Shetland Islands, although absent or unrecorded from many of the Scottish counties. It is extremely plentiful throughout the west of Ireland, but becomes rare on the eastern side. Mr. Newman speaks of its abundance in the Island of Achill, where, upon one farm, it had become established as a weed in the fields, being very troublesome and difficult to eradicate. "I was amused," he says, "to see it towering over cabbages and potatoes, and intermixed with oats and wheat." An equally curious example of a bog plant becoming a weed struck us at Oakmere, in Cheshire, where we found the furrows in the oatfields round the lake full of Sundew (*Drosera rotundifolia*). The *Osmunda* is widely spread throughout the continent of Europe, from Sweden and Russia to Spain, Italy, and Turkey. On the continent of Africa it occurs in Algeria, Zambesi-land, and Angola, and also in many of the African islands—as Madagascar, Bourbon and Mauritius, and the Azores. In Asia it occurs in many parts of India, as Bombay, in the Neilghirries, and Madras. A form, or a closely allied species (*O. speciosa*), is found in the Himalayas, and another (var. *biformis*) in Japan and Hong-Kong. In North America, the common form has been described as a species under the name of *O. spectabilis;* this corresponds very closely with the European plant, but is generally smaller; the pinnules are also smaller in proportion and more distant; this is found in the United States, as well as in Newfoundland, Labrador, and Canada: in South America it occurs on the Organ mountains, at an elevation of about three thousand feet, and on the banks of the Uruguay.

The Flowering Fern is easily cultivated in moist places, such as by the side of a small stream, or by an artificial pool, and in these situations a clump of it is extremely effective; it prefers a peaty soil. It has been stated that the fern may also be successfully grown in dry situations; but the attempts at this mode of growth which we have seen have been by no means satisfactory. Those who wish to watch its development will find it easy to do this in a Wardian-case. Mr. Charles P. Hobkirk, of Huddersfield, has a fernery opening out of his dining-room, in the centre of that town, in which he has grown the *Osmunda* for many years; and we are indebted to him for a very interesting series of specimens illustrating the gradual development of the plant during the first four years of its existence, from which the figures on preceding pages have been made.

The numerous fronds of the Flowering Fern rise from a stout tufted caudex, which often developes upwards so as to resemble a trunk; this trunk is sometimes a foot and a half or more in length, and the plant thus resembles a tree-fern in habit. This caudex has been employed in medicine, and indeed still enters into rustic practice. Gerard says, "The roote, and especially the hart or middle part thereof, boiled or else stamped and taken with some kinde of liquor, is thought to be good for those that are wounded, dry beaten or brused, that have fallen from some high place: and for the same cause the Emperickes do put it in decoctions, which the later Phisitions do call wounde drinks: some take it to be so effectuall, and of so great a vertue, as that it can dissolve cluttered blood remaining in any inward part of the bodie, and that it also can expell or drive it out of the wound." In the Lake district, where the plant is known by the name of "Bog Onion," the caudex is still used as an outward application for sprains and bruises: it is beaten and covered with cold water, and allowed to remain thus during the night; in the morning a thick starchy fluid is the result, which is used to bathe the parts affected. This fluid was formerly used as a substitute for starch in the north of Europe. It is also considered a specific for rickets in children. Gerard's description of the plant is sufficiently quaint to be worth extracting:—"Water Ferne hath a great triangled stalke two

