BRITISH FERNS.

Plate I.

A

POPULAR HISTORY

OF THE

BRITISH FERNS

AND

THE ALLIED PLANTS,

COMPRISING THE

Club-Mosses, Pepperworts, and Horsetails.

BY

THOMAS MOORE, F.L.S. F.H.S. &c.

CURATOR OF THE BOTANIC GARDEN OF THE SOCIETY OF APOTHECARIES, CHELSEA;
AUTHOR OF "THE HANDBOOK OF BRITISH FERNS,"
"THE FERNS OF GREAT BRITAIN AND IRELAND, NATURE-PRINTED," ETC. ETC.

THIRD AND REVISED EDITION.

LONDON:
ROUTLEDGE, WARNE, & ROUTLEDGE,
FARRINGDON STREET;
NEW YORK: 56, WALKER STREET.
1859.

LONDON:
COX AND WYMAN, PRINTERS, GREAT QUEEN-STREET,
LINCOLN'S-INN FIELDS.

TO

N. B. WARD, ESQ. F.R.S. F.L.S.

WHOSE INVENTION OF

CLOSE GLAZED CASES

HAS EXTENDED THE CULTIVATION OF PLANTS,

AND OF FERNS ESPECIALLY,

TO THE PARLOUR, THE WINDOW-SILL, AND THE CITY COURTYARD.

BY RENDERING POSSIBLE THEIR PRESERVATION

IN SMOKE-POLLUTED LOCALITIES;

AS WELL AS ENRICHED OUR GARDENS

WITH THE FLOWERS AND FRUITS OF OTHER LANDS,

This Little Volume

IS, WITH MUCH RESPECT AND ESTEEM, DEDICATED,

BY HIS OBLIGED FRIEND,

THE AUTHOR.

PREFACE.

THE Series, of which this Volume forms part, has been provided for the use of beginners in the study of natural objects, and especially for the young. Hence, in treating of the popular family of FERNS, it has been the Author's aim to familiarize the subject without sacrificing that integrity of detail which may render his pages acceptable even to those who may have made some progress in the study. With this intention all unnecessary technicalities have been avoided, and their place occupied by plain, and, it is hoped, easily-understood, descriptions of the plants. Those dubious and debatable matters, which, perhaps, have the most interest to the advanced student, have been

for the most part avoided, as being calculated to perplex rather than instruct those who are but acquiring the rudiments of the subject. Abstruse questions of identity or of specific distinctions have also been regarded as foreign to the purposes of this "History."

The present Edition will be found to contain notices of the more striking of the numerous varieties which are now known to occur among the British Ferns. The species which have been added to our Flora since the earlier edition was prepared, are now described, and figures of them have been added. The list of localities has moreover received very numerous additions, for which the Author has to thank many kind Correspondents, whose names will be found therein recorded.

The Author has not, indeed, found space, neither did the design of the Book seem to render it desirable, to mention, much less describe, all the variations from the normal forms of the species which have been observed,—variations of which some of our Ferns have proved very prolific. Those readers who are desirous of more extended

information on this part of the subject, are referred to the Author's "Handbook of British Ferns," and to the text and figures in the "Ferns of Great Britain and Ireland, Nature-printed." The search for varieties of the British Ferns has become so unexpectedly successful, that the modifications of form which it is found are assumed by some of the species, furnish important evidence against species-making — the bane of modern Botany. Those readers who may be fortunate enough to find curious and distinct varieties, would oblige the Author by communicating specimens of them, in illustration of this branch of the subject.

The Author may take this occasion to mention that he will be glad to receive the continued assistance of his readers in ascertaining the actual distribution, throughout *Great Britain* and *Ireland*, of the various forms assumed by certain of the disputed and difficult species, whose range is not as yet well known, *e. g.* those of *Athyrium Filix-fœmina*, *Lastrea spinulosa* and *dilatata*, and *Polystichum aculeatum* and *angulare*, &c. He has only further

to state, that he will, as heretofore, be willing to aid those inquirers who may find difficulty in recognizing the Ferns they gather; and that he will be glad to receive any additional information concerning the distribution or variation of the species generally, accompanied, when practicable, by illustrative specimens.

Botanic Gardens, Chelsea, London.
October, 1855.

PREFACE TO THE THIRD EDITION.

The Third Edition of this "Popular History," substantially the same as the second, consists of a revised Text, with descriptions of some of the more prominent new varieties added. The Plates have been redrawn, but not otherwise changed.

