THE FERNS OF GREAT BRITAIN ILLUSTRATED

Spottiswoode

1853

Spottiswoode & 1855.

THE

FERNS OF GREAT BRITAIN:

ILLUSTRATED

BY

JOHN E. SOWERBY,

PROPRIETOR OF SOWERBY'S ENGLISH BOTANY.

THE DESCRIPTIONS, SYNONYMS, &c.

BY

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LONDON:

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1855.

TO

THE PRESIDENT AND FELLOWS

OF

THE LINNEAN SOCIETY,

THIS WORK

IS

WITH THEIR PERMISSION

MOST RESPECTFULLY DEDICATED

BY

THEIR OBLIGED AND OBEDIENT SERVANT,

THE PROPRIETOR.

THE

FERNS OF GREAT BRITAIN.

INTRODUCTION.

Ferns constitute a series of vegetable productions of considerable extent, amounting to upwards of two thousand known species, the greater proportion of which is found in tropical climates, but very unequally distributed; the general habit of the fern leading it to develop most freely under the joint influence of shelter from the sun and wind, and an atmosphere replete with moisture. Hence the open prairie, the pampa, and the steppe offer conditions most unfavourable to their growth; while the land covered with dense forests, or the mountain with its rocky clefts and caverns, affords the requirements upon which it depends, especially where such occur in association with a warm and vaporous climate. The proportion that ferns bear to the aggregate vegetation of different countries, though in some measure dependent upon such circumstances, conveys no definite idea of their real numbers: thus, when we learn that in the British Islands they compose $\frac{1}{33}$th of the conspicuous vegetation of the land, and in tropical America $\frac{1}{36}$th, we are not to conclude that the numbers in the two countries at all approximate, but that amidst the exuberant development of the torrid zone the ferns maintain an equal proportion to that which

they have in our less productive region. The actual amount of species, indeed, almost constantly diminishes with the increase of latitude beyond the tropics.

In a work intended as an aid to the less scientific observers and admirers of natural productions, it is not considered desirable to enter into those minutiæ of organic composition, by which the physiologist is guided in his studies of the relative structures and affinities of the various groups composing the vegetable kingdom; but, as certain general characters appertain to that before us, and as, in describing families and species, it is convenient to employ a few conventional terms, expressive of features and conditions not belonging to other plants, a concise view of the peculiarities by which ferns are collectively distinguished, becomes a necessary introduction to their examination in detail.

With much of the aspect belonging to the higher orders of vegetation, and occasionally rivaling in port and habit the more majestic of their forms, ferns have a structure indicative of a much lower grade in organization, and may be regarded as occupying an intermediate position, or rather as representing the most complicated type of that class characterized by the absence of flowers. They are, with slight exception, perennial plants, but vary much in habit, and especially in the development of the stem; this is generally either procumbent or it extends itself below the surface of the soil, and from its root-like appearance is denominated a *rhizoma*, though some writers designate it as the *caudex*. Rarely, and almost exclusively in very warm and humid climates, ferns are arborescent, the stem growing erect like the trunk of a tree, when it is called the *stipes*, and in some species attaining a height of forty or fifty feet: it is cylindrical, of equal diameter throughout, and bears leaves only at the summit, like a palm, the necessary result of its growth being only from the termination of the axis. Occasionally a tendency to upright elongation of the rhizoma is observed in some of the larger species of the British Ferns. The leaves, usually

termed *fronds,* are generally more or less divided in a wing-like manner, rarely simple or entire: when the divisions extend to the *rachis* or continuation of the leaf-stalk or its branches, the fronds are described as pinnate, bipinnate, or tripinnate (once, twice, or thrice winged), the first or primary divisions being called *pinnæ,* the subsequent ones *pinnules*; when they are only partial, the fronds are said to be *pinnatifid* or wing-cleft, and the divisions are denominated lobes or segments. The disposition of the leaves of plants in the bud, generally regarded by botanists as an important feature, is called their *vernation,* and in the ferns is *circinate* (except in one small group), the divisions as well as the entire frond being coiled inwards previous to expansion like the spring of a watch, a disposition beautifully exhibited by those of some of the larger species.

The reproductive germs of the flowerless plants are very minute, indeed generally microscopic, and, notwithstanding the gigantic size of some members of the Fern tribe, no exception occurs in this respect; their production apparently taking place under different laws to those which regulate the fructifying function in flowering plants: they are not called seeds, but *spores* or *sporules,* and are enclosed in little cases denominated *thecæ*; which, in the ferns, are mostly aggregated in small clusters of different size and shape, termed *sori,* and arise from the veins on the under surface of the frond, or from their extremities upon its margins: in some instances the thecæ, instead of forming sori, are associated in spikes or clusters called panicles, formed by the depauperation of the fructifying frond or of its lobes. The primary development of the thecæ takes place in immediate contact with the vein, and beneath the epidermis or outer covering of the leaf, which is forced up by their enlargement in the form of a whitish membrane, constituting the *indusium* or protecting cover of the sori. During the advance of the fructification towards maturity, the indusium separates partly or wholly from the surrounding epidermis, and subsequently either

shrivels and becomes hidden by the bursting of the thecæ, or falls off altogether. In some instances, the opening takes place in the centre, the indusium investing the sorus like a cup, when it is styled, though erroneously, an *involucre*; while in others, the epidermis from both surfaces of the leaf extends beyond the margins, including the thecæ between them, and fulfilling the office of indusium without being regarded as such: occasionally this marginal separation and extension of the leaf-membrane takes place uninterruptedly along the whole edge, but it is often only local and about the soriferous extremities of the lateral veins. In a few genera the indusium cannot be traced, the sori appearing to be produced externally: but this, probably in all cases, arises from the very early period of growth at which the disruption takes place, as careful examination of some species of *Polypodium* readily discovers.

The application of the term *frond* to the leaf of a fern is objected to by some botanists; but the association of organs, that in other plants are simply conservative, with the reproductive function in those before us, is a feature sufficiently remarkable to justify the distinction, and it has thus become almost universally adopted.

The elegance and variety of the foliage of ferns, rendering them valuable objects in amateur cultivation, with the modes of treatment that experience has proved most successful, will be found in detail, accompanying the descriptions of the several species; but, as a previous provision of material is requisite, and a few general rules applicable in most instances, much repetition may be avoided by a short preliminary notice. No plants are better adapted than are the hardy species of ferns, for filling up shaded nooks in the garden and shrubbery, and for covering the sheltered parts of ruins, grottos, and rock-work, or the margins of ponds and fountains; shade and moisture being generally favourable to their development, as is evinced by the natural localities affected by most of the species, which flourish especially under the shelter of woods and

thickets, in the crevices of rocks, and in the mouths of wells, mines, and caverns, where they have little light, and enjoy an atmosphere of almost uninterrupted humidity. But while moisture is an important agent in securing, and even enhancing, that beauty which belongs to them in the wild state, drainage is no less necessary to the preservation of the greater number, and must be so far provided as to prevent the lodgement of water in a stagnant state about the roots. The subjoined materials will be found more or less requisite to those engaging in the cultivation of this interesting tribe: viz.

As draining media.

1. Shards, or fragments of garden-pots broken to the size of an inch, or larger.
2. Fragments of sandstone, limestone, slate, &c. for forcing into the soil around the roots, in planting.
3. Charcoal, broken into pieces, from the size of a filbert to that of a walnut.

As soil.

1. Peat, or bog-earth. The best is that of a blackish or dark-brown hue, and spongy texture.
2. Decayed leaf-mould, or rich garden soil.
3. Loam. The best is of a yellowish hue, containing much vegetable fibre.
4. Sand. The white or silver sand being preferable, though not essential.
5. Mortar from old buildings.

Where the collection is large or increasing, a compost, prepared by mixing the first four in equal proportions, is desirable, as being always at hand, and capable of modification as necessity may require. The old mortar is only for occasional use, but a small

quantity may generally be added with advantage. The compost should be kept slightly moist, but not wet. In potting, the shards must occupy at the least one or two inches of depth at the bottom; and it is better to place over them a thin layer of moss, to prevent the soil from falling between and interfering with the ready passage of the superfluous water. A few fragments of charcoal should be placed over the moss; and the soil being then thrown in lightly around the root of the fern, and some pieces of stone or slate forced into it vertically, the whole may be settled by watering.

Without referring to the variety of adaptations of which a fern garden is susceptible on a large scale, either as ornamental, or as affording place for the reception of species of every kind of habitat, from the river-side and the swamp to the mountain-rock and the church-tower, I will confine my suggestions as to out-door planting, within the compass attainable by those who have only a small space wherein to operate. Selecting a spot in the garden sheltered from the direct rays of the sun, but if possible not subject to the drip from trees; a bank of loose soil, or common garden-mould mixed with brick-rubbish and old mortar, may be thrown up to the height of from two to four feet above the general level; in which, when settled by the rain or copious watering, so as to avoid farther sinking, excavations of different depths may be made for the reception of those species that require the most moisture, keeping up the surrounding soil with fragments of stone or burs from the brick-kiln. In planting, it is sufficient, in a general way, to supply the compost soil to the extent of five or six inches around the ball of root, as most of the larger ferns readily spread their radicles into the looser and rougher material of the bank. Around the deeper and larger excavations for the marsh and flowering ferns, a wall of loose porous stones or old bricks, with a mixture of sandy peat and decayed mortar spread between them, will afford a congenial site for the smaller rock species, especially those of the

genus *Asplenium*; and, if the wall be carried up higher than the adjoining part of the bank, so that the latter may be raised against it, the Common Polypody will be induced to overrun the slope with luxuriance and pleasing effect, its matted rhizomes being at first kept firm, by disposing here and there a few heavy pieces of chalk-flint, or other stones.

It must be understood that the chief recommendations of such a bank, are the facility with which it is constructed, and the insurance of good drainage. Of course the water readily running off the higher parts, renders it necessary that evaporation should be checked as much as possible, and in order to effect this, irregular masses of stone, and cemented brick, from the kiln or the old furnace, may be scattered upon the surface around the roots of the ferns; these will not only retain a considerable degree of moisture beneath, but afford shelter to the foliage, and, carefully selected and disposed, may be rendered more subservient to the picturesque than elaborately constructed rock-work.

Many persons, in following out fancies of the latter kind, with more of the grotesque than good taste, employ the vitrified clinkers from the potteries and glass-works; but, as the object to be obtained is less ornament than utility, I prefer the brick, on account of its porosity and the quantity of water it is capable of retaining; and that the ferns have a similar preference, is evident from the complicated masses of root-fibre and spongioles that form on the surface of the soil, and even ramify into the pores and crevices of these rude masses wherever they have remained for a few months undisturbed.

The classification of the Ferns being very arbitrary and unsettled, and our view comprising only those of a particular locality far from rich in the number of species, I have not considered it requisite to disturb the sequence of the genera by allusion to it in the body of the work. As at present constructed, the British Ferns are in-

cluded in three principal groups or orders, the characters and genera of which are stated below.

I. POLYPODIACEÆ.

Thecæ collected in sori on the back or margin of the frond, pellucid, reticulated; invested by an articulated, elastic, more or less complete *annulus* or ring. Vernation circinate.

The *annulus* is a continuation of the stalk of the theca; in other words, it is the middle vein of the minute circinate leaf that forms the latter, which is torn open by its extension.

* *Annulus vertical.*

1. Polypodium.
2. Woodsia.
3. Lastrea.
4. Polystichum.
5. Cystopteris.
6. Athyrium.
7. Asplenium.
8. Scolopendrium.
9. Ceterach.
10. Blechnum.
11. Pteris.
12. Allosorus.
13. Adiantum.

** *Annulus horizontal or oblique.*

14. Trichomanes.
15. Hymenophyllum.

II. OSMUNDACEÆ.

Fructification developed upon depauperated portions of a more or less compound frond. Thecæ stalked, membranaceous, reticulated, destitute of annulus, opening vertically with two valves. Vernation circinate.

16. Osmunda.

III. OPHIOGLOSSACEÆ.

Fructification developed upon depauperated simple or compound fronds. Thecæ sessile, coriaceous, opaque, without any trace of annulus or reticulation, bivalvular. Vernation straight.

17. Botrychium.
18. Ophioglossum.

Genus 1. POLYPODIUM.

Gen. Char. Sori circular, naked. Margin of the frond not reflexed.

One of the most extensive and diversified genera of the order, chiefly distributed over the tropical countries of the Western hemisphere. Of the four British species, three have been occasionally referred to other genera, on account of the supposed presence of an indusium, noticed by Roth, a celebrated German botanist, but certainly not to be detected, in any stage of development, in those specimens that have passed under my own observation, either wild or cultivated, which latter I have diligently examined at every period of their growth.

The generic name is formed from πολὺς, *many*, and ποῦς, *foot*, in allusion to the form of the branched rhizoma in the most common native species.

Polypodium vulgare. Common Polypody. Tab. I.

Fronds lanceolate, deeply pinnatifid; segments linear-lanceolate, obtuse, indistinctly serrated, approximate.

Polypodium vulgare, *Linnæus*. Ctenopteris vulgaris, *Newman, Hist. Brit. Ferns*, 41.

Very frequent about the roots and moss-grown trunks of trees, on rocks, shady hedge-banks, walls, and old thatched roofs. The rhizoma branches in all directions, the branches, when it has grown long undisturbed, crossing each other and forming a thick mat-like substance: it is at first clothed with a cuticle densely covered with yellowish-brown, membranaceous, lanceolate scales, which, falling off, or becoming obliterated during the winter, leaves the surface nearly smooth and of a yellowish hue. The young fronds begin to appear in May, rapidly attaining the full size, which varies according to situation from the length of five or six inches to that of twelve or eighteen: where much exposed, and at a distance from the ground, they have generally in maturity a drooping habit, and even become almost pendent, but in sheltered localities often retain their original erect position throughout. The rachis is smooth, grooved on the upper face, and bare about half or one-third of its length.

The lateral veins of the segments are alternate, and each divides into from three to five branches, of which the lowest, directed upwards, always terminates midway, while the others are continued nearly to the margin; all of them in the barren segments being

thickened in a club-like manner at the extremity. The fructification is, in most instances, confined to the upper divisions of the frond only, but sometimes they are all fertile. The sori, of a bright yellow or orange colour, changing in maturity to brown, are destitute of indusium, and very regularly disposed in a line on each side of the mid-vein, halfway between it and the margin; a disposition resulting from their development at the extremity of the first branch of the lateral vein. In very vigorous fronds the regular dotted line of fructification thus formed is sometimes disturbed, by the production of a sorus at the extremity of one or even two of the upper branches of the same vein; indeed, the thickening of this part seems to be the first stage in the development of the sorus.

The fronds of this fern are in perfection from August to November, but are, in exposed situations, always disfigured by the first frost. Under shelter it becomes evergreen, retaining the old fronds until the appearance of the new ones. In cultivation it does not generally succeed so well as do most of our native species: Mr. Newman observes that it is somewhat parasitic, and I believe he is right, never having been able to keep it in luxuriance, until it was accommodated with a large proportion of decayed wood, moss, and straw, mingled with the compost previously employed, into the interstices of which the delicate root-fibres very soon penetrated, lining every cavity with their brown hair-like spongioles.

Several varieties are met with, distinguished chiefly by the division and serrature of the segments, viz.:

1. *bifidum*, in which each segment is divided at the extremity into two diverging lobes,—not an uncommon occurrence, indeed, in the frond itself.

2. *serratum*, characterized by the more distinct or deeper serratures.

3. *Cambricum*, Welsh Polypody, with a broader frond and the segments irregularly cleft: this is always barren. Linnæus, by whom it was first described, regarded it as a distinct species.

4. *Hibernicum*, Irish Polypody, distinguished by the broader frond being bi- or tri-pinnatifid and fertile. A very striking and beautiful variety, found by Mr. Mackay, in the Dargle, in the county of Wicklow, Ireland.

Intermediate varieties connect all of these with the normal or common form.

The rhizoma is mucilaginous and has a sweetish flavour, but by long boiling it becomes bitter. An infusion of it in a recent state is sometimes administered in the country as a mild cathartic. It was once highly esteemed by the faculty as an expectorant, and especially recommended for hooping-cough; but although still occasionally employed as a domestic remedy, it has long been excluded from the list of orthodox medicines.

POLYPODIUM PHEGOPTERIS. Mountain Polypody. TAB. II.

Fronds triangularly lanceolate, acuminate, subpinnate: pinnæ linear-lanceolate, acute, deeply pinnatifid, with obtuse, entire lobes; the lowest pair distant, deflexed. Sori nearly marginal.

Polypodium Phegopteris, *Linnæus*. Polystichum Phegopteris, *Roth*. Lastrea Phegopteris, *Newman*. Gymnocarpium Phegopteris, *Newm. Hist. Brit. Ferns*, 49.

Not unfrequent in the alpine and subalpine or rocky districts of the south-western and northern counties of England, and in Wales and Scotland; but apparently of rare occurrence in Ireland. Its favourite habitats are moist woods, and shady spots about mountain lakes, rills, and waterfalls. The rhizoma is of a blackish hue, slender, wiry, branching and creeping in every direction, so as often to form a network over the face of the moist rock where there is no trace of soil, striking its hair-like rootlets into every crevice. The fronds make their appearance about the same period, or rather earlier than those of the common Polypody, and are in perfection from July to September: they are of a pale green colour, hairy, and vary from five or six inches to a foot in height, of which the leafy portion occupies less than half, its general outline being triangular, but much acuminated. The pinnæ are mostly opposite, the lowest pair being rather distant from the others and directed downwards and forwards, forming a very remarkable feature by which this fern is readily recognized; they are likewise perfectly distinct, and attached to the rachis by a short stalk: the upper ones, on the contrary, point toward the apex of the frond, and, with the occasional exception of the second pair, are sessile, and attached by their entire base, so as to appear confluent, as indeed those toward the extremity usually are. The lateral veins of the lobes are alternate, mostly simple, and extend to the margin, bearing, each, near the end a small circular sorus, the whole fructification thus forming an intromarginal line of spots.

It is an elegant species under cultivation, spreading very freely, and requiring little attention in planting, except to secure the almost universal requirement of the Fern, shade. Exposure to the sun, though only for a very short time, changes the delicate green hue of the frond to brown, and soon destroys a plant naturally adapted to those moist situations in which alone it luxuriates.

POLYPODIUM DRYOPTERIS. Tender three-branched Polypody. TAB. III.

Fronds ternate, glabrous; branches pinnate, drooping; pinnæ pinnatifid, with obtuse crenated segments. Sori nearly marginal.

Polypodium Dryopteris, *Linnæus*. Polystichum Dryopteris, *Roth*. Lastrea Dryopteris, *Newman*. Gymnocarpium Dryopteris, *Newm. Hist. Brit. Ferns*, 57.

Not unfrequent in dry stony woods and shady rocky places in the mountainous parts of the north of England, and in Wales and Scotland; often very luxuriant about waterfalls, where it is kept constantly moistened by the spray, but rarely in this case producing fructification. The rhizoma, very slender, often almost filiform, spreads widely, forming, with its complicated branches and dark-coloured radicles, a dense turf-like mass. The fronds spring up in April, and present a remarkable form of vernation, the three branches being separately coiled, so as to resemble, as observed first by Mr. Newman, three little balls supported on slender wires. In maturity they vary from three or four inches to a foot in height, are of a pale bright green, perfectly smooth, and supported by an erect, very slender brittle stalk or rachis, clothed with a few scales at the base. A general tendency to droop is characteristic of the whole of the leafy portion of this delicate fern, affecting not only the primary branches, but giving a striking convexity to all of the segments, a circumstance well expressed in our figure. The fronds are mostly barren; the fertile ones rise higher than the others, and are farther distinguished by the comparative narrowness of their segments. The lateral veins of the segments are generally branched, and, where fertile, the sori are produced near the extremity of the uppermost branches; in luxuriant specimens their regular arrangement is often disturbed by development from some of the other branches of the vein. Fructification in June and July.

In cultivation, shade is even more essential to this species than to the preceding. Next to the delicacy of texture and graceful habit, the vivid green hue of the foliage constitutes its principal beauty, and this latter is entirely lost by exposure to direct sunlight. Abundant moisture, though recommended by many, is so far from being necessary to its flourishing condition, that, unless drainage is at the same time complete, it will soon destroy the plant by causing the decay of the rhizoma. Attention to these circumstances will ensure the fact, that one of the most elegant and beautiful of our smaller ferns is likewise one of the most free growers and most easily kept.

Polypodium calcareum. Rigid three-branched Polypody. Tab. IV.

Fronds triangular, subternate, erect, glandular; branches pinnate; pinnæ of the lower ones pinnatifid, with obtuse segments, those of the upper branch nearly entire. Sori marginal.

Polypodium calcareum, *Smith.* Lastrea Robertiana, *Newman.* Gymnocarpium Robertianum, *Newm. Hist. Brit. Ferns,* 63.

Apparently confined in its natural growth to limestone districts. Sir J. E. Smith first noticed it as a distinct species, and it is perhaps more frequent than generally supposed. In the rocky parts of Derbyshire it is far from uncommon, occurring among grass and bushes in broken limestone and tufa; the Cheddar cliffs and Ingleborough are other stations; and the growing specimens in my garden are from the vicinity of Kenilworth, where it accompanied *P. Dryopteris,* a species with which it has often been confounded, although in habit and other respects very dissimilar. The rhizoma is thicker and less spreading than that of the latter plant; the frond less distinctly ternate or three-branched, the lower branches being shorter than the terminal or middle one; all the three are rigid, expanding upward on the same plane, and not at all drooping. The colour of the frond is of a dull green, owing to the presence of numerous minute stalked glands that give a mealy appearance to the surface, and similar glands communicate a glaucous hue to the rachis. The sori arising from the extremities of the lateral veins of the segments form a more distinct intromarginal series than those of *P. Dryopteris,* and generally become confluent when the thecæ open.

Being of less compact growth than the last species, and more rigid, it is a much less ornamental plant; but it bears exposure better. Most persons who have had it under cultivation complain of its liability to die off, but I believe this to be the effect of confinement and superabundant moisture: left to itself, few ferns are more hardy, but it likes pure air and perfect drainage. Even in the wild state it cannot be styled a "free-grower," and being a very local plant, its natural condition must be considered as much as possible in our efforts to naturalize it in the fern garden. It flourishes best on a sloping bank, planted near the surface, with an admixture of lime rubbish to the ordinary compost, the ground about it being studded with fragments of stone or burs from the brick-kiln to prevent evaporation. Under these circumstances it does not seem to be injured by daily exposure to four or five hours of the mid-day sun. If grown in pots, they should be large, and about one-third filled with draining material.

Genus 2. WOODSIA.

Gen. Char. Sori circular; invested by an inferior involucre, the margin of which is divided into numerous jointed, generally capillary segments.

A very small genus of alpine ferns, named in memory of Joseph

Woods, a British botanist. Chiefly remarkable on account of the singular character of the so-called involucre, which is however only a modification of an indusium, opening in the centre, and splitting more or less regularly into the conferva-like filaments accompanying the magnified sorus in our figure of *W. Ilvensis*. Its true nature is very obvious on examination of the immature sori. The two British species are among the rarest of our indigenous plants: notwithstanding a considerable difference in habit, and in the divisions of the froud, many modern botanists regard them only as varieties.

WOODSIA ILVENSIS. Oblong Woodsia. TAB. V.

Fronds lanceolate, pinnate; pinnæ oblong, deeply pinnatifid, chaffy beneath. Rachis chaffy.

Woodsia Ilvensis, *R. Brown*. Acrostichum Ilvense, *Linnæus*. Polypodium arvonicum, *Withering*. Polypodium Ilvense, *Swartz*.