cubits high, beset upon each side with large leaves spread abroad like wings, and dented or cut like Polypodie: these leaves are like the large leaves of the Ash-tree: for doubtlesse when I first saw them afar off, it caused me to woonder thereat, thinking that I had seen yoong Ashes growing upon a bogge, but beholding it a little neerer, I might easily distinguish it from the Ashe, by the browne, rough, and round graines that grewe on the top of the branches, which yet are not the seede thereof but are verie like unto the seede: the roote is greate and thicke, folded and covered over with manie scales and interlacing rootes, having in the middle of the great and hard woodie part thereof some small whitenesse, which hath been called the hart of Osmund the waterman." His description of the localities in which the plant grew in his time also contains an amusing reference, and is worth citing as showing that the *Osmunda* was formerly a London plant: "It groweth in the midst of a bogge, at the further end of Hampsteede Heath from London, at the bottome of a hill adioning to a small cottage, and divers other places, as also upon divers bogges on a heath or common neere unto Burntwood [Brentwood] in Essex, especially neere unto a place there that some have digged, to the end for to finde a nest or mine of golde: but the birds were over fledge, and flowne away before their wings could be clipped." From the Hampstead locality it soon disappeared; for Johnson, writing less than forty years afterwards, says that it was not then to be found there.



UPPER PORTION OF FROND OF OSMUNDA.

The fronds of the Flowering Fern are about equally divided in length between the stipes and the leafy portion; their entire height varies from two to twelve feet, the former being

the length of the plants growing on open moorland, while the latter may be taken as the extreme of altitude attained by the plant in a shady situation. The base of the stipes is curiously flattened out, with a membranous margin, as shown in our plate. The rachis and stipes are pale reddish-brown when young, becoming green when mature. The leafy portion is delicate and membranous in a young state, and of a pale yellowish-brown hue, becoming leathery in texture and of a deep green when fully developed. The panicled upper or fertile portion is at first pale-green, becoming ultimately of a rich deep brown. "Each short spike-like branch of this panicle represents one of the pinnules, the spore-cases being collected on it into little more or less evident nodules, and the nodules corresponding to the fascicles of the veins. This becomes at once evident in the case of partially transformed pinnules,"* one of which we figure in our plate.

The origin of the name *Osmunda*, or "Osmund Royal," as the old writers call it, is involved in mystery; numerous suggestions have indeed been made, but none carries conviction with it. Some see in it a reference to the god Thor, under his name Osmund or Osmunder. Sir J. E. Smith says it "appears to have originated in England: Osmund, in Saxon, is the proper name of a man, said to mean domestic peace." Minsheu suggests that it may have been so called because a decoction of it was employed for washing the mouth (*ad os mundandum*). Dr. Prior thinks it is a corruption of the German *gross Mond-kraut*, greater moonwort, representing its ancient officinal name *Lunaria major*. Wordsworth's poetical reference to the plant suggests a derivation which is quite unsupported:—

"That tall fern
So stately, of the queen Osmunda named;
Plant lovelier, in its own retired abode
On Grasmere's beach, than naiad by the side
Of Grecian brook, or Lady of the Mere,
Sole-sitting by the shores of old romance."

Its really noble appearance may explain the English "King Fern," as well as the specific name *regalis*. In some lines quoted by the eccentric author of "The Circle of the Seasons" from one of his imaginary works we have another form of the name:—

"Auld Botany Ben was wont to jog
Through rotten slough and quagmire bog,
Or brimful dikes and marshes dank
Where Jack o'Lanterns play and prank,
To seek a cryptogamic store
Of carex, moss, and fungus hoar,
Of ferns and brakes, and such like sights
As tempt the scientific wights
On winter's day; but most his joy
Was finding what's called Osman Roy."

Christopheriana, or Herb Christopher, another of its old names, very likely refers to its growth by the watersides, in which locality St. Christopher, before his conversion, was wont to perform his self-imposed task of carrying people across the ford. "Osmund the Waterman"—another

* Moore's "Nature-printed British Ferns" (8vo. ed.), vol. ii., p. 316.

of its names—suggests that there is some lost legend which, could it be recovered, would clear up the point. The following occurs in several books, but is, we imagine, of no antiquity or authenticity :—