T. M.

August, 1859.

CONTENTS.

LIST OF PLATES.

*** *The Binder is recommended to place Plate I. to face the Title, and the rest at the end of the Volume.*

POPULAR

HISTORY OF BRITISH FERNS.

INTRODUCTION.

THERE are several causes which conduce to render the native Ferns of Great Britain attractive objects of study. Of these we will mention the following:—

1. They are for the most part objects of exquisite elegance; and this is apparent, whether they are superficially examined as to their external appearance, or whether they are investigated anatomically, with the view to discover and analyze their minute structure.

2. They are not very numerous, nor very inaccessible, and consequently their study opens a field which even those who have not much leisure may hope to compass, and for which the greater part, at least, of the materials may be obtained without much difficulty.

3. They are plants for the most part very easily cultivated; and they are, of all others, perhaps, the best adapted to parlour or window culture. Hence, besides the interest that may arise in the collection and preservation of them in the herbarium, and in the study of them in the dried state, there is to be added the pleasure to be derived from their cultivation, and the opportunities thereby afforded of studying and admiring them in the living state.

Those who desire a thorough knowledge of the species of Ferns, should certainly, if possible, adopt the method of study just indicated, as it reveals many curious and interesting features which are not to be learned from the investigations — though patiently and assiduously prosecuted—which are aided only by dried portions of the plants.

All the essential points necessary for the recognition of the species, may, nevertheless, be availably present in well-selected herbarium specimens; so that those who have not convenience for cultivating them, may yet store up in their cabinets ample materials for their amusement and instruction in detached and leisure hours.

There is something peculiarly fascinating in the graceful

outline and disposition of parts, which is so common among the Ferns as to have become associated in idea with this portion of the vegetable creation. Gay colours are for the most part wanting, and they wear, while in life and health, nothing beyond a livery of sober green, which can scarcely be said to gain ornament from the brownish scales and seed-patches with which, in some species, it is associated on the living plant. In certain exotic forms, indeed, as for example in some species of *Gymnogramma* and *Cheilanthes*, the lower surface is covered more or less with a silvery or golden powder, which adds considerably to their beauty; and in the wide range of the Ferns of all nations there is to be observed considerable variety, even of the tints of green. The more sober-tinted natives of our northern latitude can, however, boast but of comparatively little such variety of hue. It is not, therefore, in their colouring that their attractions rest: nor is it in their endurance; for a large proportion of the native species lose all their beauty as soon as the frost reaches them, and for nearly one half of the year they are dormant, unless artificially sheltered. We therefore conclude, that it is the elegant forms and graceful habits of the majority of the Ferns, native and exotic, which render them so generally

pleasing, even to those who are slow to perceive beauty apart from rich and gaudy colouring.

The number of the native species of Ferns may be taken at from forty to fifty, according as some of the more doubtful forms are ranked as species or varieties. In a botanical point of view, the lower estimate is probably the more correct, as the experience we have of the variability of some of the so-called species tends somewhat to the conclusion that they are insensibly united by intermediate forms. In so far, however, as their cultivation is concerned, or when the Ferns are taken up as a "fancy," the higher number is too low; for in all such cases, whenever one plant is palpably different from another, it forms a legitimate subject for culture, or for study, as a distinct object, though the differences may be of such a character as would lead the rigid botanist to brand it as being one of those which he considers not "specifically distinct" from others with which he would have it associated.

There is some acrimony, and a good deal of pedantry abroad, on both sides of this question, of the limits of the species of plants, with which, happily, in this brief descriptive history of the British Ferns, we shall have no occasion to intermeddle.

The literature of the British Ferns is tolerably extensive, viewed in connection with the comparative numerical insignificance of the plants themselves,—a mere fraction of the three thousand or more species of Ferns which are known to botanists, and a mere fraction, also, of our indigenous vegetation.

Passing by the ancient writers, whose works are both, for the most part, inaccessible, and not of much value to the casual student, we shall enumerate the several English publications of the present day which are exclusively occupied in the description of the British Ferns and their allies; for we hope that some at least of our readers may be so far led on by the sketch we shall endeavour to offer in the following pages, as to seek the further assistance to be derived from the more varied sources thus indicated. We shall arrange them in the order of their original publication, and mention the most recent editions:—

1. *An Analysis of the British Ferns and their allies.* By G. W. Francis, F.L.S. Fifth Edition, revised by Professor Henfrey. 1855. 8vo, pp. 92, with 10 plates.—Containing reduced figures of the species, which are briefly described.