Only found growing in the crevices of moist rocks about the summits of our higher mountains, and so sparingly distributed in these localities as to be regarded exceedingly rare. The recorded habitats are few, viz. Falcon Clints, Teesdale, Durham; Clogwynn-y-Garnedd, Snowdon, and Llynn-y-ewn, on Glyder Vawr, Wales; and the Clova mountains, Scotland. A careful explorer of the bleak regions over which many other rarities of our alpine flora are distributed, would however probably find reason to conclude that its extension is far less limited. This remark is not one at random; but the wanton appropriation, or it might rather be styled depredation, exercised by certain wholesale collectors, not of specimens only, but of entire plants, has rendered the true botanist, in cases like the present, averse to the promulgation of his discoveries.

The fronds grow in a tuft at the extremity of a very short rhizoma, seldom exceed two or three inches in height, and in very dry or exposed situations are sometimes not above one inch. In general outline they are lanceolate and pinnate, with mostly opposite, oblong, deeply-lobed pinnæ. The under surface is more or less covered with glossy, jointed hairs, accompanied, especially about the mid-veins, by long, attenuated scales, which, with the capillary segments of the indusium, often nearly conceal the sori. The sori are produced at or near the extremities of the lateral veins of the lobes, a crenation of the margin of the latter generally attending their development. They attain maturity in August and September.

The hairiness of the rachis, always conspicuous on the young fronds, is sometimes obliterated in their after-growth.

WOODSIA HYPERBOREA. Alpine Woodsia. TAB. VI.

Fronds linear-lanceolate, pinnate; pinnæ obtusely triangular, pinnatifid, with rounded segments.

Woodsia hyperborea, *Brown. E. B.* 2023. *Smith. Hooker and Arnott.* Woodsia alpina, *Newman, Hist. Brit. Ferns,* 79. Woodsia ilvensis, var., *Babington.* Acrostichum alpinum, *Bolton.*

Met with in similar situations as the preceding, but apparently of rarer occurrence. The habitats hitherto recorded are, Clogwynn-y-Garnedd, and Moel Sichog, Snowdon, in Wales; Ben Lawers, Mael-dun-Crosk, and Craig-Challiach, Perthshire; and, according to Dr. Balfour, in Glen Fiadh, Forfarshire, in Scotland. In habit it is not unlike *W. Ilvensis,* but the narrower fronds are of a thinner texture, and less hairy and chaffy; while the pinnæ, almost invariably alternate, are shorter, and nearly triangular in their general outline, and their lobes fewer and more rounded.

Our figures of these two ferns will convey the idea of specific distinction, and those of Mr. Newman, above quoted, are even more decided in this respect; but the comparison of specimens of both from different localities, and even from the same gathered in different years, renders it very doubtful whether they ought to be regarded as other than mere varieties of one species.

For successful cultivation of the *Woodsia,* shade, a moist atmosphere, and perfect drainage about the roots, are points of the utmost importance, and are especially indicated by its natural localities. Owing to their rarity as British ferns, few persons have ventured to plant them in the open air; in which, however, sheltered from the sun in summer, and from the drying easterly winds of spring, I am informed they may be grown luxuriantly. When potted, sandy peat, mingled with a small quantity of yellow loam, broken limestone and slate, affords a soil among which the black wiry roots readily extend; and if the pot be previously half filled with small fragments of stone and sand sifted among them, the plant will not be liable to suffer from the accumulation of moisture. Although a damp atmosphere is favourable during the growing season, these ferns will not bear confinement in close frames or cases; however vigorously they may grow at first, they are soon rendered feeble by the want of a free circulation of air.

Genus 3. LASTREA.

Gen. Char. Sori nearly circular, seated upon the back of the lateral veins; covered by a reniform indusium attached by its sinus.

The ferns included in this and the following genus, *Polystichum*, are by some botanists associated under the general name of *Aspidium*, to which genus they are referred in "English Botany." A difference in the form and attachment of the indusium has been considered a feature of sufficient importance to warrant their division. The name *Nephrodium*, originally suggested by Mr. Brown, has given way to that of *Lastrea*, bestowed upon it by Presl in honour of M. De Lastre of Chatelleraut.

Lastrea Thelypteris. Marsh Fern. Tab. VII.

Rhizoma creeping. Fronds lanceolate, pinnate: pinnæ linear-lanceolate, pinnatifid; lobes oblong, obtuse, the fertile ones with revolute margins. Sori submarginal.

Lastrea Thelypteris, *Presl.* Aspidium Thelypteris, *Swartz. Smith. Hooker. E. B. the fig. a mistake.* Hemestheum Thelypteris, *Newman, Hist. Brit. Ferns,* 123. Acrostichum & Polypodium, *Linn.*

A very local species, found only in a wet spongy soil, in marshes and bogs; not unfrequent in England and Wales, but rare in Scotland and Ireland. Where met with it is generally abundant, in consequence of its creeping habit, which is not unlike that of the common Brake (*Pteris aquilina*), the long, slender rhizoma growing rapidly, and branching in every direction. It is a colonizer of wet soils, as the latter fern is of dry ones. The fronds are of two kinds, barren and fertile, and spring up at short intervals, never in tufts: the barren ones make their appearance in the latter end of April or the beginning of May, and in their ultimate growth seldom attain more than a foot in height; the fertile, produced about July, are taller, not unfrequently reaching three feet or even four, the lower half or two-thirds of the rachis being devoid of pinnæ. The lateral veins divide in pairs about halfway between the mid-vein and the margin, and, in the fertile fronds, bear the sori, one on each division, forming thus an intromarginal series just within the recurvation. In maturity the sori become confluent, and all traces of the reniform indusium are obliterated.

The species is a very elegant one, and not at all difficult of cultivation; it does not seem to be injured by moderate exposure to the sun, provided the soil in which it is planted be sufficiently

retentive of moisture to prevent the roots from becoming withered during dry weather. I have grown it for many years on the same bank with *Polypodium calcareum*, *vulgare*, and other rock and epiphytic species, planting it at first in a hollow less than a foot below them, and covering the rhizoma with pieces of peat turf and fragments of stone and brick. The fertile fronds under these circumstances attained a height of nearly three feet, although under the influence of the direct rays of the summer sun from eleven o'clock until two. This circumstance is referred to, because it is a common notion that in the cultivation of bog or marsh plants abundant moisture is most essential to their luxuriance, and the unlimited supply furnished in consequence too frequently occasions their destruction. The Marsh Fern will endure a more continued maceration of its roots than most others, but in lieu of forming an undrainable bed for its reception, as often recommended, it would be following nature more closely were we to permit all unabsorbed water to filter through the subsoil. My own specimens (originally brought in their native turf from Epping Forest) are grown in the black peat of Wimbledon Common, laid about four inches in depth on the common garden loam, and covered as mentioned above, for the purpose of preventing the evaporation that would take place if the soil were left bare. Their share of the general watering is all that the plants receive, and they have flourished for six years under this treatment.

LASTREA OREOPTERIS. Heath Fern. Mountain Fern. TAB. VIII.

Fronds tufted, lanceolate pinnate: pinnæ linear-lanceolate, pinnatifid, sprinkled with resinous glands beneath; lobes oblong, obtuse, flat. Sori marginal.

Lastrea Oreopteris, *Presl.* Aspidium Oreopteris, *Swartz. Smith. Hooker. E. B.* Polypodium montanum, *Vogler.* Lastrea montana, *Newman, Hist. Brit. Ferns,* 129. Polypodium fragrans, *Linnæus.*

A native of mountainous and upland heaths and of woods, more abundant in the north of England, and in Wales and Scotland, than in our southern counties, where, however, it is still of frequent occurrence. In Ireland it is considered rare. The fronds make their appearance about the beginning of May, springing in a circle from the apex of the short rhizoma, and attaining a medium height of two or three feet, but varying in different situations and exposures from one to four or even five feet. The general outline is lanceolate; but the pinnæ are gradually shorter from the middle downwards, until, near the base of the rachis, they often wholly lose their pinnatifid character, and assume that of small triangular

leaflets with serrated margins. The under surface of the lobes is profusely sprinkled with minute, glossy, gold-coloured, glandular globules, which give a rich golden hue to the expanding fronds, that renders this beautiful fern very conspicuous when planted among others. To the secretion by these glands is probably due the peculiar odour of the fronds when bruised, which, being far from unpleasant in the open air, occasioned Linnæus to name the species *Polypodium fragrans*. The ordinary venation of the lobes, and the position of the sori, are shown in our figure; but, it may be remarked, that the latter are sometimes much more crowded, in consequence of the lateral veins dividing, as exhibited in the two lower ones, and bearing a sorus on each branch.

Many persons complain of a difficulty in rearing or establishing *L. Oreopteris*, and of its liability to dwindle and die under culture; and there seems to be a diversity of opinion respecting the soil and treatment that it requires, even among those whose experience is far from being limited. Thus, one recommends it to be planted in well-drained pots, with an admixture of turfy peat, broken charcoal and sand, and kept only moderately supplied with water; while another plants it in yellow loam, without any admixture of other soil, and keeps the pots constantly standing in water. Both methods may succeed; but the open air and free ground answer better than either. And, in regard to soil, a plant that in a state of nature grows here in the yellow loam, there in the black peat, and elsewhere in the fissure of the sand-rock, or on the side of the gravel-pit, can scarcely be much affected by the difference. A very good general rule to follow in the transplantation of the wild fern, is to carry with it a portion of the soil in which it grows; or, at least, to imitate this as nearly as possible. And I believe the reason why *L. Oreopteris* often fails, is, that this rule is not attended to; and that the plants, having their constitution adapted to the situation where their seedling growth commenced, do not readily change it under the new conditions in which they may be placed.

Some slight general resemblances between this species and *L. Thelypteris*, especially in the form and proportions of the frond and in the marginal fructification, which might mislead an inexperienced collector, render it necessary to remark upon the more obvious features by which they are distinguished. The fronds of the present species always grow in tufts; they are leafy almost to the very base of the rachis, which latter is copiously covered with pale brown scales, while in *L. Thelypteris* it is nearly smooth, and in the lower part devoid of pinnæ through about one-third of its height. The golden glands, and the perfectly flat instead of recurved margin of the fertile lobes, are characters—especially the former—that, if attended to, render it impossible to confound the plant before us with its congener.

LASTREA FILIX-MAS. Male Fern. TAB. IX.

Fronds tufted, lanceolate, bipinnate: pinnæ linear-lanceolate; pinnules oblong obtuse, serrated. Sori in a line on each side of the midvein.

Lastrea Filix-mas, *Presl.* Aspidium Filix-mas, *Swartz. Smith. Hooker. E. B.* Polypodium, *Linnæus.* Dryopteris Filix-mas, *Newman, Hist. Brit. Ferns,* 183.

The most common of our indigenous Ferns, with the exception of *Pteris aquilina,* occurring in woods, thickets, and on banks and hedge-bottoms in almost every kind of soil. The fronds spring in a circular manner from the extremity of the large scaly rhizoma, presenting vase-like tufts, hollow in the centre, a habit that renders this species highly ornamental when occupying situations sheltered from the wind; they vary according to age or exposure, from two to three or four feet in height, growing nearly erect, but with a slight determination outwards: their development commences in May, the circinate vernation, at first gradually uncoiling, being soon obliterated by the liberation of the apex, which, hanging downwards, gives the upper part of the frond a bend resembling that of a shepherd's crook, a character, however, it should be observed, not peculiar to this fern. The rachis, leafy through about two-thirds or three-fourths of its length, is more or less densely clothed with thin membranous pointed scales, of a pale, often purplish hue, especially towards the base. The lower pinnæ are much shorter than those of the middle, but never approach the diminutive size of those of *L. Oreopteris,* nor do they extend so far downwards. The pinnules, generally distinct at the lower part of the pinnæ and thus justifying the specific character, *bipinnate,* are confluent above; they are likewise liable to vary from the ordinary oblong and obtuse to the more lanceolate form, and the margin from crenate to serrate, the serratures occasionally terminating in slender spines. The sori are produced on the upper branch of the forked lateral veins a little above the furcation, and hence form a line on each side of the midvein, but seldom extending much more than half the length of the pinnule; they are covered by a very conspicuous smooth reniform indusium, of a more permanent character than that of most other British Ferns, and attached by its sinus. The fructification is usually matured in August, but the fronds retain their beauty to the close of the year, and often, in mild seasons and sheltered situations, throughout the winter.

Variations from the normal form of *L. Filix-mas* are not of unfrequent occurrence, and in a few instances they are of so striking and permanent a character as to claim a separate notice, viz.:

1. *incisa.* Frond robust, broadly lanceolate: pinnæ distant;

pinnules distinct, elongate, narrow, acuminate, deeply incised, the lobes serrated. Sori extending nearly the entire length of the pinnules. Lastrea Filix-mas, *β.* incisa, *Moore, Handbook Brit. Ferns,* 50. Aspidium Filix-mas, *β.* erosum, *Hooker and Arnott.* Dryopteris affinis, *Newman, Hist. Brit. Ferns,* 187.

2. *abbreviata.* Frond small, lanceolate, pinnate. Sori confined to the base of contracted or obsolete pinnules, forming a linear series on each side of the midvein of the pinnæ. Lastrea Filix-mas, *β.* abbreviata, *Babington.* Polystichum abbreviatum, *DeCandolle.*

3. *Borreri.* Frond narrow lanceolate. Rachis clothed with ruddy-golden scales and hairs. Sori few, large, two or three pairs at the base of each pinnule. Dryopteris Filix-mas, var. Borreri, *Newman, Hist. Brit. Ferns,* 189.

Of these, the variety *incisa* is far from uncommon; *abbreviata* has been found on Ingleborough, Yorkshire, on the basaltic cliffs of Teesdale, and in the Peak district, Derbyshire, everywhere apparently in dry localities; *Borreri* seems to be common, though first observed by Mr. Borrer in Devonshire, as a variety "with more copious and brighter coloured scales on the rachis, and with a bright golden-yellow tinge on the whole frond." *Brit. Flora.*

Abbreviata retains its distinguishing features in all soils and under different treatment in cultivation, and may perhaps eventually prove a separate species.

The rhizoma of this species has been employed as an anthelmintic ever since the time of Theophrastus, and it is still a favourite remedy in worm cases in many parts of the Continent. The attention of modern medical practitioners was probably first directed to it, in consequence of its being the ostensible remedy of Madame Nouffer of Switzerland, who sold her secret method of expelling the tape-worm to Louis XVI. for 18,000 francs. The inner parts of the rhizoma, carefully dried and reduced to powder, and a decoction and ethereal tincture of the same and of the unexpanded fronds or fern buds, are the preparations employed, but in this country they are now rarely resorted to, because other medicines have been found more effectual. The anthelmintic property resides in an essential oil, and is lost by keeping the powder otherwise than in well-stopped bottles, hence the fresh preparations are always preferred.

There is no difficulty in the way of cultivating the Male Fern; it will grow readily in the common soil of a garden, but is rendered more luxuriant by planting it in the compost described in our introduction, and selecting a shady and moist situation. Its compact growth, large size, and bright green hue are well adapted to contrast with the naked trunks of trees in plantations, and to break the uniformity of shrubberies and wilderness walks, but it should be so planted that its natural growth may not be disturbed

by that of its neighbours, as much of its beauty is dependent upon the regular development of the fronds, and the erect vase-like form of them in the mass.

LASTREA CRISTATA. Crested Fern. TAB. X.

Fronds linear-oblong, nearly bipinnate; pinnæ short triangular-oblong, deeply pinnatifid with oblong serrated lobes; the lower lobes or pinnules often almost pinnatifid. Sori chiefly confined to the upper part of the frond.

Lastrea cristata, *Presl.* Aspidium cristatum, *Swartz. Smith. Hooker. E. B.* Polypodium cristatum, *Linnæus.* Polypodium Callipteris, *Ehrhart.* Lophodium Callipteris, *Newman, Hist. Brit. Ferns,* 169.

One of our rarest English Ferns, or at least extremely local in its distribution, being confined to boggy heaths and moors, and found hitherto in only four of the counties of England. The recorded habitats are—Westleton, Suffolk; Holt Heath, Fritton, Dersingham, Edgefield, and Bawsey Heath, Norfolk; Oxton Bogs and Bulwell Marshes, Nottinghamshire; and Wybunbury Bog, Cheshire. The Suffolk station is doubtful. Several years back I searched the locality where Mr. Davy is said to have found it, without success, though guided to the alder bushes where his specimens were collected, nor could I meet with the plant anywhere in the neighbourhood. According to Mr. Newman, it does not appear to have been found there by any recent examiner.

It is remarkable that *L. Filix-mas* should have been frequently confounded with the present species, considering the striking difference in habit that exists between them; but the desire to add a rarity to his collection will occasionally lead even an accomplished botanist into a similar mistake to that by which we have a Suffolk habitat recorded for a fern that probably does not grow there.

The rhizoma is stout and strong, and, branching occasionally in different directions, frequently occupies in old plants a considerable space, sending up annually a tuft of erect fronds from the extremity of each branch or crown. The fronds attain a height of two feet or more under favourable circumstances, and are peculiarly erect, so as to render it next to impossible for a person who has once seen it growing naturally to confound it with any other native fern. Rather more than one-third of the rachis is bare of pinnæ, and more or less covered with scattered broad obtuse pale brown membranaceous scales; the pinnæ, nearly equal in length except toward the apex, are in rather distant and generally opposite pairs; their segments, often assuming the character of distinct pinnules in the lower part, are deeply serrated, and sometimes even pinnatifid,

the serratures terminating sharply. The lateral veins of the lobes divide into several branches, the uppermost of which bear the sori, which thus form a line on each side the midvein about half-way between it and the margin, extending to the extremity of each lobe or pinnule. The indusium is nearly circular, very permanent, and conspicuous from the contrast of its white or pale leaden hue with the black or dark-coloured thecæ. The regular arrangement of the sori is frequently disturbed in luxuriant specimens by super-development, and they generally become confluent in maturity, a state attained in the latter end of August. The fronds remain green in mild seasons throughout the winter.

This is not at all a shy species under cultivation: it succeeds best in turfy peat, without admixture of any other soil, and, though naturally an inhabitant of boggy ground, seems to bear drought better than some of those belonging to drier situations; neither is shade so essential as to render exposure to the sun a matter of any importance: indeed I have this summer a specimen, two feet high, and in fine condition, growing on a sloping bank, and quite unshaded from sunrise to three o'clock in the afternoon.

The specific name, *cristata*, has been cavilled at by some botanists, but was evidently bestowed on it by Linnæus, in consequence of a fanciful comparison between the cluster of its peculiarly erect fronds and the aigrette of vertical feathers on the head of the peacock, *Pavo cristatus*: that of Ehrhart, *Callipteris*, literally *beautiful fern*, adopted by DeCandolle, associates ill with a species not at all remarkable among its congeners for the attribute expressed.

Lastrea rigida. Rigid Lastrea. Tab. XI.

Fronds triangular-lanceolate, bipinnate, glandular: pinnules oblong, obtuse, lobed, the segments broad, rounded, 2-5-toothed. Indusium persistent, fringed with glands.

Lastrea rigida, *Presl.* Aspidium rigidum, *Swartz. Smith. Hooker E. B.* Lophodium rigidum, *Newman, Hist. Brit. Ferns*, 175 Polypodium fragrans? *Linnæus.*

This appears to be a very local species, having hitherto been almost exclusively found in the mountainous districts of the north of England. It was first noticed as a British fern by the Rev. Mr. Bree, who met with it growing on Ingleborough, and subsequent researches have shown that it is abundantly distributed along the limestone formation of Yorkshire, Westmoreland, and Lancashire. Mr. Pinder and others have remarked upon the profusion in which it grows, at intervals, between Arnside Knot (near Silverdale, Westmoreland) and Ingleborough, springing from the deep fissures of

the natural platform, and occasionally high in the clefts of the rocks. It is generally, he observes, much shattered by the winds, or cropped by the sheep, which seem to be fond of it. Mr. Tatham found it abundant in the fissures of limestone rocks, near Settle, in Yorkshire, at an elevation of 1550 feet; and also on White Scars, above Ingleton. A single plant, found by Mr. Vize, near Bath, and one Irish habitat furnished by Mr. Darby, who gathered it at Townley Hall, Louth, from a wall "built of clay-slate, and much overhung with trees," are scarcely to be regarded as exceptions to the fact that its natural site in this country is limited to the district above recorded, as in both of the latter instances circumstances seem to indicate that it was planted.

The fronds spring in tufts from the summit of a thick, slowly-lengthening rhizoma: they grow nearly erect, varying much in height according to situation, from six inches to two feet or more: the leafy portion occupies about two-thirds of the length, the lower part of the rachis being densely covered with reddish-brown membranaceous scales, broad at the base, but attenuated upwards and terminating very acutely. In general outline the frond varies, but is mostly of an elongated triangular form. Mr. Newman, however, remarks that this form is only met with in young or weak specimens, and that an elongate-lanceolate one prevails in older and stronger plants; he has figured both of these varieties, the latter having the lower pinnæ gradually shortening from the middle of the frond. The figure in Mr. Moore's 'Handbook of British Ferns,' page 54, accords with this, and, as far as my own observation extends, conveys a very erroneous notion of the general character of the species, a circumstance to be regretted, because it is almost the only faulty representation in one of the most valuable manuals ever published. Mr. Newman's left-hand figure is very characteristic of that which is generally regarded the normal condition of the plant. The pinnæ are alternate, linear-lanceolate, and all pinnate: the pinnules are oblong obtuse, sometimes slightly decurrent, more or less deeply lobed or pinnatifid; the segments broad and terminated with from two to five very acute, but not spinulose teeth, the number of which is determined by the branching of the lateral veins. The sori are disposed on the upper branches of the veins, which are always the result of the first bifurcation, and thus form two parallel lines, one on each side of the midvein; in maturity they become confluent. The indusium, reniform and attached to the vein by a short stalk at its sinus, is very permanent and conspicuous, and is fringed round the margin with stalked globular glands. Similar glands with shorter pedicels are found scattered over the whole surface of the frond, and to their secretions is probably due the not unpleasant odour that obtained for this plant the early specific name of *fragrans*, a name, however, which undoubtedly occasioned the frequent

confounding of it with *L. Oreopteris*. Fructification chiefly confined to the upper part of the frond. Mature in August and September.

The geological relations of *L. rigida*, its occurrence only in limestone districts, and its absence, in those districts, where other rocks come above the surface, might induce the notion of the necessity of imitating as much as possible its natural conditions in cultivation; hence it has been recommended to plant it among fragments of limestone or old mortar, and to water it with lime-water,—precautions altogether unnecessary. As a rock-plant, it requires good drainage; as a fern, moisture and shade during the growing season are favourable to its development; but it will flourish in the ordinary garden soil, and seems almost indifferent of exposure to the sun. In habit and general aspect it is not at all a distinguished member of its tribe, being less ornamental than most of them, and rather valuable in grouping, from the contrast it affords to more graceful forms than for individual beauty. When grown in pots, a mixture of peat and loam with broken stone or shards below, occupying about a fourth of the depth in order to ensure the ready percolation of water, affords the best medium, and the pots should never be placed in water. Mr. Moore recommends planting it with the crown of the rhizoma a little above the surface.

LASTREA SPINULOSA. Narrow prickly-toothed Fern. TAB. XII.

Fronds erect, linear-lanceolate, bipinnate: pinnules oblong, inciso-pinnatifid, with serrate, spinose-mucronate lobes. Indusium persistent, not fringed. Scales of the rachis broad, ovate, pale.

Lastrea spinulosa, *Presl. Babington, Man. Moore, Handb.* Aspidium spinulosum, *Smith. Hooker.* Lophodium spinosum, *Newman, Hist. Brit. Ferns,* 157.