At Loch Tyne dwelt the waterman, old Osmund. Fairest among maidens was the daughter of Osmund, the waterman. Her light brown hair and glowing cheek told of her Saxon origin, and her light steps bounded o'er the green turf like a young fawn in his native glades. Often in the stillness of a summer's evening did the mother and her fairhaired child sit beside the lake to watch the dripping and splashing of her father's oars as he skimmed right merrily toward them over the deep blue waters. Sounds as of hasty steps were heard one day, and presently a company of fugitives told with breathless haste that the cruel Danes were making toward the ferry. Osmund heard them with fear. Suddenly the shouts of furious men came remotely on the ear. The fugitives rushed on. Osmund stood for a moment; then snatching up his oars he rowed his trembling wife and fair child to a small island covered with the great Osmund Royal, and, helping them to land, bade them lie down beneath the tall ferns. Scarcely had the ferryman returned to his cottage when a company of Danes rushed in ; but they hurt him not, for they knew he could do them service. During the day and night did Osmund row backward and forward across the river, ferrying troops of those fierce men. When the last company was put ashore, Osmund, kneeling beside the river's bank, returned heartfelt thanks to Heaven for the preservation of his wife and child. Often in after years did Osmund speak of that day's peril ; and his fair child, grown up to womanhood, called the tall fern by her father's name.

OPHIOGLOSSUM.

THIS and the next genus, *Botrychium*, belong, as will be seen by our sketch of the classification of ferns (p. xiii.), to a distinct group or sub-order, characterised primarily by the spore-cases being without a ring, opening down the side nearly to the base, and by the vernation, which is erect, as in most flowering plants, not circinate, as in ferns. From the genus *Botrychium* the present genus is distinguished by having the spore-cases, or sporangia, in two rows, forming a distichous simple (in the European species) spike; in a frequent tropical species (*O. palmatum*) there are numerous fertile spikes to each frond, and in a South African one (*O. Bergianum*) the fertile and barren fronds are distinct. At first sight the species of *Ophioglossum* are very unlike ferns; they must however be regarded as ferns in which the spores, instead of being borne on the back of the fronds, are raised upon a stem. The common Adder's-tongue, for example, produces really but a single frond which is divided into two parts—the lowest or leaf-like portion being barren, and the upper or spiked portion being fertile.

The authors of the "Synopsis Filicum" admit ten species of *Ophioglossum;* the genus is represented in most parts of the world.

THE ADDER'S-TONGUE: OPHIOGLOSSUM VULGATUM, *L.*

This is a plant which is very easily overlooked, although, when once seen, it cannot be mistaken for anything else. Moist meadows in spring often abound with Adder's-tongue; but so nearly is it concealed by the grass, and so much does its uniform green hue resemble that of its surroundings, that it is quite possible to walk over a quantity of it without being conscious of its presence. It is widely distributed throughout England, Scotland, and Ireland, preferring a loamy soil, and is sometimes, although rarely, found in woods. In this latter habitat it is conspicuous enough, especially when in fruit; but in pastures the growing grass soon overtops it, and it is then lost sight of.

The curious appearance of the plant, with its long-stalked spike rising up from the single leaf-like barren branch, seems to have suggested some likeness to the tongue of a serpent, from which resemblance both the Latin and English names take their rise. Coles, writing in 1657, tells us it was called Adder's-tongue "because out of every leaf it sendeth forth a kind of pestal, like unto an adder's tongue;" and hence, on the time-honoured "doctrine of signatures," it was thought to cure "the bitings of serpents." This, however, was but one of its many "vertues," some of which were quaint enough: thus Langham, in his "Garden of Health" (1633), says that "being wrapped in virgin waxe, and put into the left eare of a horse, it causeth him to fall as if he were dead, but being taken out, he riseth againe." Its greatest use was as an ingredient in an ointment, which, under the name of Adder's spear ointment, is still, or was until recently, employed in some parts of Sussex and Surrey. This ointment was used, among other purposes, as a healing application to the inflamed udders