2. *A History of British Ferns.* By Edward Newman, F.L.S., &c. Third Edition, omitting the Fern allies. 1854. 8vo, pp. 343.—A handsomely-got-up book, with beautiful woodcut illustrations; but greatly disfigured by its egotistical tone, and by numerous unnecessary and inadmissible changes made in the names of the genera and species.

3. *Florigraphia Britannica,* vol. iv.: *The Ferns of Britain and their allies.* By Richard Deakin, M.D. 1848. 8vo, pp. 136, with 31 plates and numerous woodcuts.—Many of the figures are very accurate, and the descriptions full and careful.

4. *The Handbook of British Ferns.* By Thomas Moore, F.L.S., &c. Third Edition. 1857. 16mo, pp. 294.—A pocket volume, with full descriptions, accompanied by plain woodcut illustrations of all the species and of the principal varieties.

5. *A Plain and Easy Account of the British Ferns.* By the Rev. E. Bosanquet. 1854. 16mo, pp. 64.—A commendable attempt to simplify for beginners the classification and description of the species, but scarcely realizing these objects.

6. *The Ferns of Great Britain.* Illustrated by J. E. Sowerby. The descriptions, synonyms, &c., by C. Johnson, Esq. 1854. 8vo, pp. 87, with 49 plates, uniform with those of "English Botany."—The figures are coarse, and often not characteristic, especially in the details; while the text, which for the most part omits all reference to varieties, is ample, philosophic, and accurate.

7. *The Ferns of Great Britain and Ireland; Nature-printed* by H. Bradbury. By Thomas Moore, F.L.S., &c. Edited by Dr. Lindley. 1855. Imperial folio; 51 Plates, with corresponding text.—This, which is the most magnificent work on the subject that has yet appeared, was the first practical illustration in this country of the process of Nature-printing. The figures are life-size, printed in colours, and they are accompanied by full descriptions, in which the varieties are copiously treated on.

8. *The Ferns of Great Britain and their allies.* By Anne Pratt. Published by the Society for Promoting Christian Knowledge. 8vo, pp. 164, with 40 plates. —An indifferent compilation.

9. *The British Ferns, popularly described.* By G. W. Johnson. 1857. 16mo, pp. 284; woodcuts.—Another compilation, affecting to be "as free as possible from the jargon of botanical language."

The most important enumerations of the British Ferns elsewhere to be met with, are those in the "British Flora" of Sir W. J. Hooker and Dr. Walker Arnott, and in the "Manual of British Botany" of Mr. Babington. Ample descriptions, accompanied by the synonyms of the older writers, occur in Sir J. E. Smith's "English Flora."

THE STRUCTURE OF FERNS.

WHAT is a Fern? This question, which many of our young readers will be ready to ask, we will endeavour to answer by means of a familiar comparison.

We must presume that every reader of this little book, even the youngest or most inexperienced, would be able in all ordinary cases to recognize a flower; not indeed by the aid of the technical intricacies to which the man of science would resort, but by means of that intuitive perception, which has grown up with the growing faculties, and acquired strength from the little experiences of childhood and youth.

We take for granted, then, that all our readers are familiar with the buttercup, the poppy, the brier-rose, the daisy, the dandelion, and other common flowers, so profusely dispersed over the meadows and cornfields, and along the hedgerows and by the waysides. The young ears of corn, as well as the spikes of the meadow grasses, must be well-remembered objects. These all afford examples of flowers, or of masses of flowers. Now, the plants from

which the daisy-heads and the dandelions were plucked to be made into floral chains, and those which yielded the buttercups, the roses, and various other kinds for the rural garland, produced, besides their flowers—those brilliantly-coloured parts which the tiny fingers chiefly desired to gather—other parts, mostly green, in which the same intuitive perception already mentioned had learned to recognize the leaves. These two kinds of "organs," as they are called—the leaves and the flowers—are the parts of the plant most apparent in the majority of cases.