Much confusion exists in regard to this and the following species, of which it is by some regarded as a variety. Though found in various parts of the kingdom sparingly distributed, it seems to be chiefly confined to the southern and western counties of England, growing in marshy places and wet woods and thickets. The rhizoma elongates slowly, branching in old plants in every direction, so that when once established in any particular locality, the clusters of fronds are generally numerous. It is an early grower, the fronds making their appearance in April, and rapidly attaining their full development, which varies from one to two or even three feet in height: they are nearly erect, bipinnate, long and narrow in the general outline, the pinnæ being of nearly equal length throughout, except toward the acuminating apex. The leafy portion occupies

about half of the length, and is perfectly flat, never convex as in *L. dilatata*; the rachis is more or less clothed with thin, almost diaphanous, rounded or oval scales, terminating with a little point, but not at all acuminated. The pinnæ are rather distant; the pinnules more or less deeply pinnatifid, and sometimes even almost again pinnate, especially in the lower part of the large fronds. All of the segments are deeply serrated, the serratures terminating in a sharp point or mucro curving towards the apex of the pinnule. The venation is somewhat complicated, a branch of the lateral vein extending to each serrature: the sori being produced upon the uppermost branch of each lobe, are opposite to the sinuses, and form a line on each side of the midvein; in luxuriant specimens this arrangement is often disturbed by superdevelopment. Fructification is perfected on the earlier fronds in July, and on the later in September. The sori are generally small, the indusium persistent, reniform, flat, a little waved on the margin, but never ciliated with glands. As the thecæ expand, the clusters frequently become confluent, especially where the plant occupies an exposed situation.

The ordinary compost, shade, and moisture, are the only requisites for the successful cultivation of this fern. It will bear exposure, if well supplied with water; but, to obtain it in its beauty, it must be screened from the direct rays of the sun: the mottled and ever-shifting light and shade produced by the intervention of trees, is always favourable to the growth of this beautiful tribe of plants, even of those species which in a natural state occupy the most unsheltered habitats. Compared with some others, this, like *L. rigida* and *L. cristata*, is not perhaps so remarkably ornamental that it would be included in a selection for planting with a view to effect, but its character is much improved by judicious appropriation of a site sheltered from wind and sun.

In retaining this as a species, I am by no means intending to decide that it has any positive claim to be so considered. The diversity in habit, outline, and division of the frond, and other anomalies, so frequently met with in ferns the specific identity of which cannot be questioned, forbid any such assumption; but amidst the uncertainty and difference of opinion that prevail respecting the species of this and the following genus, *Polystichum*, it seems better to retain a name that has been applied to a certain well-known form like that before us, than to discard it altogether. In appointing the limits between species and varieties, our conclusions are too frequently drawn from very partial or imperfect data.

LASTREA DILATATA. Broad prickly-toothed Fern. TAB. XIII.

Fronds arched, ovato-lanceolate, bipinnate: pinnules pinnatifid

or pinnate, with serrate, spinose-mucronate lobes. Indusium evanescent, fringed with stalked glands. Scales of the rachis long, lanceolate, dark in the centre.

Lastrea dilatata, *Presl. Babington, Man.* Aspidium spinulosum *β*, *Hooker.* Lophodium multiflorum, *Newman, Hist. Brit. Ferns,* 147.

One of the most common and most generally distributed of British ferns, growing in woods, and on sheltered hedge-banks, throughout the kingdom. Contrary to the character of that of *L. spinulosa,* the rhizoma of this species is not at all creeping, rarely branches, but forms a strong, enduring, erect, stem-like base, that, in very old specimens, not unfrequently rises from six inches to a foot above the soil. The fronds grow symmetrically in a circular or vase-like cluster, arching over in every direction so as to occupy a considerable space, attaining, in mature plants and in favourable situations, a length of five feet, with a breadth in the widest part of a foot and a half; their ordinary size is, however, considerably less, viz. from a foot and a half to two feet in length: in general outline they vary from triangular to lanceolate or ovato-lanceolate, the triangular form being characteristic of the young plant, in which state it is often completely deltoid. The rachis is clothed, especially toward the base, with long lanceolate or linear-lanceolate, acuminated scales, of a deep brown or blackish hue along the centre, and nearly diaphanous at the extremity and margins. Any particular description that might be given of the divisions of the frond, beyond that already recorded under the specific character, would be of little avail in the decision of a species so protean as the present. The pinnæ are distant, so much so in the fructifying fronds as to frequently give a peculiarly meagre aspect to the plant, especially when accompanied by that convexity of the pinnules and lobes, which is an almost inseparable feature of the most common variety in exposed situations. The venation is very similar to that of *L. spinulosa,* and the situation of the sori on the upper or anterior branches is accordant likewise. The indusium is irregularly reniform, and ciliated with stalked translucent glands; it soon disappears. The fructification is less regularly disposed, and instead of being chiefly confined to the upper end, as is the case in the preceding, is scattered over the whole under surface of the frond; it is mature in August.

Some of the forms of this fern are very elegant, when grown in shade and plentifully supplied with water; but although it bears exposure well, and will live and even flourish under the circumstance, it soon loses all pretension to beauty, and remains disfigured throughout the summer. The same treatment answers equally well for this and *L. spinulosa.*

A vast amount of labour and ingenuity has been expended on the consideration of these two ferns (*L. spinulosa* and *L. dilatata*) and their varieties, with the view of establishing decided limits between the latter, or of elevating the most marked deviations from what has been agreed upon as the normal form, to the rank of species. The result has not been at all satisfactory; that which was a point of dispute a generation or two back, still remains so; and although botanists freely discuss opinions with each other, and maintain or controvert according to present conviction, every new work, nay, every new edition proves the instability of their own; the species of one day becomes the variety of another, the variety of yesterday may be the species of the morrow, or it may be discarded altogether. This has been the case over and over again with the ferns before us. Being of wide distribution, and apparently indifferent, so far as mere capability of growth is concerned, to soil, elevation, and exposure, they assume a diversity of aspect according to circumstances: to what extent the influence of such causes may have contributed to the multiplication of supposed species in this and other genera, future observation must decide; the whole genus *Lophodium* of Newman, a well-marked group among British ferns, may be implicated.

On these grounds, added to the uncertainty of definition afforded by characters too slight and variable to be depended upon, I leave the alleged varieties of *L. dilatata* to be determined by the fancy of the observer.

LASTREA FŒNISECII. Recurved prickly-toothed Fern. Hay-scented Fern. TAB. XIV.

Fronds curved, elongate-triangular, subtripinnate: pinnules pinnate or deeply pinnatifid, with serrate spinose-mucronate lobes. Indusium jagged at the edge. Scales of the rachis narrow lanceolate, laciniate, pale.

Lastrea fœnisecii, *Watson. Babington, Man. Moore, Handb.* Aspidium recurvum, *Bree.* A. dilatatum, var. concavum, *Babington.* A. spinulosum var., *Hooker and Arnott.* Lophodium fœnisecii, *Newman, Hist. Brit. Ferns,* 135 (the figure far from characteristic).

This fern, though rather widely distributed in the British islands, is generally regarded as originally a wanderer from the Azores, or other Atlantic groups; in corroboration of which opinion we find it most abundant in the south-western counties of England and Ireland, the situations toward which it would naturally be drifted by the tidal wave, or where its sporules would be wafted by the prevalent south-westerly winds. That it is among the later addi-

tions to the recent vegetation of these lands, seems farther evinced by the fact of its not having hitherto been found in the central counties of Great Britain. To speculate upon the geological epoch at which its introduction took place, would be useless; but it is highly interesting to the philosophic observer, to trace the successive distributions of a plant, which, like the present, indigenous to the islands of the North Atlantic from the Cape de Verde to the Azores, wafted by wind and wave, arrives on the coast of Sussex, Devon, and Cornwall; beyond, the same agents land it in Somersetshire, Glamorganshire, Merioneth, and Anglesea; still onward, it reaches Lancashire and Cumberland, the western islands and mainland of Scotland, and plants a colony in Orkney; lastly, the returning current lodges the later wanderers in Angus, and, southward, at Scarborough in Yorkshire: in the latter county, its most inland habitats seem at present to be attained in the vicinity of Ripon and Settle.

Few ferns are more indifferent to soil or exposure: it is met with in damp woods, and under the shelter of moist hedge-banks and thickets, attaining in such localities a height of one or two feet, and a degree of luxuriance surprising to those previously only acquainted with its smaller forms; for, although shelter and abundant moisture are favourable to its full development, it is often found growing from the clefts of sandstone and other rocks in the most exposed situations, the fronds being only from two to six inches long. The fronds spring in a circular manner from a broad crown, curving downward very gracefully in large specimens, as they extend: they are of a pale but lively green hue, and remarkable for their curled or crisped appearance, arising from the margins of the lobes and pinnules being curved upwards so as to render their upper surface concave. The leafy portion occupies about one-half of the length, and is of an elongated triangular form, in young specimens nearly deltoid; the rachis, especially at the lower part, being rather densely clothed with pale, diaphanous, long, narrow, and generally laciniated scales. In mature plants, the tripinnate character is very constant at the base of the frond and of its principal divisions; and the tertiary pinnules and lobes being all serrated, the serratures terminating in short spines, give a complexity of outline so peculiar as to render it difficult, even at the first glance, to confound this with any other species or variety, especially when combined with the concavity of surface, so strikingly opposed to the convexity of that of *L. dilatata*. Minute globular sessile glands are scattered over the whole under surface of the frond, whence the odour resembling new-made hay, from which the specific name is derived. The sori are nearly equally distributed over the frond; they are covered by roundish, reniform, generally evanescent indusia, which are irregularly cut or

jagged on the margin, and occasionally fringed with a few glands similar to those mentioned above.

This is a very beautiful species under cultivation, especially when the contingencies of shade, moisture, and good drainage are properly secured. Though of supposed tropical derivation, it is one of our most hardy native ferns, and perfectly evergreen. I have now, September 4th, before me a green frond of last year, just gathered from a plant that was exposed throughout the winter in a pot laid sideways on the fern-bank in my garden. This character renders it valuable in the greenhouse, to which its moderate size, lively green hue, and elegantly crisped habit, are farther recommendations. Whether grown in the open ground or in pots, the ordinary compost will suffice.

Regarded by some botanists as a variety of *L. dilatata* or *spinulosa*, this still bears so much the impress of distinctness, that it can scarcely be other than a species. In 1821, I first noticed it in the vicinity of Dolgelley, and again in the Vale of Festiniog, and, though marking its peculiarity, supposed it in my inexperience to be a form of *Aspidium dilatatum* of Smith; it had not then received name or notice among recent botanists, though apparently referred to both by Ray and Plukenet; nor was attention directed to its very distinct character, even as a variety, until, in 1831, the Rev. W. T. Bree described it in the 'Magazine of Natural History,' under the name of *recurvum*; since which period, opinion has been divided respecting its claim to rank as a species. It is to be regretted that the name *fœnisecii*, afterwards bestowed upon it by Mr. Lowe, should have been adopted in preference to that of *recurva*, the odour differing very equivocally from that of other species of fern, while the latter name expresses a positive feature by which the plant is at once recognized.

In regard to the other recorded species of the genus *Lastrea*, viz. *Aspidium dumetorum* of Smith, and *Lophodium collinum*, *glandulosum*, and *uliginosum* of Newman, they are at present too doubtfully circumstanced between the variable forms of *spinulosa* and *dilatata* to be admitted, without farther and stricter observation than has yet been bestowed, to occupy a separate station in a series already encumbered with uncertainty. Mr. Moore, in the second edition of his valuable 'Handbook,' makes *L. spinulosa* a variety of *L. cristata*, and observes:—"I unite the following forms under one species, because, although the two extremes are apparently distinct, they are so closely connected by the intermediate form (*uliginosa*) as to be undistinguishable from one or other of the conditions which the latter assumes." My own acquaintance with *uliginosa*, confined to a single growing specimen, is too limited, perhaps, to justify an opinion, but it inclines to an opposite conclusion, namely the entire exclusion of *cristata* from the equivocal series now before us.

Genus 4. POLYSTICHUM.

Gen. Char. Sori circular, seated upon the upper branch of the lateral veins; covered by a circular peltate indusium attached by its centre.

This genus, separated from *Lastrea* in consequence of the difference of the form and attachment of the indusium, is farther characterized by the rigidity of its foliage, and of the sharp spinous processes by which all the ultimate divisions of the frond are terminated, while the upper basal lobe or pinnule is always larger than the others. The British species are very nearly allied, and present a series of varieties between the simpler and more complicated forms that renders their determination difficult. The name, not well chosen, is compounded from the Greek πολὺς, *many*, and στίχας, *series*, in allusion to the regular linear arrangement of the sori.

Polystichum Lonchitis. Holly Fern. Rough Alpine Shield-Fern. Tab. XV.

Fronds rigid, linear-lanceolate, pinnate: pinnæ spinose-serrate, auricled at the base above, oblique below.

Polystichum Lonchitis, *Roth. Babington. Moore. Newman.* Aspidium Lonchitis, *Swartz. Smith. Hooker and Arnott. E. B.* Polypodium, *Linnæus.*

Its exclusively alpine habitats have caused this beautiful fern to be generally described as among our botanical rarities: in England and Wales it seems to be confined to the mountains of Yorkshire and the Snowdon district; but, in the mountainous parts of Scotland, it is widely and abundantly distributed, and in the north and west of Ireland. It is generally found springing from the clefts of the rocks in the highest and most exposed situations; but occasionally lower down, in the glens and mountain-passes, especially in the crevices and on the ledges of their most precipitous sides. The fronds grow in a tuft from the extremity of a very slowly lengthening rhizoma, varying from a few inches to a foot and a half in height: they are generally of a rigid texture and erect growth, but in some situations thinner and spreading, or even almost pendulous; the latter character, it has been remarked, belongs almost exclusively to English and Welsh specimens. The colour is of a deep glossy green. The general outline of the frond is linear, more or less acuminated at the upper part, and simply pinnate. The pinnæ are short, arranged alternately and

obliquely on the rachis, and extending nearly to its base, which is rather densely clothed with reddish-brown chaffy scales: they are somewhat crescent-shaped, auricled at the base on the upper side, oblique below, and so closely disposed as to overlap each other when pressed flat; the margin is deeply serrated, the serratures terminating in sharp spinous processes, which, added to the rigidity and almost leather-like character of the leafy texture, and its evergreen habit, renders the English name "Holly Fern" very appropriate. The lateral veins are alternate, generally three-branched, the upper branch bearing the sorus; on the auricle, the venation is more complex, and the production of sori indefinite. The fructification is most frequently confined to the upper part of the frond, but is sometimes irregularly scattered likewise over the lower pinnæ even to the base. The sori are disposed in a regular series on each side of the midvein, and often become confluent in maturity. The indusium is circular, opening all round, and remaining attached to the venule by a short central stalk, the distinguishing character of the genus.

The cultivation of the Holly Fern is not attended with very satisfactory results in the eastern parts of England, especially about London, where few persons have succeeded in keeping it for any length of time, unless as a potted plant, and sheltered in the greenhouse or in a cool frame; and, even under these circumstances, it is exceedingly liable to "damp off," an expression that, like "blight," is often applied to denote the action of causes we do not understand. In potting *P. Lonchitis*, or any other alpine fern, the natural condition of the plant should never be lost sight of; however moist that may be, it is always well drained; a rill may constantly lave its roots, or a cascade perpetually sprinkle its leaves, but the water never stagnates, and even the scanty soil is changing from time to time, by the addition or rather substitution of new particles, as the older are washed away to maintain the fertilization of the valley below. In order to insure drainage, the pot should be large, and at least one-fourth filled with broken stone or shards mingled with charcoal and pieces of turfy peat. The ordinary compost will suffice; but fragments of slate or sandstone placed perpendicularly around the rhizoma, though not in immediate contact with it, the soil being firmly settled between them, afford an imitation of at least one important circumstance belonging to the natural site that will be found serviceable to the possessor. In the open air I once had a small specimen of this species growing for four years, but it died during the next winter after removal; and it is a very general complaint, that although it will live and apparently flourish for a season, it rarely survives the winter and spring when exposed to their influence. The absence of the snow cover, that in their native habitats shelters the alpine plants

alike from the excess of cold and drying influence of the winds, is the chief cause of their not flourishing generally under exposure in this part of England; added to which, is the frequent alternation of excessive wet, during those seasons when the vital energies of the plants are dormant: the injurious results arising from both of these circumstances may be obviated, in a degree, by covering the plants individually with an inverted garden-pot or a hand-glass at the period in question, exposing it only in mild and dry weather. This is a plan by which I have often succeeded in preserving some of the higher alpine species of flowering plants that are otherwise incapable of cultivation in the vicinity of the metropolis, and it was the protection afforded to the above-mentioned specimen of the fern before us.

In England, the distribution of *P. Lonchitis* may probably be found to be less confined than has hitherto been supposed, Mr. W. H. Hawker having discovered it in July of last year (1853) on Swarth-fell, near Ulleswater, and this year in one or two other stations in the Lake district.

POLYSTICHUM ACULEATUM. Prickly Shield-Fern. TAB. XVI.—XVII.

Fronds rigid, lanceolate or linear-lanceolate, bipinnate: pinnules confluent, obliquely decurrent, or attached by the point of their wedge-shaped base; the upper basal ones largest; all spinose-serrate, more or less auricled at the base.

Polystichum aculeatum, *Roth. Babington. Moore. Newman.* Aspidium aculeatum, *Swartz. Smith. Hooker and Arnott. E. B.* Polypodium, *Linnæus.*

Common on hedge-banks and on the borders of woods and thickets throughout the kingdom, and occasionally met with in more exposed situations on heaths and mountains. The rhizome is large and woody, increasing in length very slowly, so that even in old plants it is very short in comparison to its bulk. The fronds grow in a tuft, in young specimens spreading out horizontally, but in older becoming nearly erect in maturity, and attaining the height of two or three feet: during the early period of development they are usually very limp in texture, and the newly unfolded pinnæ and circinate apex are liable to hang down with their own weight, as if drooping for want of nourishment, but as growth advances they acquire the characteristic rigidity so remarkable in the foliage of this beautiful genus. The general outline varies greatly in different specimens, and even in fronds belonging to the same plant, being in some instances almost linear, in others even broadly lanceolate: the division too is equally diversified, and

though the bipinnate character is tolerably constant in full-sized plants, the pinnæ are rather lobed or pinnatifid than pinnate in those of smaller size, and this difference is often independent of age. The first upper division at the base of each pinna, whether lobe or pinnule, is always larger than the others, and, standing parallel with the main rachis, the two series thus formed present a very peculiar appearance in the general aspect of the frond, especially of the upper face. All of the principal divisions terminate in a sharp spinous process, and are more or less fringed on the margin with spiny serratures. The rachis is leafy to within a few inches of its base, and is clothed throughout with reddish-brown or rust-coloured scales, which are broad and densely crowded below, but become gradually fewer and more attenuated towards the extremity of the frond. There is nothing peculiar in the fructification, beyond the regularity of the disposition of the sori, and their occurrence almost exclusively on the upper pinnæ only; they are generally rather large in proportion, and often become confluent.

A fern liable to assume such diversity in outline and division as this, could scarcely fail of becoming a subject of contention among botanists, relative to the individual claim of its more permanent varieties to the rank of species. To enter into any minute detail of the differences presented by the so-called species of *Polystichum*, as figured or described by past writers, would be to little purpose; it will be sufficient here to remark that three apparent forms of the plant now before us have been so distinguished, and named respectively *lobatum*, *aculeatum*, and *angulare*. The first two are now universally admitted to be merely different states of the same plant, dependent on age or other circumstances; the last occupies, though somewhat equivocally, a more decided position as a separate species, in the works of the most recent botanists; that position I will leave it, but rather that its prominence may lead to farther inquiry, than from any conviction of its being other than a false one: *lobatum* and *angulare*, indeed, appear to me the extremes of a series connected by so many intermediate modifications of form and habit, that, in the absence of more important differential features than have hitherto been established, it is utterly impossible to determine the limits of either. As varieties, the three may be thus defined:—

1. *lobatum*. Frond rigid, simply pinnate: pinnæ lobed or pinnatifid. Tab. XVI.

2. *aculeatum*. Frond rigid, sub-bipinnate: pinnules more or less decurrent. Tab. XVII.

3. *angulare*. Frond lax, bipinnate: pinnules distinctly stalked.

Under all its varieties of form, *Polystichum aculeatum* is among

the handsomest of the larger British ferns; it is evergreen, the foliage of a bright hue and glossy; and, its growth being scarcely suspended from the first development in April until the setting in of winter,—so that the pale yellowish-green of the young fronds contrasts very strikingly with the deep holly-like appearance of the older ones, throughout the whole of the summer and autumn,—it is more constantly ornamental in the fern-garden than most others. The cultivation is attended with no difficulty; it will grow in common garden soil, but flourishes best in a mixture of sandy loam and peat, and although not injured by moderate exposure to the sun, prefers the shelter of trees and shrubs, or a shaded bank. When grown in pot, the ordinary compost must be employed, and full drainage; and unless kept in the greenhouse or otherwise protected, the pot should be plunged in a dry border during the winter. All the varieties are well adapted for house culture, and their beauty is much enhanced by careful treatment; but they require a great deal of room, large pots, and space to extend their fine evergreen fronds, if the cultivator is desirous of witnessing their most advantageous development.

Polystichum angulare. Angular or Soft prickly Shield-Fern. Tab. XVIII.

Fronds lax, drooping, lanceolate, bipinnate: pinnules distinctly stalked, with an obtusely-angled base, more or less obtuse at the apex, spinose-serrate.

Polystichum angulare, *Presl. Newman. Babington. Moore.* Aspidium angulare, *Willdenow. Smith. E. B. Hooker and Arnott.*

This is certainly less common in its distribution than the preceding, but inhabits similar situations; the differences between them are sufficiently striking where the contrast is made with the extremer forms of each: the habit of this is flexile and drooping, the leafy texture not so firm as that of *P. aculeatum*, the upper basal pinnules often scarcely larger than the lower ones, and all of them somewhat crescent-shaped, auriculate on the upper side, rounded below, and attached to the partial rachis by a very distinct, slender stalk, instead of being decurrent. Several deviations from this normal form have been noticed, and two especially seem marked varieties, and are well known in cultivation:—

1. *subtripinnatum.* Lower pinnules deeply pinnatifid, the lobes sometimes distinct.

2. *angustatum.* Pinnules all narrow, very acute.

The latter is frequently proliferous, or rather viviparous, by the production of bulbils about the bases of the lower pinnæ and pin-

nules; this is especially the case where the plants are grown in pots in the greenhouse, or in very sheltered situations in the open fernery.

P. angulare and its varieties are less hardy than *aculeatum*, and are not so strictly evergreen, a consequence probably of the greater laxity of their tissue. They seem to require more careful drainage, a lighter soil, and complete shelter from the sun and cold winds. It might be a subject of question, whether these facts may not indicate *that* very specific distinction which previous remarks tend to set aside; but in opposition to any suggestion of this kind, it may be remarked, that division, variegation, or laxity of the foliage, constituting variety among the higher orders of plants, is almost universally accompanied by a less robust constitution than that belonging to the normal condition of the species.

Genus 5. CYSTOPTERIS.

GEN. CHAR. Sori roundish. Indusium attached by its broad hooded base beneath the sori, with a lengthened, fringed, free margin, opening towards the apex of the segment.

The British species of this genus are small, elegant ferns, of a very delicate, almost fragile texture; they are well adapted for house culture, throwing out their beautiful fronds, profusely sprinkled with fructification, in all seasons, when sheltered from the frost, the first approach of which, however, destroys them in the open air. They grow naturally on rocks and walls, chiefly in alpine and subalpine districts; and notwithstanding their delicate appearance, few of the smaller ferns are equally capable of living in a dry atmosphere, or exposed to the action of the sun.

The indusium is hollow at the base, forming a sort of hood fixed by its inner margin, that is curved beneath the sorus; the remarkable extension of the outer margin is best observed when the thecæ have recently burst through their membranaceous cover, which is then seen to be broken unequally into a fringe of narrow, often capillary segments, that becomes eventually reflected.