of cows. In William Ellis's "Country Housewife's Family Companion" (1750) we find the author saying, "My maid every year makes a pot of Adder's-tongue ointment solely for this very use; it grows in my meadows, is known by its pecked stalk, somewhat in the shape of an adder's tongue, and is in its full virtue in August, when we gather it, cut it small, bruise it, and boil it with some butter as it is taken out of the churn, free of any salt; then we strain out the thin parts, and press out what remains in the thick herby part, and keep it in a glazed earthen pot all the year ready for our want; and when we want it, she rubs it soundly on the cow's teat or bag, which generally at once or twice using it disperses the humour, allays the swelling, and cures. For, thus made, it is a balsam that heals green wounds, bitings of venomous creatures, St. Anthony's fire, burns, scalds, hot tumours, aposthemes, spreading sores and ruptures, as a Physician's character is of it. Others take Adder's tongue, Melilot, and Sellery stalks, and when they have been well bruised, they boil the juice up in fresh butter without salt. Others boil the juice of rue and houseleek with that of Adder's-tongue in butter; but the nicest way of all is, to stamp the Adder's-tongue herb in a mortar, squeeze out its juice, and boil it up in butter or fresh lard, without any salt: but butter is best, because the lard may give an unpleasant tang to the milk, if it should be mixt with it as the cow is milking. Put the juice and butter into your saucepan together, and boil them for a quarter of an hour." This account is so comprehensive that it seems unnecessary to add anything further upon the subject.

The frond of the Adder's-tongue rises erect from a short fleshy rhizome, which gives off long succulent roots, and has a lateral bud from which the next year's frond is produced: the rhizome is perennial, but the fronds are annual. Some of the roots spread in the manner of stolons, and produce new plants at some distance from the parent. When the frond first makes its appearance, the fertile portion is enclosed in the barren part; but the former is soon raised above the barren leafy portion and is quite distinct from it. The whole frond, when full-grown, is from four or five inches to a foot in height; the stipes is erect and hollow; the barren part is very smooth, quite entire, sessile, ovate in form, and of a peculiar pale yellowish-green hue; the venation consists of very numerous fine almost parallel veins, which are netted throughout. Sometimes the fertile portion is not developed; it consists of a narrow spike, having smooth round sporangia embedded in a single row upon each edge of the spike; these open transversely for the discharge of the sporules, and, remaining gaping, give the spike a jagged irregular appearance.

The distribution of the Adder's-tongue is very wide. It extends almost throughout Europe; in Asia it occurs in the Caucasus, the Himalayas, Kamtschatka, Unalaska, and Japan. In Africa it is reported from Angola, the Guinea coast, Abyssinia, and numerous of the islands—the Azores, Madeira, St. Helena, and the Mascarenes; also from Cape Colony (a form called *O. capense*). In the New World it is stated to occur in Mexico, as well as in temperate North America; as also in Australia and New Zealand.

If taken up carefully, so as to avoid damage to the roots, the Adder's-tongue is easily cultivated in suitable situations, and when once established will maintain its position with little or no attention.

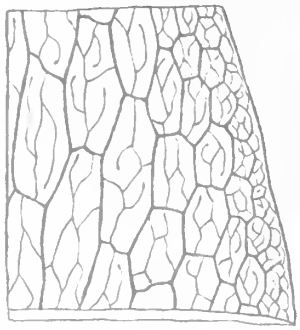
There is a variety of the Adder's Tongue, known as *O. ambiguum*, which occupies a position about midway between this and the next species, and has been found in several localities in Orkney, as well as in the Scilly Islands and near Barmouth, Merionethshire. It attains maturity at a much later date than the typical plant, and is considerably smaller in size. It is found in France, and probably in other localities on the Continent.

OPHIOGLOSSUM LUSITANICUM, *L.*

This diminutive species is of wide distribution. It can hardly be considered a British plant, in the strict sense of the term, although it is found in Jersey, where it was discovered in 1854, and was quite recently discovered in Ireland, upon Horn Head in north-western Donegal. It is a common plant in the Mediterranean region, and is found in Algeria and Morocco, as well as in the Atlantic Islands—the Azores, the Canaries, Madeira, and the Cape Verde Islands. Mr. Baker includes under this species *O. gramineum*, Willd., from northern and peninsular India, as well as another plant, called *O. gramineum* by Brown, from New Zealand and Australia, and "three closely-allied forms gathered by Dr. Welwitsch in Angola." But he retains it as distinct from *O. vulgatum*, with which, however, some authors unite it.