Popularly speaking, then, a Fern may be said to be a plant which bears leaves only, and no flowers; and these leaves are greatly varied, and very elegant in form. But some will say, How can we tell a Fern, which never bears flowers, from some other plant which does bear flowers, but from which they are temporarily absent? This seeming, and to the beginner real, difficulty, is to be overcome by a little patience and attentive study. Nothing worth acquiring is to be gained without these. Search must be made for what seems to be a full-grown plant; the under surface of its leaves must be examined, and brown, dust-like patches, round or elongated, or in lines, will be found placed here and there, and generally arranged with much regu-

larity. These patches are vast accumulations of the minute seeds—so minute as to be fabulously invisible—from which young fern-plants would be produced.

Now, as the leaves of those plants which do bear flowers do not bear these dust-like patches, it is on their presence that the novice must depend for the *assurance* that the plant he has under examination is really a Fern. It must be confessed, indeed, that this is a very imperfect definition, and one which would fail to satisfy the more advanced student; but in truth, there is no other available guide-mark at the starting-point, nor until the eye has become familiarized with the peculiar appearances by aid of which Ferns may be recognized at first sight. This first step—the ready recognition of a Fern from other plants—will be greatly assisted by the characteristic figures which accompany and ornament these pages. More detailed particulars of the peculiarities of Ferns we must now proceed to offer.

Ferns, as we have already stated, are flowerless plants. They are furnished with roots, by which they obtain nourishment from the soil; with stems, by which their conspicuous parts are borne up and supported; and with leaves, to which their elegance is due, these leaves bearing

on some part of their surface, but usually on the lower face, the seeds by which the plants may be propagated. These are their external parts, and are called organs.

The proper roots of Ferns are entirely fibrous, and they proceed from the under-side of the stem, when the latter assumes the prostrate or creeping mode of growth; but when it grows erect, they are produced towards its lower end on all sides indifferently, from among the bases of the decayed leaves or fronds. Fibrous roots are so called from their consisting of little thread-like parts; these, as they extend by growth at their points, insinuate themselves between the particles of earth to which they have access, and this in process of time becomes filled with their ramifications. They often form entangled masses, but are not always sufficiently numerous for this. The fibres of Ferns are mostly of a somewhat rigid or wiry texture; and in the younger portions are often more or less covered with fine soft hairs, which become lost with age. It is by means of these organs chiefly, that Ferns, and all the more highly-developed plants, are nourished.

The stem of a Fern is, according to its nature, called sometimes a rhizome, sometimes a caudex,—which names are given to particular modifications of the stems of plants.

The caudex forms an upright or decumbent stock, which in our native species seldom elevates itself above the surface of the ground, but in certain exotic ferns reaches from thirty to fifty feet or more in height, and gives a tree-like character to the species. The rhizome extends horizontally either on or beneath the surface of the soil, and forms what is often called a creeping stem. These creeping stems, when not buried in the earth, are generally clothed with hairs or scales, and sometimes to such an extent as to become quite shaggy ; they vary greatly in size, some being as thick as one's finger, and others, as in our native *Hymenophyllums*, as fine as threads.

The common Polypody has the thickest stem of any of the creeping British species : in this it is nearly as thick as one's little finger ; but the underground stem of the common Bracken, or *Pteris*, creeps the most extensively. The *Osmunda*, or Flowering Fern, as it is called, is, of the native upright-growing species, that which most readily gains height, and very old plants of this may sometimes be found with bare stems of a foot or more in length. The common Male Fern, the *Lastrea montana*, and the *Polystichum angulare*, have also a tendency, though in a less degree, to this mode of growth ; but it never

becomes apparent except in the case of very aged plants.

The leaves of Ferns are generally called fronds, and as this latter term is much the more appropriate, we shall adopt it, with this general explanation, that it means the leaf-like organs which are borne on the proper stem. The leaf-like character they bear has led some botanists to reject the term *frond* altogether, and to consider them as true leaves; but since they grow by development from their apex, which botanists say leaves do not, and since they produce, from some part of their surface, what in their case stands in the place of flowers, there is no more reason why they should be called leaves, than the leaf-like stems of *Cactuses*, or those of the curious hot-house plants called *Xylophylla*—each of which afford examples of plants bearing flowers on what appear to be leaves, but which are in reality stems. The frond or leafy part of a Fern is, however, not to be classed among stems; and hence, since it is of intermediate character between a leaf and a stem, a distinctive name seems to be properly applied to it, and the name in common use among botanists is that which we have here adopted.