The generic name is a Greek compound of *κύστις, a bladder*, and *πτέρις, a fern*, in allusion to the peculiar character of the indusium.

This genus is very nearly allied to *Woodsia*, differing from it chiefly, if not solely, in the form and attachment of the indusium; which, in the latter, has its point of attachment beneath the sorus, inclosing it equally all round, and opening in the middle, when it divides into numerous capillary segments forming an involucral fringe around the thecæ. In *Cystopteris*, on the contrary, the attachment of the indusium is rather lateral than basal, and the

margin is connected on the outer side with the back of the frond. In habit and general appearance our native species of *Woodsia* are at first sight very dissimilar to the species of the present genus, but *Woodsia Perriniana*, a North American species, is so like *Cystopteris fragilis*, as to be generally confounded with it by a casual observer, while the indusium is only fringed on the margin, thus leaving its involucral character the sole feature of distinction.

CYSTOPTERIS FRAGILIS. Brittle Bladder-Fern. TAB. XIX.—XX.

Fronds erect, lanceolate, bipinnate: pinnæ lanceolate: pinnules ovato-lanceolate, deeply pinnatifid, the segments ovate or lanceolate, sharply toothed or serrated.

Cystopteris fragilis, *Bernhardi. Hooker and Arnott. Babington. Moore. Newman.* Cystea fragilis, *Smith, Eng. Fl.* Cyathea fragilis, *Smith, Fl. Brit. E. B.* Polypodium, *Linnæus.*

Abundantly distributed over the mountainous and rocky districts throughout the kingdom, and occasionally on old walls and buildings in the lowland counties. It seems to prefer the moist crevices of limestone rocks in the vicinity of waterfalls, but is by no means exclusive in selecting a site, and though most flourishing and exuberant in its growth under the conditions of shade and moisture, is often met with occupying the most exposed situations. The rhizoma is creeping, but extends slowly, branching and forming new crowns around the old one, often several in number during the same summer and autumn. The fronds rise in tufts from these crowns in April, rapidly attaining maturity, and fading in succession as their place is supplied by others throughout the season, until the development is checked by frost. They vary in height, according to circumstances, from two or three inches to a foot or more, and differ much in form and division, even on the same crown: the general outline is lanceolate, more or less elongated; the pinnæ, distinct to the apex, occupy more than half the length of the slender rachis, which is smooth, and nearly destitute of scales; they are for the most part distant, especially the lower ones, not very regularly arranged, but with a tendency to alternate: the pinnules are similarly arranged, equally distinct, and sharply and deeply serrated, the lower ones being often, in fronds of larger size, deeply pinnatifid, or even pinnate. The venation, easily distinguished owing to the delicate translucency of the leafy texture, varies according to the division and serratures of the pinnules: in most instances each secondary vein bears a sorus, not at its extremity, but about half-way from its base; thus the sori form a line on each side, rather nearer to the midvein than to the margin, but

they are generally crowded, often much confused, and in maturity, or rather on the dehiscence of the thecæ, frequently become confluent and cover the whole under surface. A tolerable notion of the position of the indusium may be obtained from the enlarged view on Tab. XIX., but it is difficult to portray its actual insertion and mode of opening; it is soon obliterated by the extension of the sorus.

So much difference of opinion exists regarding this normal species of *Cystopteris* and its kindred species or varieties, and so uncertain at present are our rules for specific distinction in this tribe of plants, that it is with some diffidence I venture to adopt even a very slight departure from the arrangement of my predecessors; but having cultivated them for nearly thirty years, and observed them at intervals in their various native habitats for a longer period, their present allotment is the result of an experience to myself satisfactory, and the more so, because in the main point, viz. the separation or rather retention of *C. dentata* as a species, my decision is not a solitary one.

In the Supplement to the 'English Botany,' Tab. 2790, a figure of a fern, under the name of *Cystopteris angustata*, was published, which, with its description, was evidently a mistake. In the second edition of 'English Botany' (1841), this figure was introduced, contrary to my expostulations regarding its incorrectness, and the description in the text quoted from that of the Supplement, with only one remark for which I am answerable—"That it (*C. angustata*) is only a variety can scarcely be questioned, but it is nearer *C. fragilis* than *C. dentata*." I am the more confirmed in that opinion from later observation, and now introduce it as a variety of the species before us:—

C. FRAGILIS, var. ANGUSTATA. TAB. XX.

Frond oblong-lanceolate, bipinnate: pinnules linear-lanceolate, more or less decurrent, acutely pinnatifid or toothed; ultimate divisions narrow-oblong or linear.

Cystopteris dentata, β. *Hooker, Brit. Fl.*

Found in similar situations to those in which *C. fragilis* grows, and occasionally accompanying it, especially on the loose stone fences of North Wales and Cumberland.

Few ferns are cultivated with greater facility than *C. fragilis*: although growing more luxuriantly, and assuming its more graceful aspect when planted in soil and situation corresponding to its natural habitat, the ordinary garden mould, unless very adhesive, is not ill adapted to its preservation. It may be grown in the open border, forming, when not too fully exposed to the sun, beautiful and elegant tufts that contrast well with the smaller

species of herbaceous plants; requiring only the occasional removal of its rapidly maturing fronds to maintain the lively green appearance of the masses throughout the summer. The delicate feathery character of the foliage renders it a favourite species for pot culture, and in a cool greenhouse it becomes highly ornamental; but it is not well adapted for planting in closed cases, though often recommended for the purpose, the slender rachis being too rapidly extended in the damp confined atmosphere to support the lengthened frond, while the attacks of mildew and other fungoid pests, to which it is liable under confinement, often prove fatal to the other species in its vicinity.

All of the British species or varieties of *Cystopteris* are seen, under cultivation, to the greatest advantage when planted on shaded rock-work: like other rock and wall plants, they require good drainage, a condition readily effected by the admixture of about one-fourth of small fragments of old mortar with the soil or compost employed; the value of this addition is farther indicated by the natural preference they seem to evince for limestone districts.

CYSTOPTERIS DENTATA. Toothed Bladder-Fern. TAB. XXI.—XXII.

Fronds oblong-lanceolate, bipinnate: pinnules ovate-obtuse, bluntly toothed. Sori submarginal.

Cystopteris dentata, *Hooker, Brit. Fl. E. B.*, 2nd ed. Cyathea dentata, *Smith, Flora Brit.* Cystea dentata, *Smith, Eng. Flora. E. B.* 1588. Cystopteris fragilis, var. dentata, *Moore, Handb.*, ed. 2, 76.

Not unfrequent in the rocky parts of Wales, Scotland, and the North of England, though very liable to be passed over as a form of *C. fragilis*, with which most modern botanists indeed seem inclined to confound it. The present is, however, in maturity a smaller plant, differing considerably in the general outline of the frond, and in the form, division and arrangement of the pinnæ, which are so placed, that their upper faces, instead of being vertical, tend more or less towards a horizontal position; this character is difficult to express by figure, where, as in the ordinary state of the fern, the pinnæ are distant, but it will be understood by reference to Tab. XXII., representing an assumed variety, *C. Dickieana*. The pinnules vary in division according to the luxuriance of the frond, being deeply toothed, or, rarely, pinnatifid, but the teeth or segments are always remarkably obtuse, without the slightest tendency to become pointed at the extremity. The sori, produced at

the termination of the veins, have a disposition almost marginal, and indeed, where numerous and becoming confluent, as they usually do in maturity, form a complete and striking border to the under surface of the pinnules, very different to those of *C. fragilis* and *C. angustata*. The rachis is very slender, smooth, and almost universally of a deep brownish-purple hue.

The variety *C. Dickieana*, Tab. XXII., is a very marked and peculiar one, apparently retaining its distinguishing characters under cultivation. The general outline of the frond is ovate-lanceolate, and all of its divisions are broader and more rounded than those of the normal *C. dentata;* they are likewise nearer together, and their greater breadth occasions an overlapping of each other, that, added to the more decided tendency to horizontality of the pinnæ, give it at first sight the aspect of a distinct species. A close comparison, however, with the latter plant soon dispels the illusion. The pinnæ and pinnules are often more or less confluent, instead of being quite distinct, thus departing from the bipinnate character. The sori are never confluent in maturity, but have the intromarginal position. Mr. Newman remarks, on the authority of Mr. Wollaston, that the spores of *C. fragilis* "are always echinate, those of *Dickieana* simply verrucate"; the latter is the case with those of *C. dentata,* but whether a constant character of that species I am not prepared to assert.

This remarkable variety was found by Dr. Dickie in 1846, growing in a cave by the sea near Aberdeen, and has not hitherto been met with elsewhere.

Whether the arrangement of the four allied forms of the genus here adopted or proposed be correct or otherwise is of little importance; under either circumstance the two named as species, and which I have always considered as such, will be useful as rallying-points to those who may feel inclined to discuss the subject. Mr. Moore, who has placed all the four as varieties of *C. fragilis,* remarks: "I am inclined to think *C. dentata* to be sufficiently distinct to take rank as a species, and to look upon *C. Dickieana* as an extreme form of it." Mr. Newman, on the contrary, observes: "My own judgment, improved, but by no means matured, by the observations of sixteen years, regards *dentata* as a nonentity, *angustata* as a synonym of that nonentity, and *Dickieana* as a *possible,* but by no means *established* species." Farther on, he adds: "The propriety of separating *Dickieana* from *fragilis* rests on these grounds,—it is a perfectly healthy plant, not monstrous or distorted, and produced freely from seed, becoming a perfect weed; whereas *fragilis,* under similar treatment, rarely reproduces itself. Cultivated in the same soil and in the same pot with *fragilis,* the latter becomes larger and more vigorous, *Dickieana* smaller and less vigorous: and the more care the cultivator be-

stows on these two plants, the more will he find they recede from each other; whereas all differences between the so-called *C. fragilis*, *angustata*, and *dentata*, are speedily lost in cultivation." If there be any value attaching to physiological facts of this kind, regarding the determination of species, it must depend upon their correspondence under all circumstances, and the above remarks do not agree with my own experience. Of *C. Dickieana* I know but little, indeed nothing beyond that which the examination of the plant affords as to its general characters and structure, growing specimens not having come into my possession until within the last two or three years; but of the others, cultivation from the wild state for nearly thirty years has led to very different results. The plants have retained during that period all their original features, while their spore-scattered offspring have grown up as types of the parent forms, except that *fragilis* has generally, but not uniformly, produced *angustata* instead of its own: the latter circumstance seems significant of the effect of difference of soil or situation in the production of varieties among ferns, and may account for the discrepancy of the two statements; my own specimens being chiefly grown in the open air, and never having any other protection than a cold frame or occasionally a hand-glass, while Mr. Newman's may have had the advantage of a closed case or greenhouse.

Cystopteris alpina. Alpine Bladder-Fern. Tab. XXIII.

Fronds lanceolate, sub-tripinnate: pinnæ ovate: pinnules confluent, oblong-ovate, deeply pinnatifid; the lobes broadly and shortly linear, obtuse, with two or three erect blunt teeth.

Cystopteris alpina, *Desvaux. Hooker and Arnott. Moore. Babington.* Cyathea regia, *Forster.* Cyathea incisa, *E. B.* 163. Cystea regia, *Smith.* Polypodium, *Linnæus.*

Though admitted by most botanical writers into the catalogue of British Ferns, this species has no other claim to be regarded as such, than the fact of its having at one time grown very plentifully on a garden wall at Low Leyton, near Walthamstow, Essex, where it was first noticed by Mr. Forster: about thirty years back, the wall needing repair and fresh pointing, it was obliterated from this habitat, or nearly so, the occasional discovery of a specimen either there or on other walls in the neighbourhood being of late years looked upon as a rarity. It has been recorded by some of the older botanists as occurring both in Wales and Scotland, but as the habitats mentioned by them have been searched in vain, it is now generally considered that dwarf and deeply-divided specimens of one or other of the preceding have been mistaken for it. It is

very common on the Alps and Pyrenees, and most of the growing plants in our collections are of continental origin. Mr. Moore, however, observes that he has received specimens from Mr. Shepherd, of Liverpool, gathered in Derbyshire and Yorkshire, but without any particular habitat being assigned. The species is very distinct in character, when closely compared with any form of *C. fragilis* or *C. dentata*: the fronds are, strictly speaking, bipinnate, but the pinnules are so deeply lobed or pinnatifid, that, although always confluent, they give them at first sight the appearance of being again pinnate; the lobes are linear, very obtuse, and generally divided on the margin with two or three blunt teeth pointing upwards. The venation is more or less compound, according with the division and toothing of the pinnules, and the small roundish sori are submarginal. The fronds are variable in height, from two to six or eight inches in foreign plants, but I have never seen any British specimens from the wall at Low Leyton above three or four inches long.

It is not at all difficult to cultivate and multiply when once established; but is more susceptible of injury from the accumulation of moisture about the roots than *C. fragilis*; good drainage is therefore more imperative, but otherwise it may be similarly treated. A sheltered situation in the out-door fernery is better than confinement under glass.

CYSTOPTERIS MONTANA. Mountain Bladder-Fern. TAB. XXIV.

Fronds triangular bipinnate: pinnules of lower pinnæ pinnate; ultimate pinnules and lobes deeply pinnatifid, their segments toothed at the apex.

Cystopteris montana, *Link. Hooker and Arnott. Babington. Moore.* Cystopteris Myrrhidifolium, *Villars. Newman, Hist. Brit. Ferns,* 97. Polypodium montanum, *Allioni.* Aspidium montanum, *Swartz.*

First found as a British species in 1836, by Mr. W. Wilson, on Ben Lawers, one of the Breadalbane mountains, and since by others in several localities on the mountains of Perthshire and Forfarshire, but so sparingly distributed that it may be considered as one of our rarest ferns. The rhizoma is filiform, branching and creeping, like that of *Polypodium Dryopteris,* or *P. calcareum,* the latter of which, especially, this species nearly resembles in habit and general appearance. The fronds might almost correctly be regarded as ternate, the two lower pinnæ, which are opposite, being so much larger than the others as often to be nearly equal to them in the aggregate; it is in this pair only that the pinnules are pinnate, all those of the upper pinnæ being only deeply lobed: the lower inferior pinnule of

the same pair is always larger than the upper corresponding one, and more divided; the disproportion gradually decreasing in each of the following, until toward the apex of the pinna the opposite pinnules are nearly equal: the upper pinnæ show very little tendency to this irregularity. The venation does not present any striking peculiarities; the lateral veins are alternate, and generally terminate in the sinus between two serratures, thus determining the arrangement of the fructification. The sori, generally numerous, are small, nearly circular, and very prominent in maturity. The indusium accords in position and attachment with that of other species of the genus; but, unless examined previous to or immediately after dehiscence, its presence will often not be recognized, so that the species might be regarded as a *Polypodium*, with certain members of which genus its habit and the form of its fronds so nearly associate.

Not having yet had living specimens of this fern in my possession, I cannot offer any remarks upon its cultivation, resulting from my own experience. From the little I have seen of it in the keeping of others, and the complaints made respecting its liability to "damp off," it seems to me probable that a treatment similar to that recommended for *Polypodium calcareum* would be likely to succeed; not indeed exposure to the sun, which all ferns are better without, and especially those of alpine localities, but fresh air and free drainage. In regard to the supply of water, there is less danger in comparative drought than in superabundance. See the remarks on *Polystichum Lonchitis*, p. 31.

Our figure is from a specimen kindly forwarded by Mr. Borrer, gathered by himself in Corrach Dh'Oufillach.

Genus 6. ATHYRIUM.

Gen. Char. Sori oblong-reniform or crescent-shaped. Indusium attached along the upper side of the lateral veins, opening towards the mid-vein, with a free margin fringed with capillary segments, at length reflexed.

This genus is adopted, rather to avoid the misplacement of one of the most common and at the same time most elegant of British Ferns, than under the idea of its distinctive character being other than very equivocal. *A. Filix-fœmina*, the Lady-Fern, differs so greatly in habit from all the indigenous species of the next genus, *Asplenium*, to which in point of fructification it approaches the nearest, that few amateur collectors would think of seeking among them for its description: I have therefore followed the example of most of my contemporaries, in regarding it as the type of the present.

The name, first applied by Roth, from the Greek *ἄθυρος*, *open*, probably refers to the turning back of the indusium.

ATHYRIUM FILIX-FŒMINA. Lady-Fern. TAB. XXV.

Fronds lanceolate, bipinnate: pinnæ linear-lanceolate, acuminate: pinnules oblong-lanceolate, deeply serrated or pinnatifid.

Athyrium Filix-fœmina, *Roth. Babington. Moore. Newman.*
Asplenium Filix-fœmina, *Bernhardi. Hooker and Arnott.*
Aspidium Filix-fœmina, *Swartz. Smith. E. B.* Polypodium, *Linnæus.*

It occurs in most parts of the kingdom, less universal in its distribution than *Lastrea Filix-mas*, but equally abundant in those localities that are adapted to its growth. Moist, shady situations are essential to its full development, and though occasionally a few stunted plants may be found on the exposed heath and hill-side, it is on the sheltered hedge-bank, and in the damp wood and ravine, that it attains the graceful and almost fragile character, which acquired for it in long past times the popular name. The fronds appear in May, springing in succession from the crown of a thick and more or less elongated rhizoma, which occasionally, in old plants, rises above the ground, in the form of a trunk or stipes, from a few inches to a foot or more in height: their early development is very similar to that described under *L. Filix-mas*, p. 19, and they not unfrequently assume the vase-like arrangement of those of the latter fern; in which case, and when of large size especially, few vegetable productions equal this in grace and beauty. In the subalpine parts of the country I have often noticed specimens so charactered, in which the central fronds had a height of between four and five feet and were nearly erect, while the outer ones drooping in every direction around them, the whole comprised the most lovely arrangement of light green feathery foliage that it is possible to conceive. I once counted thirty-seven fronds composing such a tuft. The general outline varies from a broad, almost ovate, to a linear-lanceolate, and the rachis, generally bare from about one-third to a fourth of its length, is sometimes feathered with pinnæ gradually diminishing in size almost to its base. The pinnæ are much diversified as to disposition, being either alternate or opposite, distant or close together, in different specimens. In some instances the bipinnate character is departed from, the pinnules being decurrent. The division and serrature of the pinnules are equally variable, and though the venation, owing to the delicate texture of the frond, is readily traced, it is far from presenting that regularity in its branching which would render it worthy of notice. The position of the sori is always on the upper or anterior side of

the branch veins, but they are very irregular in form, being sometimes straight, and in other instances so short as to appear nearly circular, although the curved reniform or semilunar outline is the most common: in some varieties they are distant, in others so close as to become eventually confluent, even to completely covering the under surface. Such differences have afforded a wide scope for speculative botanists to indulge their fancies in the multiplication of species and varieties, and were the wishes and advice of all my kind correspondents to be attended to in regard to the latter, I might exhaust the Greek alphabet from alpha to omega in prefixes. The claim advanced on behalf of a few of the varieties to rank as species, should be very cautiously examined before its admission; those who recommend or incline to their adoption would do well to bear in mind the plasticity of vegetable nature, and the very uncertain tenure of specific distinction in the aggregate, not in this class only, but in groups far higher in grade, and in which features of more determinate character can be arraigned in evidence of supposed dissimilarity. The three principal forms, including the normal one, that are considered best entitled to the rank in question are thus characterized:—

1. *incisum*. Fronds more or less drooping, broadly lanceolate: pinnæ distant: pinnules lanceolate, distinct, flat, pinnatifid with toothed lobes. Sori distinct. A. Filix-fœmina, *Roth*.

2. *molle*. Fronds nearly erect, lax, lanceolate: pinnæ approximate: pinnules oblong, connected by the wing of the midrib, flat, toothed. Sori distinct. A. molle, *Roth*.

3. *convexum*. Fronds nearly erect, rigid, narrow-lanceolate: pinnæ distant, convex: pinnules distant, linear, toothed or pinnatifid, convex, with deflexed margins. Sori short, numerous, eventually confluent. A. rhæticum, *Roth*. *Moore, Handb*. 136. Aspidium irriguum? *Smith*. *E. B*. 2199. This is, unquestionably, the most decidedly charactered of all the forms, and less positively associated with them by intermediates.

Besides the numerous slight variations in habit, and in the outline and division of the frond, several remarkable monstrosities are met with in cultivation; of these the variety *crispum* is the most common, and its dwarf, clustered, and much-divided fronds resemble a tuft of curled parsley—a figure of one of the fronds is given by Mr. Moore, Handb. 142. It was originally found by Mr. A. Smith, on Orah Hill, Antrim, Ireland, and since by Sir W. C. Trevelyan, in Braemar, Scotland. Another Irish variety, still more peculiar, is given by Mr. Newman, Hist. Brit. Ferns, 218.

The cultivation of the Lady-Fern is not attended with any difficulty, as it will grow in almost any kind of light soil, provided the situation be not too dry or exposed to the sun. To obtain it in its beauty, however, it should be planted in a mixture of turfy peat

and sand, and supplied during the growing season with abundance of water. When potted, the ordinary compost will suffice; but the pots should be large, the bottom covered with small lumps of charcoal, and placed in pans of water. In a shaded greenhouse, under these circumstances, this beautiful fern may be grown to great perfection, and it assumes a delicacy of hue and texture resembling those of tropical development. In the open air its beauty is much enhanced by planting at such a distance from others as to allow the foliage from each tuft to spread without interference, and this is a good rule to be observed in the arrangement of all the larger tufted species of the tribe; even in artificial wilderness scenery, if it be not attended to, the general effect of the masses is greatly deteriorated.

In Ireland, *A. Filix-fœmina* abounds on most of the bogs, occupying in the open parts of the country the position of the common brake on our heaths, and, like that, is employed as a packing material for fish and fruit.

Genus 7. ASPLENIUM.

Gen. Char. Sori linear-oblong, straight, attached along the upper or inner side of the veins. Indusium opening toward the mid-vein or inwardly.

The sori are in some species, as in *A. fontanum*, so short, that at first sight the generic character may appear doubtful, but the position of the indusium is more to be attended to in this genus than the outline of the masses of fructification. The mid-vein is not always present, a circumstance that has given rise to a division of the genus by some botanists, and which is here adopted in the arrangement of the species, on account of the difference of habit to which it is allied.

The name, from the Greek *a*, privative, and *σπλὴν*, *the spleen*, was bestowed on one of the European species, formerly in repute as a remedy in diseases supposed to originate in an enlargement of the spleen, and even considered capable of dissolving that organ if administered in excess.

* *Ultimate divisions with a distinct midvein.* Asplenium.

Asplenium fontanum. Smooth Rock Spleenwort. Tab. XXVI.

Fronds linear-lanceolate, rigid, bipinnate, glabrous: pinnæ oblong-ovate: pinnules obovate-cuneate, with a few large angular mucronate teeth. Rachis winged throughout. Sori short, oblong.

Asplenium fontanum, *Bernhardi. Smith. Hooker and Arnott. Moore, Handb.* Aspidium fontanum, *Swartz. E. B.* 2024.

Athyrium fontanum, *Presl. Babington, Manual.* Polypodium fontanum, *Linnæus.*

This may be considered a rarity in England; indeed most of our botanists doubt its title to admission among British species. It seems to have been first noticed here by Hudson, as growing "above Wybourn, in Westmoreland," and afterwards as being found on Agmondesham or Amersham church, Buckinghamshire, but these localities have been since searched in vain. The herbarium of the Botanical Society of London contains specimens, presented by Mr. Newnham, from Cavehill, Belfast, and others collected in 1838, on rocks in Wharncliffe Wood, Yorkshire, by Mr. Redhead: Mr. Moore mentions its having been gathered "on rocks near Stonehaven, Kincardineshire, in a spot since destroyed by the construction of a railway," and likewise at Matlock, in Derbyshire. As it is a not uncommon fern in rocky districts on the continent of Europe, it is not unlikely that the preceding habitats may be correctly stated; but it has been unfortunately circumstanced, like *Cystopteris alpina,* in being so scantily distributed as to escape the observation of succeeding inquirers, or to be obliterated by the march of improvement; the latter was the case in the only instance in which I ever met with it otherwise than under cultivation, viz. on an old wall on Tooting Common, Surrey, where the ruthless hand of repair had already commenced its destruction. The Rev. W. H. Hawker found it last year "growing in some quantity on a very old wall near Petersfield, in Hampshire."