Ophioglossum lusitanicum is readily distinguished from the common Adder's-tongue by its very small size, the whole plant being rarely more than three inches in height, and sometimes scarcely attaining one inch. The barren portion of the frond is much narrower than in *O. vulgatum*, tapering gradually to the base, and it also differs, as will be seen from our figure, in the reticulation, which is much less branched; the texture, too, is thicker. A minute character by which the two species may be distinguished is to be found in the spores, which are tuberculated in *O. vulgatum*, but smooth in *O. lusitanicum*. The fronds are produced in the autumn, remaining throughout the winter, and dying down in the spring. So small a plant is, of course, likely to be overlooked, and it is probable that a close search for it in some of the south-western districts of England might be rewarded by its discovery.

1B × 6



1A × 6

2B × 4

2A × 4

1.
NAT. SIZE

NAT. SIZE

1 OPHIOGLOSSUM VULGATUM. 2 OPHIOGLOSSUM LUSITANICUM

1 PORTION OF BARREN FROND SHOWING VENATION. 1B PORTION OF FERTILE FROND

1A PORTION OF BARREN FROND SHOWING VENATION. 2B PORTION OF FERTILE FROND

1A & 1B 6 TIMES NAT SIZE. 2A & 2B 4 TIMES NAT SIZE.

BOTRYCHIUM.

THIS genus, like the preceding, is constituted of species having fronds of two branches, one being fertile and the other barren ; and it is at once distinguished from *Ophioglossum* by having both the fertile and barren branches again divided, while in *Ophioglossum* they are simple. Another difference may be noted in the way in which new fronds are produced. In *Botrychium* the frond for the ensuing year may be found enclosed in the base of the stem of the existing frond, and within that the frond for the year next following, and so on ; but in *Ophioglossum* the new frond is produced outside the stem, not within it as in the Moonwort.

There are about a dozen species of *Botrychium*—more or less, according to the estimate taken of what constitutes a species. These are found throughout the world, with the exception of Africa, in which the genus is unrepresented, extending from the tropical to the arctic regions, and most abundant in the temperate regions of the northern hemisphere. They are involved in some confusion, and not always very easily distinguishable. Those desirous of pursuing the subject critically will find a careful analysis of the species in Milde's "Filices Europeæ."

THE MOONWORT : BOTRYCHIUM LUNARIA, *L.*

This is the best-known and only British species of the genus. It is a short stout plant, with a frond from an inch to four inches in height, and divided, as we have already remarked, into two parts. The smooth dark-green leafy or barren portion of the frond is pinnate, the pinnæ, which vary in number from three to eight or nine pairs, are fan-shaped and semi-circular or crescent-shaped in outline ; this form probably suggested some connection between this plant and the moon, whence the Latin name *Lunaria*, and the English "Moonwort." The fertile part of the frond is bipinnate, somewhat triangular in outline, the pinnæ or branches bearing a number of smooth, nearly spherical spore-cases, which open transversely when ripe, and allow the smooth pale spores to fall out. Mr. Newman suggests that it is a parasitic plant, but other writers do not concur in this belief. The Moonwort, although recorded for nearly all the English and most of the Scottish counties, is by no means a common plant, although probably more common than is generally supposed. It grows in dry open pastures and upon heaths, and is very liable to be overlooked, as it is not readily distinguishable from the grass among which it grows. In Ireland it is recorded from most if not all of the counties, often occurring in dry limestone pastures. The fronds appear above ground in April, attaining their full development in May or June. It is generally distributed over Europe and Northern Asia, but is absent from the American and Atlantic floras. In Europe it extends to arctic Russia, Livonia, Lithuania, and the Caucasus ; it also occurs in Spain, Italy, and the Mediterranean islands. In Asia it occurs in Kamtschatka, Persia, and Lazistan ; it is also recorded from Australia and Tasmania ; while in the New World it is found in Newfoundland and in the northern United States.