There are no flowers produced by the Ferns (we use the

term *flower* in its popular sense, without entering into points of speculative botany), so that it is in the fronds that we must seek for that ornamental aspect which renders them such general favourites. The fronds alone, however, afford almost endless variety:—some are very large, others very small; some quite simple and not at all divided, others divided beyond computation into little portions or segments, and it is these much-divided fronds which, generally speaking, are the most elegant.

Even in the few species which are natives of Britain, this variety of size and form is very obvious, some kinds not being more than two or three inches, others five to six feet or more in height,—some quite simple, and others cut into innumerable small segments. There is much variety of texture too; some being thin and delicate, almost transparent, others thick and leathery, and some perfectly rigid; while as to colour, some are pale green, some are deep green, some are blue-green, some dark brownish, scarcely green at all; and as regards their surface, some are smooth and shining, others opaque, and some few are covered with hair-like scales.

The duration of the fronds of many species is comparatively short: they come up in spring, and in some cases

the earliest of them do not last till autumn ; in others they continue until touched by frost, from which the more robust of them shrink, even as the tender sorts do from drought as well as frost. Others are much more durable, and the plants, if in a moderately-sheltered situation, become evergreen. These latter should be most extensively adopted for culture where ornamental effect is an object. We shall point out these peculiarities as we describe the different species.

The fronds of Ferns consist of two parts—the leafy portion, and the stalk, which latter is often called the *stipes*. The continuation of the stalk, in the form of a rib extending through the leafy portion, and becoming branched when the frond is divided, is called the *rachis*. If the frond is compound, that is, divided, so that there is another set of ribs besides the principal one, the latter is called the primary rachis, and the former the secondary rachis. Few of our native species are so highly compound as to possess more than a secondary rachis. In practice, when the outline or division of the frond is mentioned, it is generally the leafy portion only that is referred to, exclusive of the stipes.

The stipes is generally furnished more or less with mem-

branous scales, which are sometimes few and confined to the base, and at other times continued along the rachis. Sometimes these scales, which are generally brown, are large and so numerous that the parts on which they are situated acquire a shaggy appearance. The form of the scales, as well as their number and position and even colour, is found to be tolerably constant in the different species or varieties, and hence they sometimes afford marks of recognition. Whenever they are produced along the rachis, as well as on the stipes, they are invariably largest at the base, and become gradually smaller upwards.

In some species the leafy portion of the frond is undivided, that is to say, the margins are not scalloped or cut away at all: an example of this occurs in the common Hartstongue. Such fronds are called *simple*. The margin is, however, commonly more or less divided.

In the simplest mode of division which occurs among the British species, the margin of the frond is deeply divided or scalloped out at short intervals, the divisions extending inwards nearly to the rachis, but not reaching it: this slightly divided form is called *pinnatifid*.

The fronds are sometimes divided quite down to the

rachis, which is, as it were, quite bared of the contiguous leafy expansion; and when this occurs, the frond is said to be *pinnate;* in this case, each of the distinct leaf-like divisions is called a *pinna.* When these pinnæ are divided again upon precisely the same plan, the frond becomes *bipinnate,* or twice pinnate; but if the pinnæ are only deeply lobed, they are, like the frond when similarly divided, said to be pinnatifid.

When the fronds are thrice pinnate, they are called *tripinnate;* and in all other more intricate forms they are called *decompound;* but this seldom occurs in any of the native kinds, the nearest approach to it being in very vigorous plants of the common Bracken, and in some of the *Lastreas,* when very largely developed.

The young fronds of the ferns, before being developed, are arranged in a very curious manner, the rachis being rolled inwards volutely from the point to the base. In the compound sorts, the divisions are each again rolled up in a similar way. This arrangement is what is called *circinate.* All the British species, with two exceptions, are folded up in this way, so that their development consists of an unrolling of the parts of the fronds. The exceptions mentioned are the Moonwort and the Adders-

tongue, in both of which the fronds in the undeveloped state are folded straight.

The substance of the fronds is traversed by veins variously arranged ; in some species forming straight, nearly parallel lines, in others joined together like network. The manner in which the veins are disposed is called the *venation*, and the nature of this venation affords useful data in the division of the ferns into family groups. It is from some determinate part of these veins that the clusters of fructification proceed, that part to which they are attached being called the *receptacle.*

A correct appreciation of the condition and position of the receptacle with reference to the veins, is of considerable importance in the study of the genera and species—that is to say, the family groups and the individual kinds. In some, though few, of the native kinds, it is projected beyond the margin, and the little cases of seeds are collected around its free extremity. More commonly, however, the veins stop within the margins, and the seed-cases grow in round or elongated clusters, situate in some cases at their ends, in others along their sides, and protruded through the skin of the lower surface of the fronds.