The fronds grow in a dense tuft, varying from two or three to five or six inches in length; they are smooth, of a deep green hue and very rigid texture, are more or less erect and of a linear or narrow lanceolate outline: the rachis is slightly winged and leafy almost to the base, the lower pinnæ gradually diminishing in size and becoming more distant, the upper ones being shorter and more crowded as they approach the apex; the pinnules are often decurrent, they are of an obovate form tapering below, and deeply divided with from two to five sharp spinous teeth. The sori, two or three generally on each pinnule, are very short, sometimes approaching to circular; their disposition is far from regular, and they often become confluent.

In cultivation this pretty fern has with many a very indifferent character for endurance: in the open air it is exceedingly liable to die off during the winter, unless the situation be well sheltered and the drainage complete; indeed, I have never known it to exist beyond the second year in the vicinity of London, unless when planted on a fragment of an old and mouldering wall, under the shade of some aged trees, but at the same time so arranged as to avoid their drip. Under glass, in a close frame or shaded greenhouse, there

is no difficulty in keeping it; but it should be planted in sandy peat, and the drainage secured by filling the pot about one-fourth with pieces of old mortar and charcoal intermixed. Mr. Moore recommends elevating the caudex a little above the level of the soil between two or three pieces of soft sandstone, and I have no doubt the plan would be advantageous in securing the growth of a small specimen; though, if the arrangement below be such as to prevent any accumulation of superfluous moisture about the roots, a plant once established is not liable to damp off under ordinary care. Although a comparatively small species, I have found that it requires considerable space to extend its roots, and that it is safer to use a large than a very small pot, so that when settled it may remain undisturbed for two or three years at the least. The increase by division of the main caudex should be avoided by those who may be desirous of retaining a fine specimen, as its growth is slow, and, unless assisted by the temperature of a hothouse, liable to receive a check that the plants do not readily recover. This remark is addressed to the amateur cultivator not possessing all the appliances requisite to ensure success in propagation, and it is induced by having witnessed the destruction of two noble specimens under the infliction. It is an evergreen species, and, under cover, continues its growth throughout the year.

ASPLENIUM LANCEOLATUM. Lanceolate Spleenwort. TAB. XXVII.

Fronds lanceolate, bipinnate: pinnæ ovate-lanceolate: pinnules obovate, deeply and sharply toothed. Rachis not winged. Sori short, nearly marginal.

Asplenium lanceolatum, *Hudson. Smith. E. B.* 240. *Hooker and Arnott. Moore. Babington. Newman.*

A very local species in this country, where it is almost exclusively confined to the maritime counties of the south of England and of Wales. Being a native of the Atlantic Islands and of the south of Europe, it may be regarded rather as naturalized than indigenous. In the Channel Islands, Jersey especially, it is most abundant. Its favourite localities are in the crevices of rocks and old walls, and lining the sides of wells and the shafts of deserted mines. The fronds rise from a tufted base or crown, varying greatly according to situation, in size, position, form, and even texture: they are of a bright green colour, the lower part of the rachis excepted, which is purplish-black, when growing exposed to light. In shady and moist places they attain a length of twelve or eighteen inches, while on dry rocks and walls they often do not extend to more than two or three inches; sometimes they are erect in growth, sometimes

drooping or even spreading horizontally. The rachis is more or less covered with bristle-like scales. The general outline of the frond varies from linear-lanceolate to a broader and more directly lanceolate form, and in some specimens it is nearly triangular: the pinnæ and pinnules are equally variable, and the former are often, and not in young plants only, lobed instead of pinnate; the ultimate divisions in either case are deeply and sharply toothed or serrated, a branch of the lateral veins extending to the extremity of each serrature. The sori are remarkable, compared with those of other species of the genus, both as to form and position; they are produced near the terminations of the branch veins, usually one to each serrature, and are at first, while yet covered by their thin white indusium, oblong or even linear, but become circular as they enlarge, and eventually often confluent, so as to form a line round the whole under-margin: their arrangement in luxuriant specimens is very irregular. When the frond approaches the triangular outline, this fern is apt to be mistaken for the following species, *A. Adiantum-nigrum*, the peculiarity of the sori constituting the most marked differential character between them.

Like other maritime species of ferns, natural importations from a warmer climate, the Lanceolate Spleenwort is not at all adapted for cultivation in the open air in the eastern parts of England; this may be understood by noticing the limited extent of its distribution here, reaching it is true along the whole southern coast from the Land's End to Kent, and along the western as far north as Caernarvonshire; but still confined to localities influenced by the great current and swell of the Atlantic, and chiefly to those so situated as to receive their continuous flow,—the counties between the Channel and the estuary of the Severn. A treatment similar to that recommended for the last species, *A. fontanum*, I have found to succeed the best hitherto, except that it makes less root, and does not require so large a pot in proportion to the size of the plant. Another circumstance to be noted is, that it is very susceptible of injury under close confinement, and consequently not adapted for the Wardian cases. From observation of several plants placed under different conditions, I believe this injury to the fern in question to arise from the accumulation of water on the surface of the fronds: breathing a moist atmosphere, it must be admitted, is very distinct from drowning, and to the latter process the moisture-loving fern is too frequently subjected by the mismanagement of a very useful invention. In Nature, superfluous moisture is removed quickly by evaporation, and although some plants are capable of adapting their functions according to the circumstances in which they may be placed, others are less pliant, and our *Asplenium* is one to which a perpetual vapour-bath is death. Under all its forms it is ornamental, and, like most of its congeners, evergreen.

ASPLENIUM ADIANTUM-NIGRUM. Black Spleenwort. TAB. XXVIII.

Fronds triangular attenuated or ovate, twice or thrice pinnate: pinnæ triangular: pinnules ovate or ovate-lanceolate, inciso-pinnatifid, sharply toothed. Sori linear-elongate, approximate to the midvein.

Asplenium Adiantum-nigrum, *Linnæus*. *E. B.* 1950. Generally adopted.

One of the most generally distributed of our smaller ferns, being found in almost every part of the kingdom, growing in the crevices of rocks and old walls and on shaded hedge-banks. The fronds spring in tufts from the crowns of a slowly-branching rhizoma, and vary greatly in development in different habitats, being often on exposed walls and rocks not above two or three inches in length, while under the influence of shade and moisture they extend to one or two feet. The rachis is bare about half of its length, and this part is glossy and of a deep purple almost black. The leafy portion of the frond is mostly of an elongated triangular outline, but sometimes perfectly deltoid, the lowest pair of pinnæ being always longer than the others, unless occasionally in very small specimens when an ovate-lanceolate form prevails. The pinnæ are pinnate, obliquely triangular, and generally point upwards toward the apex of the frond; they differ much in division, but it is only in very large fronds that the tripinnate character is fully developed. The ultimate divisions are unequally toothed, the teeth being more or less attenuated or obtuse, but always terminating in a point. The venation is very distinct, and varies with the division of the frond, the fructification being always produced on the inner or upper side, near the separation of the branches from the midvein, and thus occupying the middle of the pinnules. The sori are linear, covered at their first appearance with a white indusium attached on the outer side to the vein; in maturity this is covered by the expansion of the thecæ and the sori become confluent, often spreading so as to occupy the whole under surface.

The protean character of this fern is apt to mislead the too sanguine collector in his search for novelties, and an assemblage of all its diversities of form would certainly puzzle the discriminative faculties of any one beholding them for the first time: a little farther acquaintance, however, and especially the results obtained by cultivating them under corresponding treatment, will soon dispel any illusion regarding specific distinction. A very striking difference is presented in contrasting the two extremes of form to which it is liable, the intermediate and most common one being that on which the foregoing description has been chiefly framed.

When of small size, as before remarked, the form of the frond is often less triangular, and in such case it is less divided, and the divisions are broader and more obtuse:—this not unfrequent condition, dependent on accidental circumstances, presents us with the original *Asplenium obtusum* of Willdenow, the variety *obtusum* of later authors.

A second form has acquired more importance on account of its being still regarded by some as a separate species, viz. *Asplenium acutum*, Bory (Newman, Hist. Brit. Ferns, 231). Mr. Newman's figure represents a luxuriant frond from Ireland, to which country, in the text, he confines its British habitats. I have met with the same, smaller in size, in several parts of North Wales, and have preserved specimens collected in 1821 from the walls of the Cathedral at St. Asaph, between which and those of Irish growth I am unable to trace any difference. In regard to its being a species, such claim is very doubtful, resting apparently at present solely upon a slight difference in texture, not appreciable by the aid of the microscope, and the narrow linear form of the ultimate divisions of the frond.

The Black Spleenwort was formerly employed medicinally in diseases of the chest, its real or supposed efficacy in asthma, cough, &c. being probably based upon a slight tonic quality belonging to the ferns generally, and the relief afforded by its mucilaginous juices.

All the forms are ornamental and well adapted for rock-work, but though it will live in exposed situations, the more luxuriant states are only obtainable in the shade. It will grow in any light soil, but succeeds best when planted in a mixture of sandy peat and old mortar. It is well fitted for the stove or greenhouse, but the pots should be carefully drained. In the close case, it soon becomes mouldy and decays.

Asplenium marinum. Sea Spleenwort. Tab. XXIX.

Fronds linear, pinnate: pinnæ stalked, oblong-ovate, inciso-serrate, oblique, obtuse, unequally wedge-shaped, and more or less auricled at the base. Rachis winged.

Asplenium marinum, *Linnæus. Smith. E. B.* 392. *Hooker and Arnott. Babington. Moore. Newman.*

Frequent on rocks and cliffs, and especially in caverns, near the sea; it grows likewise on old walls, castles, and churches, but very rarely in inland situations. Its principal localities are on the southern and western shores of the island, commencing with the sand cliffs of Hastings; but it is distributed at intervals around the Scottish coast, terminating on the eastern side about Scar-

borough in Yorkshire. On the shores of Ireland and in the Channel Islands it is most abundant. Few of our native ferns vary more in size and general aspect than this; in exposed situations the fronds being often not above an inch in length, while in warm and sheltered ones they are not unfrequently one or two feet or even more. The rhizoma is short, firmly fixed by long and very slender wiry radicles that penetrate deeply into the crevices of the rocks, which renders transplantation difficult and precarious; it forms new crowns or branches that divide very slowly, so that in plants of large size the fronds compose a dense tuft. The rachis is bare for about one-third of its length, glossy, and of a dark purplish-brown colour, passing into black at the base. The pinnæ are nearly equal in length throughout, except towards the apex, giving the frond generally a linear but slightly acuminated outline; they are of a deep green above, pale beneath, in maturity of a firm, almost leathery texture, and so placed as to point more or less obliquely forward; in form and distance on the rachis they vary according to size and exposure, the general figure being an oblong-oval, with an unequal base, more or less auricled on the upper side and truncated below; the margin is serrated, and occasionally so deeply as to become lobed. The lateral veins are alternate and forked, bearing the linear sori on the upper division.

Although so common and so widely distributed along our seashores, this is a troublesome fern in cultivation; it will not bear exposure at all in the vicinity of London. I have tried it several times on rock-work, and under various treatment as to soil and elevation, but have never succeeded in keeping it through the winter. In many of its native habitats it occupies caverns and narrow crevices, of such depth that the light must be almost totally excluded; in these it attains the greatest luxuriance; and in an imitation cleft, a small Devonshire specimen, planted this spring, bids fair to rival its wild associates, and, judging from present appearance and progress, to find itself quite at home. Independent of the effect of cold upon plants, we do not pay sufficient attention in cultivation to the circumstances attending their natural growth. I have previously referred to the necessity of observation in this respect, and believe the want of such observation to be a main obstacle to that success, the failure of which is so often deplored by the fern amateur. Now, in regard to the species before us, it will be found, almost universally, growing sheltered from the wind, and so disposed as to avoid the lodgement of rain upon the fronds; the latter is a point most essential to the health of an evergreen fern, and if attended to, would, as I know from experience, ensure that duration which is in many instances so equivocal. In pot-cultivation, *A. marinum* requires the same care of ensuring perfect drainage that is necessary to rock-plants generally. The soil may

be a mixture of peat and sand in about equal proportions, or an additional fourth of the latter material may be added to the ordinary compost; pieces of broken slate or angular fragments of granite forced through the loose soil at the time of planting and before settling the whole by watering, assist the after-drainage, and form a medium over which the growing radicles are encouraged to extend their ramifications. The pots may be kept in a cold frame or green-house; in the latter case, it is better to cover it with a glass shade. In the hot-house it will attain a large size, and when the air is kept moist, does not require a glass. In such circumstances I have seen the fronds eighteen or twenty inches long; certainly it luxuriates in warmth.

The distribution of this species, extending from the north of Africa and the Canaries and Madeiras, along the shores of Spain and France, and its absence in other parts of Europe, apparently well authenticated, is a curious geographical phænomenon, pointing to a probability of its having taken place prior to the great disruption of the chalk and the vast deposit of alluvial matter along the eastern coast of England, especially when added to the fact of its sparing occurrence in Hampshire and Sussex, and to its non-existence throughout the former line of connexion between this country and the continent, and even beyond this northward to Flamborough Head.

The pinnæ of *A. marinum* are occasionally very narrow, and the serratures so deep as to give a totally different aspect to the plant; but no permanent or decided varieties exist deserving more than a passing notice.

Asplenium Trichomanes. Common Wall Spleenwort. Common Maiden-hair. Tab. XXX.

Fronds linear, pinnate: pinnæ opposite, roundish-oblong, obtuse, crenated, stalked, truncated and cuneate below. Rachis purple or black.

Asplenium Trichomanes, *Linnæus. Smith. E.B.* 576. *Hooker and Arnott. Babington. Moore. Newman.*

This beautiful little evergreen fern is one of very general distribution on shaded rocks, old walls and buildings, generally selecting a northern aspect, or at least a position not exposed to the sun; occasionally it is met with covering hedge-banks in a sandy soil. The fronds grow in tufts from a short, dense rhizoma, erect or spreading according to circumstances, and vary in length from two or three inches to a foot. The rachis is smooth, glossy, of a deep purple approaching to black, and leafy almost to the base. The

pinnæ, mostly opposite, vary in distance, and are of a roundish oval form, sometimes nearly rhomboidal; they are of a deep glossy green colour, slightly crenated on the margin, and attached to the rachis by a very short stalk formed by the attenuation of the wedge-shaped base. The lateral veins divide about midway into two or rarely three branches, the upper one bearing a sorus near its extremity, obliquely pointed towards the apex of the pinna.

The fronds are occasionally forked or even multifid at the apex; but this is not a character sufficiently permanent to constitute a variety. Plants having the pinnæ of a thin texture, and more or less deeply pinnatifid, are sometimes met with, and such have retained this character under cultivation, constituting the variety *incisum* of some botanists. It is generally barren.

The common Spleenwort is very easily cultivated, and is among the most elegant of the smaller ferns, and, above all, admirably adapted for the decoration of shaded rock-work. Of course we must be guided in our treatment by bearing in mind, as in regard to other species, the conditions of its natural growth. Many persons think that if they put the root of a plant into soil, and water it, they have done all that is necessary, and are surprised and disappointed when their expectations are not realized. Now, the wall and rock ferns require something more than this, or they will not grow to please us. The thin succulent extremities of the wiry roots, insinuating themselves into every crevice, and absorbing on all sides the scanty moisture retained by the coarse material upon which they vegetate, are in removal generally left behind; and yet the plant is expected to live and flourish, for the simple reason that, as it must have been half-starved upon the dry wall, and now has plenty to feed upon, it ought to do so. The decayed mortar and the mouldering brick, while they afford the potash, lime, and other mineral substances necessary to fern-structure, ensure the grand requisite of drainage, and admit no accumulation of moisture beyond that which is essential to vegetable life. Stagnant water, and especially when lodged in soil abounding in decomposing organic matter, is fatal to most of the species of this genus; and though *A. Trichomanes* will flourish under shelter in almost any kind of compost employed by the fern-grower, I have never found it succeed so well in the open air, under exposure to the alternate wet and frost of winter, as when planted in old mortar mingled with a very small proportion of sandy peat. It may be grown in pots in the green-house or in a cold frame, but does not like confinement for any length of time; and though the shelter of a bell-glass is favourable to its full development within-doors, frequent change of air will alone prevent it from eventually becoming unhealthy.

ASPLENIUM VIRIDE. Green Spleenwort. TAB. XXXI.

Fronds linear, pinnate: pinnæ alternate, rhomboidal or roundish-ovate, crenated, stalked. Rachis green.

Asplenium viride, *Hudson. Smith. E. B.* 2257. *Hooker and Arnott. Babington. Moore. Newman.* A. Trichomanes ramosum, *Linnæus.*

Chiefly confined to mountainous and rocky districts, and delighting in the vicinity of rills and waterfalls, but occasionally found elsewhere. It is a local rather than a rare species, and is very liable to be passed over as a form of *A. Trichomanes,* which it nearly resembles in general appearance, though usually growing more erect than the ordinary state of that species. The whole plant is however of a paler hue, especially the rachis, which, though dark brown or purple at the base, is always light green or yellowish above. The fronds are tufted, in dry situations two or three inches long, in moist ones ten inches to a foot. About one-third of the rachis is bare: the pinnæ are usually more distant than those of the preceding fern; they are very variable in form, but most frequently tend to the rhomboidal; the margin, too, is more or less deeply crenated. The lateral veins are generally alternate and forked, and the sori are produced near the point of division, rarely at or near the extremity of the upper venule as in *A. Trichomanes.*

A tendency to divide dichotomously is more remarkable in the fronds of this fern than in those of the preceding, and originated the Linnæan specific name.

In the vicinity of London the cultivation of *A. viride* is far from being satisfactory; it does not succeed well in the open air, and is apt to damp off under confinement. Among the various kinds of treatment to which it has been subjected, I have not hitherto had reason to congratulate myself as to the result; the plants live, but cannot be said to flourish; they send out new fronds strong and well-conditioned in the early summer, and then, in whatever situation they may be placed, gradually assume an unhealthy appearance, which characterizes them during the greater part of the year. A mixture of broken freestone and sandy peat seems to succeed best as soil, and the pots should be one-third filled with draining material, the upper part of which should consist of charcoal broken into small fragments: I believe the chief value of this latter medium, as applied to fern cultivation, consists in its absorbing and antiseptic qualities, which enable it to retain moisture, and at the same time to counteract the effects of it in a stagnant condition upon the soil. The foregoing remarks are only to be considered as applicable to the metropolitan climate; in a purer air and moist

sheltered situation it seems almost, if not quite, as much at home as among its native alpine rocks.

** *Ultimate divisions without a midvein.* Amesium, *Newman.*

Asplenium Ruta-muraria. Wall-Rue. White Maiden-hair. Tab. XXXII.

Fronds deltoid, bipinnate: pinnules rhomboid-wedge-shaped, notched or toothed on the upper margin. Indusium jagged.

Asplenium Ruta-muraria, *Linnæus. Smith. E. B.* 150. *Hooker and Arnott. Moore. Babington.* Amesium Ruta-muraria, *Newman, Hist. Brit. Ferns,* 253.

Very common on old walls throughout the kingdom, but indigenous to the mountainous and subalpine portion of it, where it grows in the fissures of the rocks: its original migration from the latter is indicated by the fact of its occurrence being gradually less frequent as we advance from the central counties of England toward the eastern coast. Its predilection for brick walls was noticed at an early period, hence the common English name, and it may be accounted for by the preference it exhibits in the wild state for rocks of calcareous composition. In general appearance and stature it is very much diversified; in the low countries, as a wall-plant, we are familiar with it as one of small size, with fronds sparingly divided, from half an inch to two inches in length; while, in the rocky clefts of the hills of Derbyshire, Wales, and Scotland, they attain a length of six or eight inches, and a branched habit that might readily induce the casual observer to regard it as a different species. Our figures are rather to be taken as expressive of the ordinary than of the alpine form, which latter is subject to considerable deviation. The fronds grow in tufts from the extremity of a slowly extending and branching rhizoma; they are of a thick, almost leathery substance and deep green colour, but in exposed situations always covered with a glaucous secretion, whence the name White Maiden-hair. In young and starved specimens, the fronds are sometimes undivided or only simply pinnate with roundish or reniform pinnæ, but the more compound character and triangular outline above assigned prevail even in comparatively small plants. The normal arrangement of both pinnæ and pinnules is alternate, but they are not unfrequently opposite in the dwarfer forms, and the latter vary in figure from bluntly wedge-shaped to rhomboidal, more or less attenuated in both directions, so as to become in some instances almost linear; under all circumstances the upper margin is irregularly toothed or serrated, the wedge-shaped base entire. The veins diverge in a flabelliform man-

ner from the stalk-like base of the pinnules, branching above and extending to the teeth or serratures, without any apparent mid-vein. The sori, produced on the inner side of the veins, are linear elongated and eventually become confluent, covering the whole under side of the pinnule. The indusium, only traceable in the earlier condition of the fructification, is white, and the free inner margin if examined at the time of separation is more or less jagged or uneven, a character of small importance in specific distinction, unless far more decided than will be found in this instance (see the following species).

Those who would cultivate this fern should endeavour to obtain it with the roots uninjured, which it is impossible to effect by any other means than removing the brick- or stone-work among which it grows, a process not always agreeable to the owner. When obtained from the fissures of rocks, the principal portion of the fibres is often left behind; circumstances exceedingly adverse to its after-establishment. Grown in pots, brick rubbish or old mortar with a very small admixture of sandy peat, a strict attention to drainage, free air, and little water, are the conditions on which it may be expected to live, but, like many other common plants, care kills it. Wall specimens, removed with the mortar in which their roots are imbedded, and placed between bricks or stones piled in imitation of the stone-hedges of Wales, and with a little old mortar scattered between them, will generally establish themselves readily, especially if sheltered from the sun and cold winds; for though the plant is often found naturally developed from seed in very exposed places, a certain degree of exclusion may generally be traced in its choice of a habitat.

ASPLENIUM ALTERNIFOLIUM. Alternate-leaved Spleenwort. TAB. XXXIII.

Fronds pinnate: pinnæ alternate, distant, wedge-shaped, ascending, bifid or trifid at the apex. Indusium entire.

Asplenium alternifolium, *Wulfen. Smith. E. B.* 2258. *Hooker and Arnott.* Asplenium germanicum, *Weiss. Babington. Moore.* Amesium germanicum, *Newman, Hist. Brit. Ferns,* 258.

As a British species this is extremely rare, and, though widely distributed, far from common on the Continent. Its localities agree with those of *A. Ruta-muraria,* which however it is not found to accompany. Three habitats have been recorded in Scotland; three miles from Dunfermline, Fifeshire; Stenton Rocks, near Dunkeld, Perthshire; rocks on the Tweed, two miles from Kelso, Roxburghshire. In England it has been met with on Kyloe Crags, Northum-

berland; in three or four places about Borrowdale, Cumberland, growing in the clefts of the rocks; and Mr. W. Hawker writes that he met with two plants of it this summer (1854) growing with *Asplenium septentrionale*, on a precipice near Scaw-fell. In North Wales, it has been collected near Llanrwst, and in the Pass of Llanberis. The habit of this fern approaches so nearly that of the preceding, that many botanists consider them to be merely varieties of the same species; and some forms of *A. Ruta-muraria* certainly do resemble it in foliation, to a degree that appears at first sight to render the question of identity far from doubtful: the general outline of the frond, however, and its division are very different; in the present it is narrow lanceolate or linear, and never more than simply pinnate, it is likewise of thinner texture and lighter green colour. The pinnæ, though varying in form and size upon the same frond, are always distant and directed upwards; they are generally of a narrow wedge-shape rapidly attenuated downwards into a slender stalk, toothed or notched at the extremity, and, the lower ones especially, not unfrequently divided into two or three lobes; not however showing any tendency to the bipinnate character. The sori are developed like those of its near ally, but differ in the margin of the indusium being entire. The fronds are usually from two to four inches in height, but some preserved specimens from the Tyrolese mountains measure six or seven inches.