The Moonwort was in old times accredited with mysterious and magical powers. Parkinson, writing in 1640, says: "It hath beene formerly related by impostors and false knaves, and is yet believed by many, that it will loosen lockes, fetters, and shooes from those horses feete, that goe in the places where it groweth; and have been so audatious to contest with those who have contradicted them, that they have been knowne and seene it to doe so; but what observation soever such persons doe make, it is all but false suggestions and meere lyes: some alchymists also in former times have wonderfull extolled it to condensate or convert quicksilver into pure silver, but all these tales were but the breath of idleheaded persons, which divers to their cost and losse of time and labour have found true, and now are vanished away with them, like the aire or smoake therein." The traditional power of the Moonwort over iron is well known. Culpeper (ed. 1653) says: "Moonwort is an herb which they say wil open locks, and unshoo such horses as tread upon it; this some laugh to scorn, and those no smal fools neither; but country people that I know, cal it Unshoo the Horse; besides I have heard commanders say, that on White Down in Devon-shire near Tiverton, there was found thirty hors-shoos, pulled off from the feet of the Earl of Essex his horses being there drawn up in a body, many of them being but newly shod, and no reason known, which caused much admiration; and the herb described usually grows upon heaths." Coles in his "Adam in Eden" says: "It is said, yea, and believed by many, that moonwort will open the locks wherewith dwelling-houses are made fast, if it be put into the key-hole." There is a curious passage illustrating this belief in Aubrey's "Natural History of Wiltshire" which is worth transcribing, although of course the supposed circumstance which it records is, as Ray says, undoubtedly a fable. It runs as follows:—"Sir Bennet Hoskins, Baronet, told me that his keeper at his parke at Morehampton, in Herefordshire, did, for experiment sake, drive an iron naile thwert the hole of the woodpecker's nest, there being a tradition that the damme will bring some leafe to open it. He layed at the bottome of the tree a cleane sheet, and before many houres passed the naile came out, and he found a leafe lying by it on the sheete. Quære the shape or figure of the leafe. They say the moonewort will doe such things. This experiment may easily be tryed again. As Sir Walter Raleigh saies, there are stranger things to be seen in the world than are between London and Stanes."

As might be expected, a plant of such wonderful power has not escaped the notice of the poets. If we may believe the Ettrick Shepherd, witches found the Moonwort of considerable use when preparing for their nocturnal excursions:—

"The first leet night, quhan the new moon set,
Quhan all was douffe and mirk,
We saddled our naigis wi' the moon-fern leif,
And rode fra Kilmenin kirk."

Du Bartas writes:—

"Horses that, feeding on the grassy hills,
Tread upon moonwort with their hollow heels,
Though lately shod, at night goe barefoot home,
Their maister musing where their shoes be gone.
O moonwort! tell us where thou hid'st the smith,
Hammer and pincers, thou unshodst them with?
Alas! what lock or iron engine is't
That can thy subtile secret strength resist,
Sith the best farrier cannot set a shoe
So sure, but thou so shortly cans't undoe!"

So George Wither, writing in 1622, says:—

> "There is an herb, some say, whose vertue's such
> It in the pasture, only with a touch,
> Unshooes the new shod steed."

And, again, Ben Jonson enumerates it among the herbs collected for various purposes:—

> "I ha' been plucking plants among—
> Hemlock, henbane, adder's tongue,
> Nightshade, *moonwort*, libbard's bane,
> And twice by the dogs was like to be ta'en."

According to Mr. Newman, the Moonwort is the easiest of all ferns to cultivate, never refusing to grow freely if properly treated. "First dig up a large sod, where a few mature fronds are conspicuous among the grass; take care to have it broad enough and deep enough, so that not one of the roots of the Moonwort is exposed, much less injured; fit this sod in a large pot, a saucer, or even a box; place it in the open air, and be sure to add comfort or rich vegetable soil."