No flowers are produced, but the plants bear, generally,

great abundance of seed-like bodies, which are technically called *spores*, and are contained in little cases of very singular construction. Collectively, these cases and their contents are called the *fructification*. The seed-cases, as already remarked, are attached in the different species to certain determinate thickened portions of the veins, which points of attachment are called the *receptacles*. Each separate mass or cluster of the seed-cases is called a *sorus*, but as they are generally spoken of collectively, the plural term *sori* becomes much more frequently used. The sori are *marginal* when they grow out from the margin, and *dorsal* when they occupy some part of the under surface of the frond.

The seed-cases—called also *spore-cases*, or *sporangia*, or *thecæ*—are mostly minute roundish-oval bodies, containing one cavity, and nearly surrounded by a jointed vertical band called a ring, which is continued from the base so as to form a short stalk, by which they are attached. When they have reached maturity, the elasticity of the ring bursts the case by an irregular transverse fissure, and the seeds or spores, in the shape of fine dust, almost invisible, become dispersed. This is what occurs in the majority of the native species. In *Trichomanes* and *Hymenophyllum*, however,

the elastic band is horizontal or oblique, instead of vertical; and in *Osmunda*, *Botrychium*, and *Ophioglossum*, the spore-cases are two-valved, and either destitute of the elastic ring, or having it reduced to a very rudimentary condition.

In a considerable proportion of the known species of Ferns, and in the majority of those which are natives of Great Britain, the sori are covered in the earlier stages of growth by what is commonly called the *indusium*. This is mostly a thin transparent membranous scale of the same general form as the sorus itself, at first completely covering or enclosing the young seed-cases. Eventually, however, by their growth, its margins are disrupted, and it is thrust back, or frequently even cast off before the maturity of the seeds. Some species, however, never bear any visible indusium, and its presence or absence is consequently one of the technical points by which the large body of Ferns are divided into groups of moderate extent.

In some Ferns the indusium, or cover, or at least what is considered analogous to it, is cup-shaped, containing the seed-cases; but this form is of very rare occurrence among the native species, and exists only in *Trichomanes* and the *Hymenophyllums*.

The Ferns belong to the lowest group of vegetation, which is especially remarkable for its loose and often succulent texture, owing to the absence, or nearly so, of those tissues which give firmness and elasticity to the higher orders of plants. The Ferns, however, are the highest members of this group, and hence we find them possessing, to some extent, both woody and vascular tissue, —matters which, together with cellular tissue, the soft loose material above mentioned, may be found explained in any elementary book on physiological botany.

Taking now a retrospective glance, we have seen that the Ferns are, as regards external structure, flowerless plants, having erect or creeping stems, which bear the leaf-like fronds; and on some part of the surface of the latter, usually the lower side, but sometimes the margin, are borne the clusters of seeds, which, in the majority of the native species, are, when young, furnished with a membranous scale-like cover.

PROPAGATION, DEVELOPMENT, AND CULTURE.

NATURALLY, Ferns are propagated by means of the spores, of which mention has been already made. These spores, which are somewhat analogous to seeds, being, like them, endowed with that mystery—the vital germ, when placed under fitting conditions, become developed into young plants; but they differ from seeds in some important particulars.

All true seeds have a determinate structure. They have an embryo, provided with special organs, namely, the plumule, or germ of the ascending axis, the origin of the stem, and the radicle, or germ of the descending axis, the origin of the root. When a seed is planted, in whatever position it may chance to have been deposited in the soil, the young root or radicle strikes downwards, and the young stem or plumule grows upwards.

The Fern spores have none of these determinate parts, but are, as it were, homogeneous atoms; and when placed under circumstances which induce germination, that part

which lies downwards produces the root, and that part which lies upwards produces the rudimentary stem. The spores are very minute cells of various shapes, mostly roundish, and often beautifully ornamented with markings on the exterior. They consist merely of a small vesicle of cellular tissue, and as they grow, this vesicle becomes divided into others, which again multiply and enlarge, until they form a minute green leaf-like patch, roundish, but irregular in outline, and unilateral, forming a primordial scale, or germ-frond, technically called the *prothallus*, on the under side of which certain germ-cells are produced. One of these, it appears, at length becomes the axis of development, and produces a small leaf or frond, which is usually very different in aspect as well as size from the mature fronds, and is succeeded by others, which acquire by degrees the characteristic features peculiar to their species.