The scarcity of this fern has hitherto prevented experiment upon its growth in the open air, in which it would probably succeed as well as the preceding. It is usually kept in the house covered by a bell glass, but is liable to die off during winter, and even in the full growth of summer, without frequent attention to change of air, and avoiding the accumulation of moisture upon the fronds. In planting it is advisable to keep the crown a little elevated above the surface, and the soil may be a mixture of sand and peat, to which some add a little decayed vegetable mould; I do not consider the latter necessary, if it be not injurious, by contributing to the retention of water around the roots, the supply of which ought to be limited so as merely to prevent positive drought.

It is remarkable that the plant before us should occur both in this country and on the Continent in company with *Asplenium septentrionale*, and always very sparingly. To even hint at any probability of connection between them will perhaps horrify some of our modern manufacturers of new species, accustomed as they are to measure differences by half hair-breadths, but under the risk of being classed as an innovator against all the established laws of specific distinction among ferns, I believe this may be the case; indeed, that if the three British species of the *Amesium* series are not really varieties of the same, dependent upon circumstances influencing their primary development, the affinity of the present

plant is nearer to the latter than to *A. Ruta-muraria*. The ordinary form of *A. septentrionale* is certainly very different, but under cultivation it occasionally produces branched fronds, the lateral lobes of which so nearly resemble the pinnæ of *A. alternifolium*, that the most practised eye would find it difficult to trace any difference. The character of the indusium is the same.

ASPLENIUM SEPTENTRIONALE. Forked Spleenwort. TAB. XXXIV.

Fronds linear, bi- or tripartite; the segments alternate, elongate, acutely two- or three-toothed above. Margin of the indusium entire.

Asplenium septentrionale, *Hull. Smith. E. B.* 1017. *Hooker and Arnott. Babington. Moore.* Amesium septentrionale, *Newman, Hist. Brit. Ferns,* 265. Acrostichum septentrionale, *Linnæus.*

A very local species in this country, growing in the fissures of rocks and the interstices of the loose stone walls that occupy the place of hedges in the northern and western parts of the kingdom. The habitats are too numerous to record, beyond general notice of the districts in which they may be expected: it is rather a subalpine than mountain species, not being found at any great elevation. The extreme western and northern counties of England, the Snowdon district in Wales, the southern and central parts of Scotland, yield it in tolerable abundance, so as scarcely to warrant the epithet of rare applied to it by most writers, though it is doubtless much more so than formerly, in consequence of that insatiate spirit that too often prevails among the *petit maîtres* of natural science, so numerous and so enthusiastic at the present day. The rhizoma creeps and branches, forming when left undisturbed a compact mass of stem and root fibre of large size compared with that of the upward growth. The fronds are generally simple, of an elongated linear-lanceolate form, gradually diminishing in breadth downwards into the rachis, and are from two to four inches in length; the broad part has usually two or three lateral alternate teeth, often so deep as to become lobes, and the extremities of these as well as of the main frond are usually furcate, whence the English name: the variation to which this form is liable has been already referred to in the concluding remarks on *A. alternifolium*. The venation is dependent on the divisions of the frond, a vein or branch extending into each point or segment. The sori are usually more elongated than in the other species of the series, and become confluent in maturity.

The same plan may be pursued in the cultivation of this as recommended for *A. Ruta-muraria*, but it is less adapted for exposure

in the open fernery, at least in the eastern parts of England, the evergreen fronds being liable to suffer from frost, and especially during the dry piercing winds of spring. It will however live and flourish when planted in a sheltered cavity better than under confinement. If potted, a cold close frame, where it may be kept with *A. marinum, fontanum*, &c., shaded alike from the sun and cold, will answer better than the greenhouse, bearing in mind that the absence of all superfluous moisture must be strictly attended to, and the fronds of larger ferns must not be allowed to spread over it. The crown should be elevated.

Genus 8. SCOLOPENDRIUM.

Gen. Char. Sori linear-elongate, straight, growing on the lateral veins, two together, approximate in one line. Indusia two, opening down the middle of the apparently simple sori.

This genus was separated from *Asplenium* on account of the very remarkable difference of its fructification. The sori are double, each pair being disposed between two parallel branches of the lateral veins, and so closely approximating as to appear as one. The two series of thecæ composing each apparent sorus, arise individually from the opposite sides of the outer branches of two principal lateral veins, each being covered at first by its appropriate indusium: the confined space thus allowed for their development occasions the two sori to become confluent, while the margins of their indusiæ, separating in opposite directions, appear like one opening down the middle. The double or compound character of the sori may be readily traced by careful examination, and will be very evident when observed in an early stage of growth.

The regularly parallel lines of fructification, disposed at equal distances on each side of the mid-vein of the long, entire frond of *S. vulgare*, bear some resemblance in arrangement to the legs of a Scolopendra or Centipede, hence the name.

Scolopendrium vulgare. Common Hart's-tongue. Tab. XXXV.

Fronds entire, linear or oblong-lanceolate, cordate at the base. Rachis shaggy, with narrow membranous scales.

Scolopendrium vulgare, *Symons. Smith. E. B.* 1150. *Hooker and Arnott. Babington. Moore.* Phyllitis Scolopendrium, *Newman, Hist. Brit. Ferns*, 271. Asplenium Scolopendrium, *Linnæus.* Scolopendrium officinarum, *Swartz.* S. Phyllitis, *Roth.*

One of our most common ferns, growing on moist shaded banks, in the clefts of rocks, about old buildings, and in the mouths of

wells, mines, and caverns. It varies greatly in size, according to the locality: in the open vault, by the great hall in Conway Castle, I have gathered fronds upwards of three feet long and nearly four inches in breadth; but in more exposed and drier situations their ordinary length is from six inches to a foot. The rhizoma is very compact and deeply rooted; it does not elongate, but increases slowly by the formation of new crowns around the older, attaining thus, when left undisturbed, considerable bulk and an almost spherical form. The fronds grow in circular tufts, unfolding at first in an erect position, but afterwards radiating and curving outwards: when springing from the side of a rock, or in the mouth of a well, they are often pendulous: in outline they are linear-lanceolate or strap-shaped, more or less acuminated at the apex and cordate below, with an entire slightly-waved margin. The rachis is generally of a dark purple hue, especially the petiolate portion, which constitutes about a third or fourth of the length of the frond, sometimes smooth throughout, but more frequently beset with chaffy membranous pale-brown scales, that give it a shaggy appearance, and are often distributed along the under side of the midrib likewise. The parallel linear sori are usually very regular in their disposition, but liable to vary in length, and sometimes form two series, alternately longer and shorter: their peculiarity of development has been already referred to, under the generic character of *Scolopendrium*, and is illustrated, as well as the venation, in the outline figure of a portion of the frond on our plate.

So many deviations from the normal form are presented by the varieties of this fern, and so closely do they approach each other, that it is very difficult to select those deserving a separate notice. In some instances the diversity arises from the division of the rachis, in others from peculiarity in the marginal development of the leaf, and occasionally from a combination of both. Among the apparently endless and far from constant forms thus resulting, the following, well known to the fern cultivator, are the most marked and permanent:—

1. *polyschides*. Fronds narrow linear, deeply and irregularly crenato-lobate on the margin. *Moore, Handb. Brit. Ferns*, 174, fig. δ, 178. Phyllitis polyschides, *Ray*.

The narrow linear form is the distinguishing character of this, the division of the margin being often very obscure. The fronds are generally fertile.

2. *crispum*. Fronds thin, strap-shaped, the margins much undulated or curled, the base cordate-auriculate. *Moore, Handb. Brit. Ferns*, 175, fig. γ, 178.

The dilatation of the margin, which occasions the curled character, is the probable cause of this very elegant and permanent variety being almost uniformly barren.

3. *lobatum.* Fronds strap-shaped below, dilated at the upper part and divided there into two or more acute lobes. *Moore, Handb.* 175, fig. *β*, 178.

When the midrib divides only once, it is the variety *furcatum.* The lobes are generally flat, and fertile like the lower part of the frond. In some instances the primary division of the rachis occurs in that part which may be regarded as the petiole. This constitutes the variety *ramosum,* of which however a correspondent form is met with in the next.

4. *multifidum.* Fronds strap-shaped below, dilated above, repeatedly divided toward the extremity; the lobes more or less obtuse, undulated, crowded. *Moore, Handb.* 175. Phyllitis multifida, *Ray.*

This is a very beautiful variety when grown luxuriantly, but is liable to pass into the preceding form in dry seasons and situations. The lower part of the frond is fertile, the undulated terminal lobes barren.

5. *laceratum.* Fronds broad, the margins deeply and irregularly inciso-lobate, or pinnatifid. *Moore, Handb.* 175.

This remarkable variety was found by Mr. Young of Taunton, on a wall in that neighbourhood, and he has kindly favoured me with original specimens of it and of another, which he has named *endivæfolium,* obtained by sowing its spores; the latter chiefly differing in having the fronds broader, more deeply divided, and the lateral lobes lacerated and toothed at the extremity, while the broad apex is repeatedly divided like that of *multifidum,* which it resembles in having the terminal divisions barren, while the rest of the frond bears sori abundantly. The leading character in these two varieties seems to consist in the deep incision and lobing of the lateral margins, and in the greater comparative breadth of the frond, which is sometimes almost as broad as it is long. I include them under the same general denomination, because the distinguishing features of the so-called *endivæfolium* do not appear to me to be permanent; such at least was the case this year in the growing specimens at Kew, originally forwarded by Mr. Young, in which the two extreme forms and several intermediate ones were developed from the same root.

The broad bright-coloured patches formed by this fern and its varieties render it highly ornamental in contrast with our other native species in cultivation, and its evergreen habit is an especial recommendation to abundant plantation out of doors, as well as in pots among the less hardy exotics of the greenhouse. Though not absolutely requiring the same degree of shelter that is necessary to the preservation of many ferns, the Hart's-tongue may be regarded as a free-growing plant: it can only be obtained in its more luxuriant and ornamental condition by keeping it shaded

from the sun and furnished with a copious supply of water during the growing season. In order to avoid the effect of drought, a larger proportion of yellow loam may be added to the ordinary compost to render it more retentive of moisture, but it will grow in almost any kind of soil that is not too stiff for its roots to penetrate.

It was formerly in repute medicinally as an astringent and vulnerary, and an ointment prepared from the bruised leaves is still used in some parts of the country as a dressing for wounds, especially burns and scalds.

Genus 9. CETERACH.

Gen. Char. Lateral veins alternate, irregularly branched, the branches anastomosing towards the margin. Sori oblong or linear, attached to the upper side of the anterior principal branches, except the lowest, which is on the opposite side of the lower or posterior branch. Indusium obsolete. Whole back of the frond covered with densely imbricated chaffy scales.

The apparent want of indusium and the anastomosing veins are the chief features that separate this genus from *Asplenium* or *Scolopendrium*, to both of which it has been referred. The indusium is however present in the British plant, partly covering the sorus in an early stage of development, and subsequently as a narrow nearly erect membrane attached to the back of the vein. The Arabian and Persian physicians, by whom the normal species has been long esteemed for its supposed medicinal qualities, call it *Chetherak*.

Ceterach officinarum. Scaly Spleenwort. Tab. XXXVI.

Fronds linear-lanceolate, deeply pinnatifid; segments oblong-obtuse, waved or slightly lobed on the margin.

Ceterach officinarum, *Willdenow. Hooker and Arnott. Babington. Moore.* Scolopendrium Ceterach, *Symons. Smith. E. B.* 1244. Grammitis Ceterach, *Swartz. Hooker. E. B.* ed. 2, 1408. Asplenium Ceterach, *Linnæus.* Notolepeum Ceterach, *Newman, Hist. Brit. Ferns*, 277.

The countries bordering on the basin of the Mediterranean and the islands and eastern shores of the North Atlantic appear to have been the original stations of this remarkable fern. In the British islands its distribution is too partial to admit of its being regarded as strictly indigenous, though probably naturalized here at a period little subsequent to the arrival of *Asplenium marinum*. It occurs here on limestone rocks, but more frequently on old walls and

ruins, rooted deeply in the decaying mortar, and often accompanying *Asplenium Ruta-muraria* and *Trichomanes*. Like other natural importations from the south, it is found most abundantly in the western maritime counties that receive the more direct flow of the tide, and has progressed slowly towards the northern and central parts of the kingdom; in Scotland it has not yet traversed beyond Perth, and is still regarded as a rare species; while in Ireland its copious distribution seems to indicate an earlier arrival. The fronds are evergreen, the new ones making their appearance in May, and at intervals throughout the summer: they vary considerably in size according to situation, and our figure may be regarded as representing the medium, from three to five inches in length, but where much exposed they are often not more than a third of this, and in very sheltered places sometimes extend to eight or ten inches. Some specimens sent from Teneriffe and Madeira measure more than a foot and a half, with a greater proportionate breadth, that induced me at first to believe them of a different species. It is, however, a fern that cannot be mistaken, and I am informed that seedling plants, raised from the spores of these giants, assumed the general aspect of those of British growth. The general outline of the frond is varied from linear to linear-lanceolate, and the alternate segments are occasionally so far separated by the extension of the rachis as to assume the character of pinnæ, especially where growing in the deeper fissures of rocks. The whole of the under surface is densely clothed with brown, pointed, imbricated scales, finely serrated on their margins, the outermost of which extend beyond the margins of the segments and often overlap them; on the unexpanded fronds these scales are white and silvery. The venation is not very readily traced unless in the young state of the frond, or by carefully removing the sori and scales from the back of an old one, when they will be found to accord with the description of them given under the generic character. The sori are oblong; their disposition has been already noticed, as well as the obscure nature of the indusium: the latter organ, if we are justified in so terming it, is rendered unnecessary as a protecting cover to the thecæ, in consequence of the disposition of the scales; which are arranged in regular series along each side of the veins and venules, pointing outwards, and conceal the sori by their broad bases, which completely overlap them in their immature condition.

The medicinal value of *Ceterach* has long been exploded by European practitioners, though still believed in among those of the East. It seems to have been the true *Asplenium* of the Greeks, mentioned by Dioscorides and others, and which, according to Vitruvius, annihilated the spleen of the Cretan swine that fed upon it.

It is not at all easy to cultivate this fern successfully: it is too impatient of confinement to live long in the greenhouse, and the cold frame, so useful for the protection of other half-hardy species, is almost certain death to this. The metropolitan cultivator is told that London air disagrees with it, and yet the only plant of it I possessed in my early career, lived in a nook of an old wall, in a back area in Hatton Garden, for several years, and may be there still, unless eradicated by repair; sun never reached it, and ancient mortar, which, constantly moist, had somewhat the consistence of paste, probably agreed with its constitution; a very necessary point to be studied in planting, as when left to its own selection, or in the wild state, it seems universally to prefer a calcareous habitat. Whether planted in the open fernery, or grown in pots, great care must be exercised as to drainage, and in the latter case especially to avoid wetting the fronds in watering.

Genus 10. BLECHNUM.

Gen. Char. Sori forming a continuous line on each side of the mid-vein, and parallel to it: covered with a continuous indusium opening inwardly.

Named from the Greek, *βλῆχνον*, applied to the following or some other species of fern.

The arrangement of the fructification is very peculiar in this genus, and is dependent upon an equally characteristic form of venation, which latter, however, being in most instances very obscure, I have omitted from the generic character. The lateral veins are alternate, and extend, in our British species, obliquely upward about half-way towards the margin, when, by a sudden turn, each runs parallel to the mid-vein and anastomoses with the one above it, thus forming an apparent longitudinal vein on each side of the middle one. The sori occupy the upper or inner sides of these lateral veins, from the bend to the point of contact with the next, and thus become blended into an uninterrupted line, which the continuity of their indusia renders more decided.

Blechnum boreale. Hard Fern. Tab. XXXVII.

Fronds linear-lanceolate, of two forms: fertile ones erect, pectinate-pinnate, with distant, narrow linear acute pinnæ: barren ones spreading, pinnatifid, with broadly linear blunt approximate lobes.

Blechnum boreale, *Swartz. Smith. E. B.* 1159. *Babington. Hooker and Arnott.* Blechnum spicant, *Roth. Withering. Moore, Handb. Newman, Hist. Brit. Ferns.* Osmunda spicant, *Linnæus.*

Very common in almost every part of the kingdom, on heaths

and uncultivated ground, in woods and thickets, and on rocky hills, especially about pools and water-courses. Its continental distribution is wide, extending from Swedish Lapland to the borders of the Mediterranean. The barren fronds, which remain throughout the winter, are always more or less spreading in their habit, and, where uninterrupted by surrounding vegetation, generally prostrate; they are pinnatifid, smooth, dark green, and leafy nearly to the base, the leafless portion of the rachis being shaggy with lanceolate membranaceous scales; the segments are linear, flat, obtuse at the extremity, more or less approximate, and remarkably regular in disposition: the ordinary length of these fronds is from six to twelve inches. The fertile fronds are always erect, from one to two feet in height, and distantly pinnated: the pinnæ are contracted, linear, generally pointed, and with the margins recurved, not above half the width of the barren segments, one to two inches in length on the upper half of the rachis, but little more than rudimentary below: the rachis is in most instances of a dark purple hue, smooth and glossy. The peculiarity in venation above described, in the remarks on the generic character, does not belong to the barren frond, the lateral veins of the lobes branching dichotomously about the middle, and their divisions extending to the margin, the main or upper branches not anastomosing. The fertile fronds may be found from May to October, but they soon wither away after the dispersion of the sporules.

Like most other ferns, this is liable to deviate from the normal character, and occasionally such deviations may under peculiar treatment become permanent in cultivation, but my own experience has not confirmed this: it is true that specimens sometimes occur in which the frond of *Blechnum boreale* is divided at the extremity, and more frequently, in which the intended fertile frond has all of its pinnæ abortive, the rachis merely developing their rudiments; but I have found the recurrence of such monstrosities too uncertain to admit of enrolling them as varieties.

It is a highly beautiful fern, well worthy of cultivation as an evergreen little liable to injury by frost, and, during the summer, presenting an elegant contrast in its varied fronds, and a habit totally dissimilar to that of all our larger species. In moving it from its natural habitat, care should be taken to bring away as much of the soil as convenience will admit; otherwise our labours will be probably disappointed, as it does not readily form new roots. From want of attention to this circumstance I used to regard it as one difficult to establish, a character quite undeserved, as few of our native species are more readily naturalized in the garden. When planted among rock-work, it must be so placed as to receive abundant moisture, and the soil employed should be more

retentive than usual; a mixture of peat and stiff loam in equal proportion I have found to answer well: in the wild state it grows in almost all kinds of soil, from sand and gravel to the most retentive clay. Shade is necessary to its more luxuriant growth, but it will bear exposure better than most others, especially if well supplied with water. It may be kept in large pots, but does not like confinement.

Genus 11. PTERIS.

GEN. CHAR. Fructification forming a continuous marginal line, covered by the attenuated recurved margin of the frond.

The fructification in this genus is very obscure in regard to its primary development, and much difference of opinion has prevailed among pteridologists respecting the presence or absence of indusium: were it one of small extent, this would be of little importance, but the contrary is the case; and, although the local botanist can have no difficulty in recognizing our solitary indigenous species, from the above superficial character, a correct understanding of those points of structure that are generally adopted in the association or distinction of genera in this tribe of plants, is serviceable to the general student. A close examination of the fructifying frond of *Pteris aquilina* shows us that the lateral veins of the lobes divide one, two, or three times before they reach the margin, and that the extremities of the branches become anastomosed near the latter, forming an intromarginal vein; it is from this vein that the thecæ arise, the margin of the lobe recurving with them, not over them. The thecæ are not produced on the under surface, as in the true dorsiferous ferns, but on the edge of the frond, the substance of which terminates with the vein in question, while the epidermis is extended beyond it from both surfaces, and thus encloses the fructification in its earliest stage of development between two membranes, the folding of which backward with their contents has occasioned all the equivocality originally attaching to this part. Both of the membranes have their margins ciliated with jointed hairs, and under the microscope their cellular structure will be found to differ in accordance with that of the upper and under epidermis from which they are individually extensions.

Pteris, πτέρις, the common Greek name for *fern*, signifying *wing* or *feather*, well accords with the appearance of the fronds of *P. aquilina*, the most common and most generally distributed of European ferns.

PTERIS AQUILINA. Common Brake. Braken. Eagle Fern. TAB. XXXVIII.

Fronds deltoid, with an elongated stem-like petiole, bi-tripinnate; primary pinnæ opposite; ultimate segments oblong, obtuse.

Pteris aquilina, *Linnæus. Smith. E. B.* 1679. *Hooker and Arnott. Babington. Moore.* Eupteris aquilina, *Newman, Hist. Brit. Ferns,* 23.

Abundant on heaths and moors, and on stony and sandy pastures, as well as in woods and thickets, throughout the kingdom. The rhizoma, of a dark colour and velvety exterior, extends far below the soil, branching and creeping in every direction, so as to form, where long established, a densely interwoven horizontal network at a greater or less distance below the surface, according to the character of the subsoil. It has often been observed that the plant is not found over chalk, a circumstance, however, apparently due rather to the ordinary shallowness of the soil over that rock in England, than to any prejudicial influence of the chalk itself. The repeatedly compound fronds grow upward, at intervals, to the height of from six inches to eight or nine feet, according to the fertility of the spot, or as they are more or less exposed or sheltered; in a moist wood, near Hampstead-heath, I once measured one upwards of thirteen feet long; such inordinate growth is rarely attended with the production of fruit. The stem-like portion of the rachis is light yellowish-green, passing into a purplish-brown or black at the lower part; the leafy part of the frond deep green, and smooth on the upper surface, pale and hairy beneath. The compound character varies according to size and other circumstances; the primary pinnæ, usually opposite, are generally broad, the secondary ones narrow or linear-lanceolate; the pinnules, or ultimate divisions, are sessile, always confluent towards the extremity, oblong and obtuse. Owing to the peculiar disposition of the woody tissue and its dark hue, a transverse section of the lower end of the rachis presents a fanciful image of an oak-tree, or, if cut obliquely, of the imperial or spread-eagle; in either case it is a pretty object for the microscope. The fronds appear above ground in May, but are liable to be destroyed by very slight frost before they have unfolded, and, when mature, are always among the first natural objects whose change of appearance indicates the approach of winter.

No permanent varieties occur of this most common fern, though it is liable to considerable modification in different localities. It is seldom cultivated, on account of its tendency to overrun other species, a vagrant habit that is difficult to control. Some trouble and frequent disappointment may be incurred in the endeavour to establish it, either in pots or in the garden, on account of the depth

at which the growing part extends itself and the obstacles to be encountered in its removal; but, once obtained, there is little risk of loss, as it seems quite independent of difference of soil.