BOTRYCHIUM MATRICARIÆFOLIUM, *A. Br.*

This species is very nearly allied to the common Moonwort, but can usually be readily distinguished by the shape of the barren segment of the frond; this is somewhat triangular in shape and broadest at the base, while in *B. Lunaria* the general outline is lanceolate, the lower portion not being broader than the centre of the segment. The barren division is divided into several pinnæ, which approach each other closely, the lower ones being deeply pinnatifid. The fruiting portion of the frond is pedunculate, the panicle of fruit being dense and bipinnate, and somewhat triangular in shape.

This is widely distributed in the north of Europe, extending to Switzerland and northern Italy in a few localities; it occurs also in Unalaska. It has been reported as an English plant, but its occurrence as such requires confirmation. *B. boreale* of Milde—a small plant approaching *B. Lunaria* in appearance—is considered by the authors of the "Synopsis Filicum" as a slight variety of this.

Botrychium lanceolatum, Angst., is nearly allied to *B. matricariæfolium*, under which the authors of the "Synopsis Filicum" place it as a variety. It is a more slender and smaller plant, with narrow almost linear pinnæ separated from each other (not close together, as in the species just named), and with a smaller panicle. It is found in northern Europe, Siberia, and North America.

BOTRYCHIUM TERNATUM, *Sw.*

This is a fleshy, sometimes slightly hairy plant, varying from four to twelve inches in height; the barren segment rises on a long petiole from near the base of the plant, and is broadly triangular in outline, divided into three pinnatifid divisions, the lower pinnæ being much the largest. The fertile segment is raised considerably above the barren portion, and is triangular in shape, and very much divided. *B. ternatum* is a plant of wide distribution, although its European range is very restricted. It extends in the New World from the Hudson's Bay Territory to New Granada and California, where it attains a very large size. In the Old World it occurs in Australia and New Zealand, and in Japan, Siberia, and Lapland. The young unexpanded frond is covered with soft hairs or down.

BOTRYCHIUM SIMPLEX, *Hitchcock.*

This is in some of its forms the smallest species of the genus, never exceeding six inches in height, and usually much smaller, the average height being from two to three inches. It has a slender stem, the sterile segment of the frond being usually towards the base, varying from nearly or quite simple in very small examples, to deeply lobed in longer specimens; the shape also varying from roundish-ovate to somewhat triangular, or even ternate. The panicle or fertile segment is raised on a long peduncle; in very small specimens this is quite simple, but it is subsequently more or less branched, in most cases resembling that of the common Moonwort. Several forms have been described, based upon the variations above indicated, especially in the fertile part of the frond. The example figured in the plate is one of the smallest of these. This species is a native of northern and central Europe, as well as of California, British North America, and the northern United States.

BOTRYCHIUM VIRGINICUM, *Sw.*

This is the handsomest and largest of the Moonworts. It differs in texture from the preceding species, being thin and membranous when mature, although in its early stage it is of a thick fleshy texture, resembling that of the other species. It is very variable in size, sometimes attaining as much as two feet in height and sixteen inches in breadth at the base of the sterile branch. This branch is sessile above the middle of the stipes, and ternate; the fertile portion is from two to three times pinnate. In general appearance the leafy portion of the frond resembles the foliage of some umbelliferous plants. This extends from Norway to Austria; it is found in many parts of Asia and North America, extending to Mexico.

Vincent Brooks Day & Son Ltd.

BOTRYCHIUM.

(NAT. SIZE)

1. B. SIMPLEX. 2. B. VIRGINICUM. 3. B. RUTÆFOLIUM. 4. B. TERNATUM. 5. B. LUNARIA. NAT. SIZE.

5^ PORTION OF FERTILE FROND OF B. LUNARIA. MAGNIFIED 12 TIMES.

GENERAL INDEX.

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