The Common Brake was the *Filix-fœmina,* or Female Fern of the old botanists, or those prior to the time of Linnæus, who transferred the title to another, the present *Athyrium Filix-fœmina.*

There is reason to conclude that many exotic species, so considered, belonging to different parts of the world, may not be really other than slightly varied forms of the *Pteris aquilina,* resembling it closely as they do in habit, tendency to complexity in the division of the frond, and other circumstances. Should future observation render fact that which is at present merely speculative, then might the fern before us rank as the most universally distributed of all vegetable productions, extending its dominion from west to east over both continents and islands, in a zone reaching from Northern Europe and Siberia to New Zealand, where it is represented by, and perhaps identical with, the well-known *P. esculenta.* The rhizoma of our plant, like that of the latter, is edible; and though not employed in these islands as food, powdered and mixed with a small quantity of barley-meal, it is made into a kind of gruel called *gofio,* in use among the poorer inhabitants of the Canary Islands, especially those of Palma and Gomera: its astringency, however, is so great, that it has been recommended for dressing and preparing kid- and chamois-leather, and its qualities as a vermifuge are said to equal those of *Aspidium Filix-mas.* The large fronds form a durable thatch, and are used as litter for cattle: in many parts of the country they are collected for fuel, especially for heating ovens, and sometimes even for burning limestone. The ashes contain a large proportion of alkali available in the manufacture of both soap and glass, and are often employed by country people as a substitute for the former article, for which purpose they are generally formed into balls by moistening and afterwards heating them in the fire; in this state they are well known in some districts in England by the name of ash-balls. A bed made of the fresh-gathered fronds is a provincial remedy for the *rickets.*

Genus 12. ALLOSORUS.

Gen. Char. Sori circular, near the extremities of the lateral veins, confluent in maturity; covered by the reflexed margin of the pinnules of the contracted fertile frond fulfilling the office of an indusium.

Most recent botanists place this genus next to *Polypodium,* on account of the form of the sori and the absence of a true indusium; but the eventually confluent fructification, forming an intromar-

ginal line covered by the reflexed epidermoid prolongation of the edges of the pinnules, seems to denote a nearer structural affinity to *Pteris*.

The name, from the Greek ἄλλος, implying *difference* or *change*, evidently alludes to alteration that takes place in the appearance of the sori as they become confluent.

ALLOSORUS CRISPUS. Parsley Fern. Curled Rock-Brakes. TAB. XXXIX.

Fronds deltoid, bi-tripinnate, of two kinds: ultimate divisions of barren fronds wedge-shaped, cut and toothed; of the fertile linear-oblong, entire.

Allosorus crispus, *Bernhardi. Babington. Moore. Newman.* Pteris crispa, *Linnæus. Smith. E.B.* 1160. Cryptogramma crispa, *Brown. Hooker and Arnott. E. B.* ed. 2, 1443. Osmunda crispa, *Linnæus, Sp. Pl.*

This elegant little fern is exclusively European, growing in the more sheltered crevices of mountain rocks, from Lapland to the Mediterranean. In this country it is generally regarded as a comparatively rare, or at least local species; the former it certainly is not, the latter only in accordance with its alpine habit. In Scotland its distribution is a wide one, though apparently less abundant than in the North of England and North Wales, where it often grows profusely on the ledges and in the narrow clefts of the slate and trap rocks. Southward it is found more sparingly, and is rapidly disappearing owing to the rapacity of collectors. In Ireland it has been rarely met with. The fronds spring in tufts from a slowly creeping and branching rhizoma, the fertile ones growing erect from six inches to a foot high, the barren ones, more numerous, being not above half that height; the latter are of a bright yellowish-green, and much resemble, at first sight and when newly expanded, the leaves of a small umbelliferous plant. The ultimate divisions of the barren frond vary in form in different specimens from wedge-shaped to oblong or oval, and in being entire or toothed and serrated: those of the fertile frond are oval, oblong, or linear, stalked, mostly entire, but in some instances forked at the extremity, and occasionally showing a tendency to become hastate below; the reflexed margins nearly meet in the middle at first, so as to completely cover the fructification. The circular form of the sori is only evident when examined at an early stage: no trace of an indusium has yet been observed.

The delicate green hue and close growth of the Parsley Fern render it one of the most beautiful among the smaller species, but its duration is very limited, the fronds appearing in May and

June and becoming disfigured by the first morning frosts of the autumn. It grows freely under cultivation, whether planted in pots or among rock-work, and I have found it succeed in several different soils, though never better than when planted on the margin of a gravel-walk, among the pebbles of which some of the finest tufts were produced. For potted specimens, light sandy peat, with a small quantity of old mortar, and fragments of slate, limestone, or granite, the first especially placed vertically throughout the soil, will be most available, when associated with a copious supply of water and as free drainage during the growing season. Exposure to the sun should be guarded against, as though not necessarily fatal to the fern, it is to the lucid green colour that constitutes its chief beauty.

Genus 13. ADIANTUM.

Gen. Char. Sori roundish, growing from the extremities of the veins on the under face of the reflexed margin of the frond, the epidermis of which is prolonged over them in the form of an indusium.

Adiantum is an extensive genus, containing about seventy known species, of which the greater number are tropical. The fronds are generally of a very delicate, almost membranaceous texture, especially those which are much divided: they have a peculiarly slender, hair-like, and elastic rachis, which, being usually of a dark-purple or blackish hue, occasions many of the species to rank among the most elegant of the fern tribe, as the thin bright-green pinnules seem to be suspended in the air. They all delight in shade and moisture, growing almost exclusively in the damp and dark crevices of rocks, among trickling streams, and in the depths of tropical forests where the atmosphere is constantly loaded with moisture. *A. pedatum* in North America, and *A. Capillus-Veneris* in Europe, are the only species met with extending naturally into cold climates.

The European species was named *ἀδίαντον* by the Greeks, from *ἀδίαντος, dry*, because the foliage repels water, and is with difficulty wetted.

Adiantum Capillus-Veneris. Maiden-Hair. Tab. XL.

Fronds deltoid, lax, bi-tripinnate: pinnules stalked, rhomboidal-wedge-shaped, lobed, alternate. Fertile lobes reflexed, forming transversely oblong indusium-like folds covering several roundish sori: barren lobes serrated.

Adiantum Capillus-Veneris, *Linnæus*. *E. B.* 1564. Generally adopted.

The common or true Maiden-hair is unquestionably a wanderer

here from warmer lands, being only very locally distributed in situations open to such arrivals from the Atlantic. Cornwall, Devonshire, and Glamorganshire, and the southern and western parts of Ireland, afford its principal British habitats, and it is rarely found very far from the sea; indeed chiefly in moist maritime caves and on rocks and cliffs where it is exposed to the spray, and especially where fresh water trickles down their sides. A perpendicular surface seems most favourable to its development, and hence the mouths of old wells and the deserted shafts of mines are occasionally tapestried with its beautiful foliage. Its geographical distribution over the warm and temperate parts of the globe seems, from the testimony of botanists of high repute, to be almost universal. The slender, black, scaly rhizoma creeps and branches slowly in every direction, sending up the light fronds in lax tufts from the extremities, varying in height, according to the situation, from three or four inches to a foot. The hair-like fineness of the rachis and its branches, and their glossy, black, or purplish-black hue, originated both the Latin and English names of the species, but they are not peculiar to it. The pinnules, distinct, with capillary stalks, are somewhat flabelliform in general outline, with an unequally wedge-shaped base; they are of a very thin, almost membranaceous texture, and delicate, bright, though rather glaucous green colour, and divided at the top into several unequal segments, which are either serrated or have their extremities folded backwards, bearing the sori, which thus appear to form an interrupted marginal line: their true character and position is given under the generic character, and illustrated by the right-hand enlarged figure on our plate.

This elegant fern had formerly high medicinal repute, especially as a diuretic and expectorant, but is now only remarkable in an economical point of view as giving name and a slight flavour to the well-known *Capillaire*, which is prepared by pouring boiling syrup upon the freshly-gathered fronds. It grows abundantly in the South of Europe, where, however, the North American *A. pedatum* is often employed as a substitute, being cultivated for the purpose. They are both astringent, and the syrup is esteemed useful in coughs and other pectoral ailments, but a strong decoction of the latter plant is said to act as an emetic. In the South Isles of Arran, on the coast of Galway, where the Maidenhair grows profusely in the fissures of the limestone rocks, the people use a decoction of the fronds as a substitute for tea.

The great beauty of the foliage of the *Adiantum* would render it a valuable decoration to the ruin, rock, and fountain in ornamental gardening, but, like other maritime self-naturalized species, it is liable to be destroyed by frost, unless planted in warm and sheltered situations; indeed, it is scarcely possible to preserve it alive

through the winter in the open air in the eastern parts of England. The amateur grower will manage better with it as a house plant, in which case the season of dearth is that in which its delicate fronds are most attractive to the eye. It will flourish in the stove and greenhouse, but in the inhabited room requires the cover of a bell-glass, and is admirably adapted for growing in the close or Wardian case. It ought never to be exposed to the sun. In regard to soil, I have found it succeed well in the same compost as that recommended for *Asplenium marinum*.

Genus 14. TRICHOMANES.

GEN. CHAR. Sori marginal. Thecæ sessile around columnar filiform receptacles, which are extramarginal extensions of the anterior branches of the lateral veins, within open cylindrical or suburceolate involucres of the same texture as the frond.

The generic name, borrowed from *Dioscorides*, was applied by the Greeks to some species of ferns, probably *Asplenium Trichomanes*, and is not unaptly transferred to these, considering the arbitrary allotment of botanical names generally; the prefix, from θρὶξ, τρῐχὸς, a *hair* or *bristle*, bearing allusion to the hair-like receptacles of the sori, while the termination, from μανὸς, *soft, thin*, or *flexible*, accords with the character of the fronds; a convenient, though forced, interpretation, that may suffice in the absence of one more consistent.

The plants comprised under this and the following genus, *Hymenophyllum*, are remarkably different from the other ferns in the development of their fructification, in habit, and in the texture of the frond, which latter is membranaceous, and under the microscope very beautifully reticulated. They grow only in very moist and shaded places; indeed, their organization is not adapted to support those ordinary changes in the hygrometric condition of the atmosphere that do not visibly affect vegetation in the aggregate; their delicate fronds become brown, and shrivel when exposed even to a few hours' drought, and they resist all customary modes of cultivation, in consequence of the excess of light and insufficiency of moisture in the surrounding air that are their usual concomitants. The numerous species of both genera are almost all tropical, inhabiting the deep recesses of the forests of hot climates, where, in an atmosphere loaded with vapour, they flourish, as well as in similar situations to those to which they are confined in Europe.

TRICHOMANES RADICANS. European Bristle Fern. TAB. XLI.

Fronds tri-quadripinnatifid, glabrous, deltoid-ovate or lanceo-

late; segments alternate, linear, entire or bifid, obtuse. Involucres solitary in the axils of the upper segments, shorter than the filiform receptacle.

Trichomanes radicans, *Swartz. Hooker. Babington. Moore. Newman.* Trichomanes brevisetum, *Brown. Smith. E. B.* ed. 2, 1445. T. speciosum, europæum, pyxidiferum, and alatum, of authors. Hymenophyllum alatum, *Smith. E. B.* 1417.

The original locality of the Bristle Fern is doubtful, as specimens collected in several parts of the world, not essentially differing from our own, evince a wide distribution; though, being found in the West Indies and in the islands of the North Atlantic, renders its transit hither consistent with those natural causes that have enriched the catalogue of British vegetation with many other productions of warmer climates. At present this may rank as a rarity to the home botanist, not being found in any other part of the United Kingdom than in the Irish counties of Cork and Kerry, where it grows more or less abundantly on dripping rocks, about lakes and waterfalls, and depending from the walls and roofs of caverns. The rhizoma creeps and spreads like that of *Polypodium vulgare*, and in some situations attains a length of several feet, often covering the moist rocks on which it grows with a complete network; it is of a dark colour, almost black, and clothed with narrow, bristle-like, articulated scales. The fronds, developed at intervals as the rhizoma extends, are from three inches to a foot in length, and generally pendulous, in consequence of the position they occupy on the sloping or perpendicular faces of the rocks: the general outline is somewhat deltoid, but in very luxuriant plants it passes into an oblong-lanceolate form very much acuminated, constituting the variety *Andrewsii* of Mr. Newman, Hist. Brit. Ferns, 292. The rachis is winged throughout on each side, corresponding with the plane of the frond, the leafy portion of which seems to consist only of a continuation of these wings in a broader form along each side of its branches, which latter constitute the veins; this structure renders all the ultimate divisions narrow and linear. The veins, dividing alternately, are hard, woody, and wire-like, and, where barren, terminate before reaching the ends of the segments; but where fertile they extend beyond the segment, the tissue of which separates and distends in the form of a more or less elongated cup around the prolonged vein—this cup is the *involucre*, the prolonged vein the *receptacle*, referred to under the generic and specific characters. The thecæ form a small globular cluster round the receptacle at the bottom of the cup, beyond which latter organ, as they advance to maturity, the modified vein extends in the form of a bristle, varying in its exserted length from two to four or even six times that of the invo-

lucre. In the more luxuriant form of the plant, the involucral cup is very distinctly winged, in consequence of the double layer of tissue, composing the segment to which it belongs, not separating through its whole breadth; in smaller specimens the wings or margins of the modified segment are not readily distinguishable, but the cup-like cylinder is always slightly compressed to the plane of the frond, indicative of its origin as above stated. It is true that, like most other modifications of tissue attending the development of fructification, the cup changes from the bright green colour of the frond to a white or brownish hue, and loses its translucency, but the continuity of texture and similarity in other respects are readily traceable by close examination.

The growth of this rare and elegant fern is not attended with any difficulty, provided that the peculiarities of its natural habitats are studied by the cultivator; these are chiefly, an atmosphere loaded with moisture, absence of stagnant water about the roots, and exclusion of the direct rays of the sun: the first of these conditions is rarely attainable under cultivation unless with the shelter of glass. Many very successful growers have described the varying minutiæ of the several modes of treatment by which they have attained magnitude of development far exceeding that of the plant in its natural state in Ireland; but the specimens which I have hitherto seen growing in the more fanciful modifications of the closed case, and under the elaborate course of planting and after-treatment recommended in such circumstances, have always appeared to me too delicate to be consistent with health, and that they really are so, the fact, generally lamented by the amateur grower, that they never perfect fructification seems to confirm. The plant grows freely in a common pot or seed-pan; the latter is better, even commencing with a small specimen, as it affords more room for the spreading of the rhizoma; it should stand in water, and be covered with a bell-glass of sufficient size to admit of the uninterrupted extension of the fronds; the bottom should be strewn with fragments of porous stone and little lumps of charcoal intermixed, and the soil may consist of about equal parts of sand, peat, and decayed leaf-mould. In this way, sheltered from the sun, but freely exposed to the daylight, and with the occasional admission of fresh air by removing the glass for a few minutes at a time, the thecæ are not unfrequently fully formed and the filiform receptacle exserted as much as in wild specimens. Success in the treatment of small plants will readily lead to contrivances in regard to the management of larger; but those who may be desirous of emulating the more magnificent though barren state alluded to above, will find much valuable information on the subject, by reference to Mr. Ward's book 'On the Growth of Ferns in Closed Cases,' or Mr. Moore's 'Handbook,' p. 202

et seq., of which the limits of the present work will not admit an extract.

In the durability of the fronds for several successive years, in general habit and texture, *Trichomanes* has all the characters of a tropical species, and though naturalized in our sister island, under the influence of a very moist and temperate climate, would probably not bear exposure even in corresponding localities in England, where the winters are so much more severe, and the drying effects of the easterly winds in the spring so generally prejudicial to vegetation.

Genus 15. HYMENOPHYLLUM.

Gen. Char. Sori marginal. Thecæ sessile on a columnar subclavate receptacle within a two-valved involucre of the same texture as the frond.

The name, from *ὑμὴν*, a *film* or *membrane*, and *φύλλον*, a *leaf*, is expressive of the pellucid filmy texture of the frond. The genus formed a part of the Linnæan *Trichomanes*, but was separated by Sir J. E. Smith, in consequence of the bivalvular involucre and short receptacle. The division is rather one of convenience than admissible on a structural foundation. The two British species carry a fragility of form and texture almost exclusively characteristic of the smaller species of tropical ferns, to the highest latitudes in which it seems capable of existing.

Hymenophyllum Tunbridgense. Tunbridge or Common Film Fern. Tab. XLII.

Fronds membranaceous, pinnate: pinnæ distichous, pinnatifid, decurrent, forming a broad wing on each side of the rachis; the segments linear, undivided or bifid, spinosely serrated. Involucre solitary, axillary, suborbicular, compressed; the valves spinosely serrated.

Hymenophyllum Tunbridgense, *Smith. E. B.* 162. *Hooker and Arnott. Babington. Moore. Newman.* Trichomanes Tunbridgense, *Linnæus.*

Abundantly distributed in the north-western and southern counties of England, in mountainous and rocky districts; in Wales; and less frequently in the Highlands of Scotland, and in Ireland; growing on shady wet rocks, and among moss on the trunks and roots of old trees, or on the ground near lakes and rivulets. The black and thread-like rhizoma spreads and branches widely, forming a kind of turf over the surface on which it grows, and from

which it is in general easily separated in mat-like masses. The fronds vary from one to three or four inches in length, springing singly at short intervals from the creeping rhizoma; they are of a very thin, almost filmy texture, and composed, like those of *Trichomanes*, of the winged upper portion of the wire-like rachis and its branches. The pinnæ are alternate, connected throughout by the wing of the rachis, and deeply once or twice pinnatifid, chiefly on the anterior or upper side; the ultimate segments are linear, obtuse, and margined with sharp spiny serratures. The fructification is sessile, terminating a vein, and occupying the place of the first upper segment of each pinna, as expressed in our lower figure; the involucre being apparently formed by a modification of the segment it supplants, similar to that of the last genus. The involucre in this species is somewhat orbicular, but a little compressed, especially toward the apices of the irregularly and sharply serrated valves, and includes a short central column or receptacle bearing around it the sessile thecæ; this receptacle is, as in the previous instance, the extremity of the branch vein, but instead of being filiform, it is thickened so as to become almost club-shaped, and never extends beyond the involucre.

The figures of this beautiful little fern represent it as growing on the ground, erect; but if inverted would better display the ordinary habit, and that in which it appears to the greatest advantage; or, clothing with a tapestry of deep olive-green the shaded perpendicular faces of dripping rocks and caverns, when its filmy fronds are nearly pendulous, and the several series overlie each other at the base like the half-ruffled plumage of a bird: much of its beauty is lost when growing in a horizontal position.

It may be cultivated in the open air by imitating its natural site, and very successfully in the house under glass, on the same plan as recommended for the Bristle Fern; the chief object to be attended to being the retention of a moist atmosphere about its fronds, which, being short, do not require when grown apart from other species a glass of the same elevation as the latter; but it may be planted around other larger ferns in the closed cases, and vegetates luxuriantly under either circumstance, producing its fructification copiously at all seasons. It is little, if at all susceptible of injury from cold, a fact rather opposed to some of the recorded habitats within the tropics, which probably refer to different though perhaps nearly allied species.

HYMENOPHYLLUM UNILATERALE. Wilson's Film Fern. TAB. XLIII.

Fronds pinnate: pinnæ subunilateral, recurved, pinnatifid; the segments linear, undivided or bifid, spinosely serrated. Involucre

stalked, solitary, axillary, ovate, inflated; the valves entire. Main rachis very slightly winged.

Hymenophyllum unilaterale, *Willdenow. Moore. Newman.* Hymenophyllum Wilsoni, *Hooker. E. B. Supp.* 2686. *Hooker and Arnott. Babington.*

Found in similar situations to the preceding, which it frequently accompanies. Its distribution is more extended, especially in Scotland, where its extreme limit is Unst, the most northern of the Shetland Islands. In general appearance this is not very much unlike *H. Tunbridgense,* with which it was for a long time confounded; but the fronds are far less delicate in texture, and comparatively rigid. The principal characters of distinction are found in the fructification, which, occupying a similar position, is stalked instead of sessile; the involucre proportionally longer and ovate instead of rounded, with very turgid convex valves, meeting by their edges, not compressed toward the apex, and never at all serrated. The tendency of the pinnæ to assume a recurved position is not a character to be depended upon, but the darker green hue and less compact growth will generally enable the observant eye to distinguish the present at a glance from *H. Tunbridgense,* a plant of more elegant habit. The involucres are generally curved forward.

The treatment required for cultivation is the same as that already noticed for its congener, and will succeed with the exotic species of this curious family, all of which are well deserving the attention of the amateur cultivator.

Genus 16. OSMUNDA.

Gen. Char. Fructification naked, clustered on contracted rachiform portions of the frond, forming a (generally) terminal panicle. Thecæ stalked, subglobose, reticulated, two-valved, opening vertically.

The name is from the Saxon, *Osmund,* 'domestic peace,' but the origin of its application is unknown, though several romantic legends are connected with it.

The ferns of this genus differ greatly from those of all the preceding, not only in the peculiar disposition of the fructifying masses, which occupy, upon the veins or branches of the rachis, the place of the leafy tissue on the upper part of the fertile fronds, but likewise in the structure of the thecæ; these are exannulate, or without that prominent articulated continuation of the supporting stalk, by the ultimate extension of which those of ordinary ferns are torn open to discharge the spores; their tissue is opaque, very regularly reticulated, and the bivalvular dehiscence takes place

along a striated vertical band, reaching over rather more than half of the circumference.

OSMUNDA REGALIS. Osmund Royal. Flowering Fern. TAB. XLIV.

Fronds bipinnate: pinnæ opposite: pinnules oblong, nearly entire, more or less auricled at the base. Fructification in bipinnate panicles terminating some of the fronds.

Osmunda regalis, *Linnæus. E. B.* 209. Generally adopted.

This stately fern is of common occurrence throughout the United Kingdom, in wet spongy soils about the borders of woods and thickets, and on the shaded margins of rivers, lakes, and swamps, varying much in size in different situations. The fronds grow in large tufts from a thick woody rhizoma, which sometimes extends horizontally, branching so as to occupy a large space of ground, but occasionally, and especially in much encumbered habitats, elongates in an erect position to a height of two or even three feet above the soil, assuming the character of the stipes or trunk of the tropical tree ferns. When the tufts are large and luxuriant this is by far the most magnificent of our native species of fern, the barren fronds being from six to nine feet high; I have met with them on the banks of the Dee rather exceeding the latter, and Mr. S. Murray, as quoted in the 'British Flora,' measured a tuft on those of the Clyde which was eleven feet and a half in height. The fertile fronds are shorter than the others and comparatively few in number; in both the bipinnate character is the same throughout, the primary divisions opposite, the secondary mostly alternate. The pinnules are of an elongated ovate or oblong form, approaching occasionally to lanceolate, and either entire or slightly crenated on the margin, while the base is somewhat dilated, especially on the lower side, so as frequently to become auricled. In the fruit-bearing fronds, four or five of the lower pairs of pinnæ have the leafy character, while the remainder develope clusters of thecæ in lieu of pinnules, and similar clusters displace occasionally pinnules on other parts of the frond, illustrating the true origin of the reproductive organs by modification of the leafy tissue. The clusters of thecæ are at first of a light green hue, gradually changing to a reddish-brown as they approach maturity. The fronds appear about the end of April or the beginning of May and last until November, but the fructification withers and disappears at the end of August or earlier according to the character of the season.

The rhizoma is tonic and astringent, and a decoction is esteemed in some parts of the continent as a remedy for the rickets.

To thrive under cultivation, the Flowering Fern should be planted in a shady situation, either in peat or a mixture of peat and yellow loam, and be plentifully supplied with water; with these requirements it may be grown with little, if any, deterioration of its wild luxuriance, and will constitute one of the most beautiful ornaments of the fern garden, as well on account of its own stately habit, as by the contrast its foliage presents to that of the other large species. When planted near water, the outer fronds often assume an elegant curve, bending over so as to dip their extremities into the pond or rivulet, and it is in such situations that they attain their greatest length.

Genus 17. BOTRYCHIUM.

Gen. Char. Fructification naked, clustered on a contracted branched frond, forming a unilateral panicle. Thecæ sessile, globose, opaque, two-valved, opening vertically.

The name is from the Greek *βότρυς, a bunch of grapes,* which the branched clusters of globular thecæ somewhat resemble.

In this and the following genus, *Ophioglossum,* the venation, instead of being circinate as in ferns generally, is straight. The fructification, resembling in *Botrychium* that of *Osmunda* in disposition and origin from the branches of the rachis, differs in the coriaceous and non-reticulated texture of the thecæ. The species are few, but widely distributed, extending into Australia in the southern hemisphere. North America yields about half the number at present known, viz. five species: of these *B. Virginicum* is remarkable as being the largest of the genus, and is known there by the name of Rattle-snake Fern, probably, as Pursh observes, from its growing in places where those reptiles are generally found, and yielding them an agreeable covert, though it is stated by others to be one of the Indian remedies for the bite.

Botrychium Lunaria. Moonwort. Tab. XLV.

Barren frond pinnate: pinnæ lunate or fan-shaped, notched or crenate on the outer margin. Fertile frond springing apparently from the common rachis.

Botrychium Lunaria, *Swartz. Hooker and Arnott. Babington. Moore. Newman.* Osmunda Lunaria, *Linnæus. E. B.* 318.

The Moonwort, though scarcely to be considered a common species, is not at all confined in its distribution, either in Great Britain or Ireland; in the former, its localities are only limited by the two extremes of the Isles of Wight and Shetland, in the

latter it occurs from Cork to Antrim. Dry exposed heaths and commons, and elevated rocky pastures are the likely and frequent habitats, but it is liable to be overlooked, in consequence of the small size and frequent cropping of the fructifying frond by cattle. The habit of this plant is totally different from that of *Osmunda* and all of the soriferous ferns: it has no true rhizoma, but the growing part or caudex is very little elongated below the surface of the soil, sending out a few succulent and brittle roots that extend more or less horizontally: the upward growth is from a lengthened bud invested by the membranaceous bases of previously developed fronds. The perfect plant consists of a single pinnated barren frond, through the sheathing lower part of whose rachis rises a second, modified, and bearing the fructification. The succulency of the recent pseudo-stem thus formed, renders its positive structure obscure, and has occasioned it to be sometimes described as homogeneous, and the frond to be considered branched. The pseudo-stem is hollow; and at the base, the fronds of the following year may be traced by dissection, more or less perfectly formed, and often, the rudimentary bud of the year succeeding within the latter; the position of the barren and fertile fronds being reversed in the successional development. The pinnæ are opposite, numbering from three or four to seven pairs, of a glaucous green hue, smooth, crenated on the margin, and occasionally more or less lobed, acquiring, in the latter case, a fan-shape instead of the lunate or crescent-form which confers the specific name. The thecæ are comparatively large, and, though at first sight apparently crowded, are really disposed in two regular series upon the divisions of the paniele-like rachis, and directed towards the upper or inner face of the modified frond; their texture is more dense than in *Osmunda*, and presents no trace of the regular cellular reticulations which character the membranaceous ones of that genus: dehiscence takes place along an elevated vertical line formed by the junction of the margins of the valves. The fertile frond, which is the taller of the two, rises to the height of five or six inches, and is in perfection about the time of the hay-harvest; soon after which the plant begins to decay.

Specimens are occasionally met with bearing more than one barren or fertile frond; others with the pinnæ-bearing thecæ on their margins; and sometimes the pinnæ are so much divided as to render the frond almost bipinnate. Certain variations of the latter form may have induced some botanists to consider one or other of the continental species, *B. rutaceum*, or *B. matricarioides*, to belong to Britain, a circumstance not at all unlikely, but requiring surer evidence than we at present possess.

The only mode of ensuring the growth of the Moonwort in the fern garden, is by removing the turf containing it without dis-

turbing the roots, and afterwards keeping the grass around well trimmed to prevent overgrowth. The plants removed, with a small portion of soil only, at the period of fructification seldom live beyond the following year. The turf should be planted in an exposed situation and where water cannot become stagnant around it.

Genus 18. OPHIOGLOSSUM.

Gen. Char. Fructification arranged on the margins of a contracted simple frond, forming a flattened stalked spike. Thecæ sessile, connate in two rows, opaque, opening transversely with two valves.

The aspect of the European species warrants the generic name, from *ὄφις, a serpent,* and *γλῶσσα, a tongue.*

The species, few in number as at present known, are chiefly natives of warm climates.

Ophioglossum vulgatum. Common Adder's-tongue. Tab. XLVI.

Barren frond ovate, obtuse, spathe-like. Fertile frond club-shaped, springing apparently from the common rachis.

Ophioglossum vulgatum, *Linnæus. E. B.* 108. Generally adopted.

Though local in its distribution, and more frequent in England than in other parts of the kingdom, the Adder's-tongue is generally abundant in those meadows and pastures in which it has once settled, sometimes even prevailing to such an extent as to become injurious to the grass. The situations it prefers are rarely those which foster the Moonwort, the latter requiring a dry, while the present plant flourishes best in a moist soil. The whole plant is succulent and much resembles *Botrychium* in habit, and in the development of its double frond, but differs in the production of the new plant externally instead of within the base of the old one, a circumstance illustrated in our figure. The height varies according to the luxuriance of the surrounding vegetation from two or three inches to a foot. The barren frond, of a pale yellowish-green, invests the rachis of the fertile one as the spathe of the Arum does its fructification; its form is ovate varying to ovate-lanceolate, more or less obtuse: the venation is more complicated than is usual in the fern family, anastomosing and forming an irregular network. The thecæ are imbedded in two parallel series on the margins of the club-like termination of the inner frond, to

which, as they open to discharge the spores, they give the appearance of being serrated. The fructification is perfected toward the end of June, soon after which the fronds begin to die off, one or more buds being previously formed at the base, which remain dormant to the following spring.

The barren frond is often forked at the extremity, occasionally deeply lobed, and in very luxuriant specimens two or three spikes of fructification are developed instead of one. An ointment is sometimes prepared from the green fronds to use as a vulnerary. Removal of the containing turf is by far the preferable mode of introduction to the fernery, as, like the Moonwort, it is rather impatient of cultivation.

OPHIOGLOSSUM LUSITANICUM. Lesser Adder's-tongue. TAB. XLVII.

Barren frond linear or linear-lanceolate. Fertile frond elavate.

Ophioglossum lusitanicum, *Linnæus*. *Newman, Hist. Brit. Ferns*, 331. *Lindley, Veg. Kingd.* 77.

This small species has been long known and described as a native of the south of Europe and the Atlantic Islands. For its discovery in the Channel Islands we are indebted to Mr. George Wolsey, who found it among short herbage, "on the summit of rocks, not far from Petit Bot Bay on the south coast of the Island of Guernsey," growing with *Trichonema Columnæ* and *Scilla autumnalis*. It is far from improbable that it may be found upon the southern coast of Devonshire and Cornwall; indeed, I have received a specimen said to have been collected in the latter county, but as the habitat has been, perhaps wisely, withheld, merely mention the circumstance as an inducement to farther research. The specimens from which our figures have been taken, were kindly forwarded by the Rev. Henry Hawkes, from whose correspondence it appears that the greediness of collectors has almost exhausted it in the original locality, but that it is fortunately to be met with in others not yet published. The student of nature is from the example of his tutor liberal; it is to be regretted that those who affect only to be his fellows, should by their insatiate grasping tend to render him miserly as themselves, and to desire to conceal discoveries that he would share with pleasure, merely to avoid the total loss to his country of a rare or beautiful object.

The fronds are in perfection in Guernsey in February or even earlier.

Specimens of the two following ferns were not obtained sufficiently early to be introduced in their proper order. The genus *Gymnogramma* ought to follow *Polypodium*.

Genus GYMNOGRAMMA.

Gen. Char. Sori linear, naked, forked, eventually confluent.

Named from the Greek *γυμνὸς*, *naked*, and *γράμμα*, *a line* or *letter*; the situation of the sori, without indusium, upon the forked veins of the frond, presenting some resemblance to letters, or otherwise from their linear form.

Gymnogramma leptophylla. Tab. XLVIII.

Fronds ovate, sub-deltoid, bipinnate, fragile: pinnæ roundish wedge-shaped, three-lobed, the lobes cut and toothed, obtuse.

A native of the south of Europe and of the Atlantic Islands, this has no farther claim to a place among British species than from its occurrence in Jersey, where it is not very local in its distribution, being found in several parts of the island growing in shaded moist places among mosses and *Marchantia*, especially on hedge-banks and near springs, in a light sandy loam. It is a biennial plant, so far as that it appears to develope from the spores late in the summer, not sending up the longer fructifying fronds until the following year. The early fronds are small, very little divided, spreading over the ground, and usually barren; the later rise to the height of three or four inches, are generally few in number, and varying in division, according to their luxuriance being bi- or tripinnate, and the pinnæ and pinnules opposite or alternate: the ultimate pinnules are bluntly wedge-shaped, or rounded, about three-lobed, and the lobes terminate with two blunt teeth. The linear sori depend upon the termination of the vein on which they develope; this is sometimes simple, but more generally forked, each branch as it diverges bearing its portion of the thecæ, so that the sorus, commencing on the principal vein, becomes forked likewise: in maturity they are confluent and often cover the whole under-surface of the pinnules.

The chief requisites for this species in cultivation are a light friable soil and a moist atmosphere: it appears to grow with equal luxuriance in sandy loam or a mixture of peat and sand. In the hothouse it springs up spontaneously after the first introduction.

POLYPODIUM ALPESTRE. Alpine Polypody. TAB. XLIX.

Fronds lanceolate, bipinnate: pinnules linear-lanceolate, pinnatifid with obtuse sharply serrated lobes.

Polypodium alpestre, *Koch. Sprengel. Moore, Handb.* 50. Pseudathyrium alpestre, *Newman, Hist. Brit. Ferns*, 199.

This fern, a native of most parts of northern and central Europe, does not seem to have been recognized as a British species, until after its discovery in the Highlands of Scotland in July 1841, by Mr. Watson; having been previously overlooked as an alpine variety of *Athyrium Filix-fœmina*, which, though of less elegant habit, it somewhat resembles at first sight. Its mountain habitats render it one of local occurrence, but it appears from the observations of recent botanists to be far from sparing in its distribution in North Britain. The rhizoma has a tendency to spread and branch in a decumbent position, and the description to the contrary, given by some botanists, has probably originated from their acquaintance with its habit being confined to plants growing in situations not admitting of its natural development, or otherwise to young specimens. The fronds are produced in circular tufts from each crown, and vary in height from six inches to three feet, according to age or luxuriance. The rachis is leafy almost to the base, which is more or less thickly covered with broad pointed brown scales. The small circular sori generally spring from the lower anterior branch of the lateral veins of the pinnules, near the sinuses between the lobes, but occasionally are more numerous, and in such case become confluent in maturity.

I am only familiar with this fern, so far as its cultivation is concerned, as a continental species, and have not had an opportunity of examining many specimens of British growth; but traces of an indusium are undoubtedly present occasionally, a circumstance that probably led several European botanists to place it in the genus *Aspidium*.

The Alpine Polypody succeeds well under the same treatment as the Lady Fern.

Pseudathyrium flexile, Newman, Hist. Brit. Ferns, 203, may be, as has been suggested, only a variety of *alpestre*, but if so it is a very elegant one. The question of distinction as a separate species must depend upon subsequent observation, but there is reason for considering it such.

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Synonyms and names incidentally mentioned are printed in Italics.

THE END.

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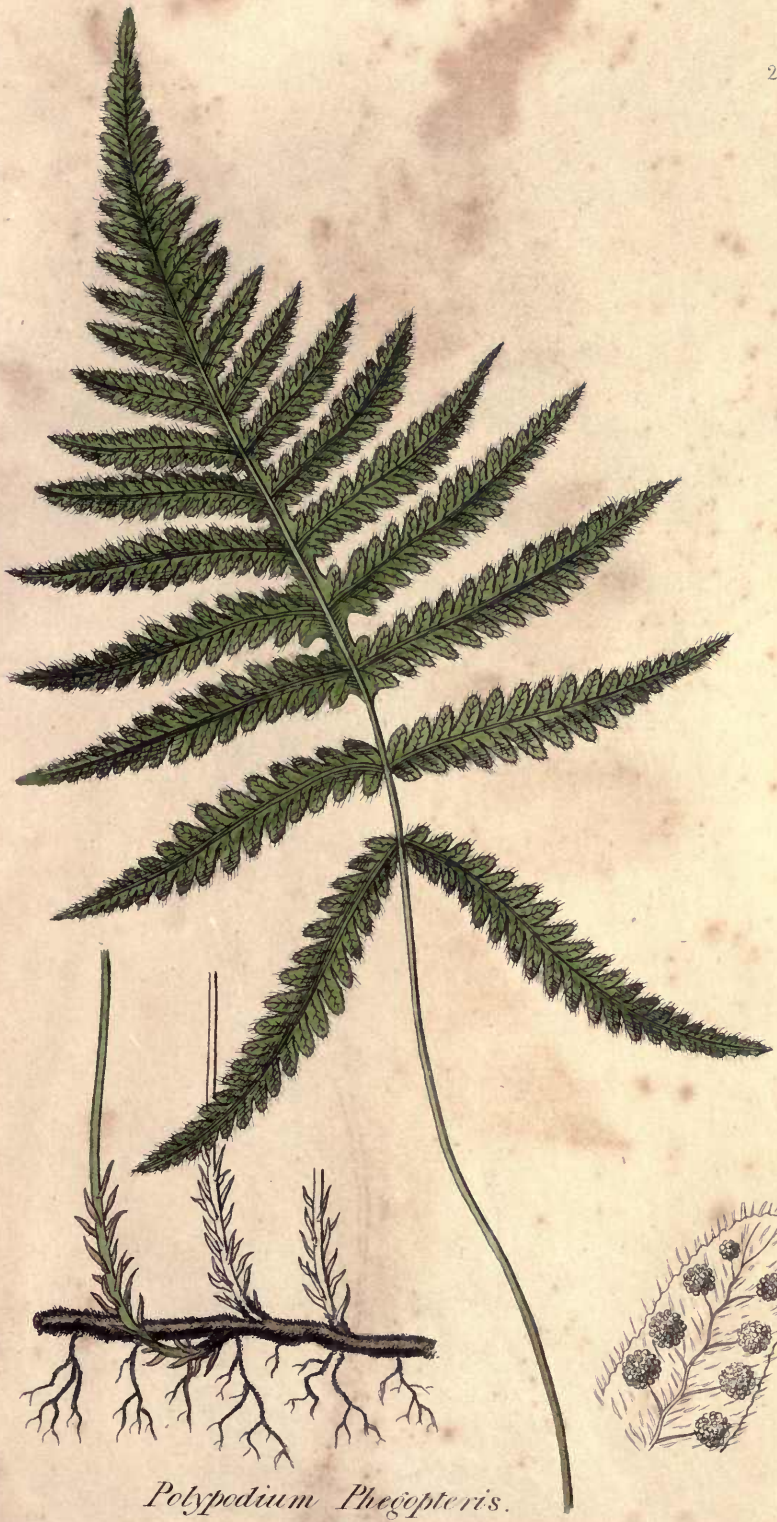
Polypodium vulgare.

J.E.S.Fecit.



Polypodium Phegopteris.

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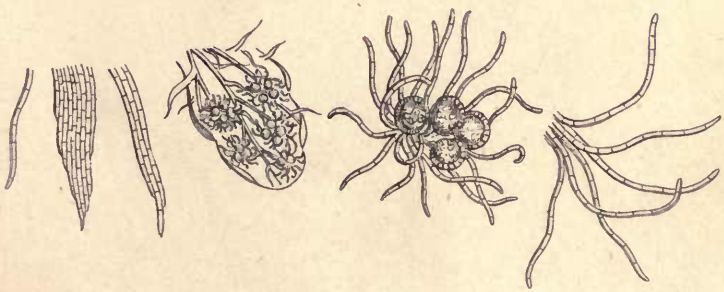
Polypodium Dryopteris.

J.E.S. Fecit.

Polypodium Calcareum.

J.E.S.Fecit.



Woodsia Ilvensis.

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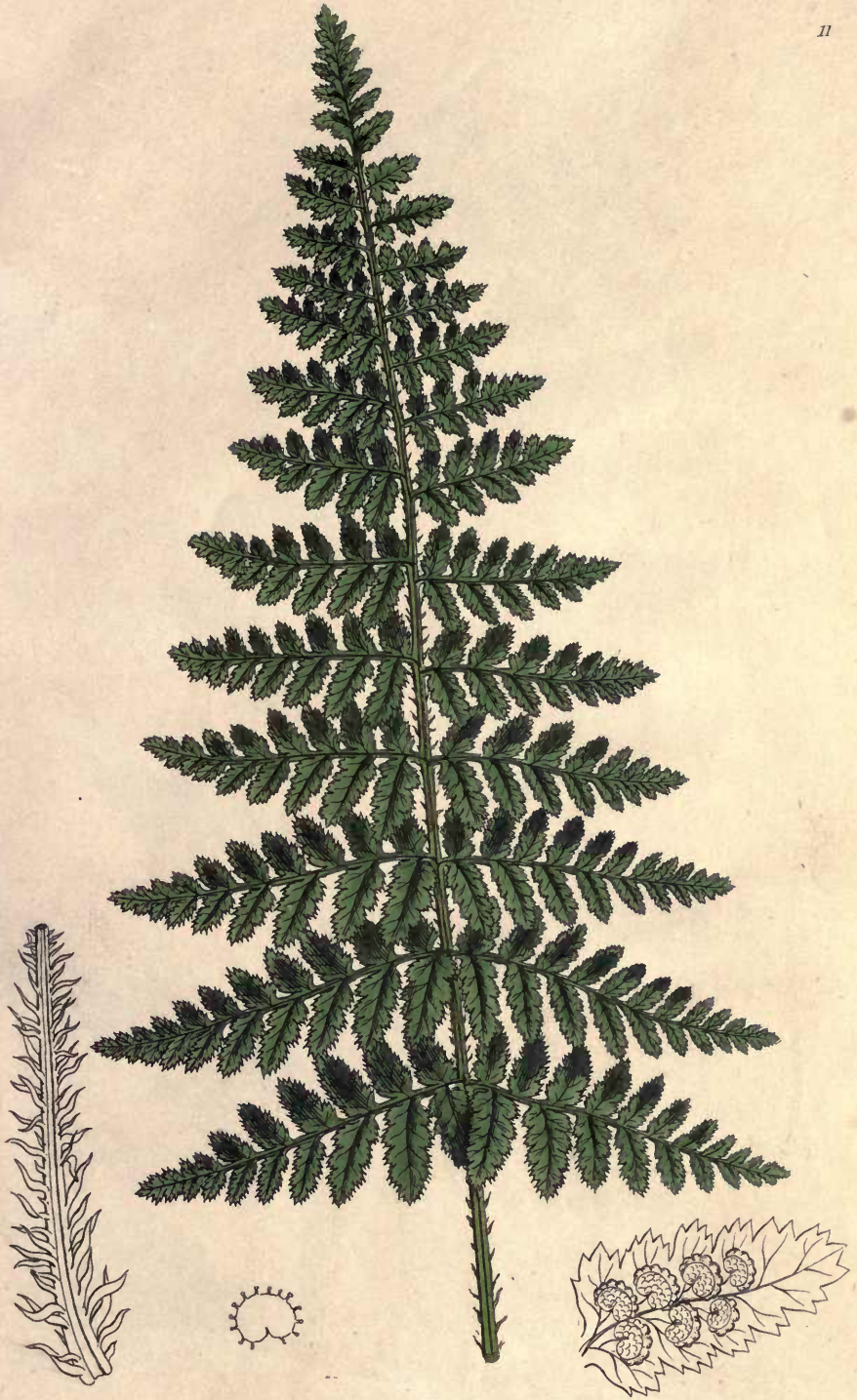

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Cystopteris angustata.

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Ceterach officinarum.

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Blechnum boreale.

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Pteris aquilina.

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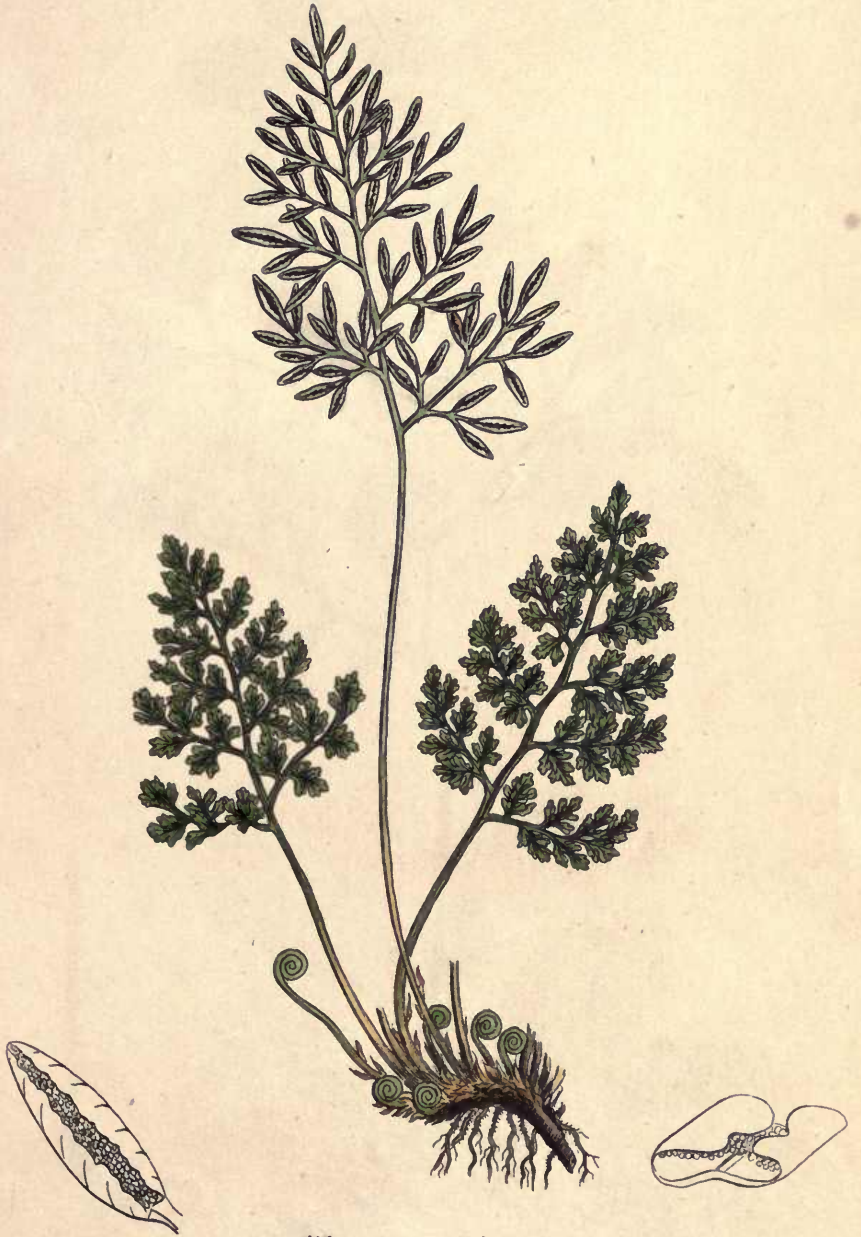

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Adiantum Capillus-Veneris.

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Trichomanes radicans.

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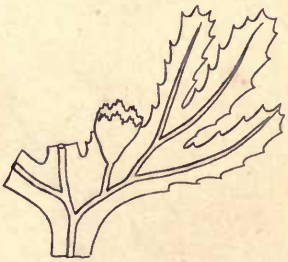

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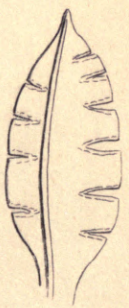

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