In annual Ferns the mature character is soon attained, but in those of perennial habit, two or more years of growth is required before they reach maturity, and a much longer period is of course necessary to those which acquire tree-like stems. They, however, in most cases soon begin to assume something of their peculiar appearance, so that by the time three or four of these young fronds are pro-

duced, sometimes even earlier, a practised eye can in many cases recognize the species.

It is from the under side of the prothallus, or germ-scale, at the base of the axis of development, where it comes in contact with the moistened soil, that the roots are protruded. The stem, or caudex, whatever its character, originates in this primary axis.

Thus we see, that in the first stages of development, young seedling Ferns (that is, Ferns developing from the spores) assume the appearance of a Liverwort, forming a green, semi-transparent, crust-like patch, which is the germ-frond, or prothallus, referred to above.

In these minute and almost invisible atoms, no less than in the more ponderous materials which surround us, we discover the impress of Almighty and Creative power. They teem with life! No commixture of elementary matter, no electric shock guided by human agency, can originate that. Truly the hand that made them is Divine!

The requisite condition to induce the germination of the spores of Ferns, in addition to the degree of heat proper for each particular species, is simply contact with a continually damp surface. Diffused light is favourable to

the young growth as soon as it begins to form, but is apparently not necessary as a means of exciting it. It matters little in what way the principal condition above mentioned is supplied. In hot-houses and confined situations, congenial to ferns, the plants shed their spores freely; and the latter germinate on the undisturbed soil, or on any damp surface with which they come in contact, sometimes even on the upright sides of the pots in which the plants are growing, if these are so circumstanced as to remain continually damp. They grow very readily on the rough surface of a piece of sandstone-rock, just kept moistened by water constantly, but slowly and gently, dripping upon it.

The most convenient way, however, to raise Ferns from the spores, where cultivation is the object, is to sow them on the surface of moist, loamy soil, in pots of convenient size, the surface of the soil being kept an inch or more below the level of the pot rim, so that a piece of flat glass may be laid over the top, to secure a close and constantly moist atmosphere, and prevent rapid evaporation from the soil.

The pots should be nearly half-filled with small pieces of broken potsherds or of broken bricks, and the soil itself should be used rather coarse than fine, the surface being

left rough—that is, not pressed down close and even. The pots should be set in pans or feeders, in which water should be kept, so that the soil may be constantly damp. By this means, the soil may be kept at the required degree of continual dampness ; but if, by any chance, sourness, arising from constant saturation, seems to be taking place, the supply should be withheld for a time. A shady situation, under the influence of a temperature proper for the individual kinds, should be selected for these nursery pots.

When all is in readiness, the spores should be thinly scattered over the rough surface of the soil, and the glass cover at once put on. It is necessary to be somewhat careful in the act of sowing, as the spores, from their lightness and minuteness, are liable to be dispersed in the atmosphere, instead of being lodged on the seed-bed prepared for them ; from the same cause, they are apt to cling about the surface of the paper—even though it be glazed—in which they may have been enclosed. A bell-glass may be employed to cover the soil after sowing, but we have been content to point out the simplest means and materials by which the end in view may be attained.

A simple and convenient contrivance for sowing the spores, by which the progress of germination might be

very readily watched, would consist in inverting a porous flowerpot in a shallow dish or pan of water, large enough to take also the rim of an enclosing bell-glass, which should cover some surface of the water. A small cup or vase, set on the top of the inverted pot, with two or three worsted siphons, would keep its sides always damp; the spores scattered over the sides of this moistened porous earthenware would find a proper nidus for their development, which might thus be watched with great facility. It is to be borne in mind, however, that the seedling plants are not so readily transplanted from an earthenware or stone surface, as they are when growing on the soil.

The general features of culture—which it will be sufficient here to notice—are shade, shelter, and abundance of moisture. Neither of these are, however, essential to all the species, but when judiciously combined they produce the conditions under which all the species admit of being very successfully grown.

In the garden, Ferns seem only appropriately introduced on what is called rockwork, which generally means a bank of earth irregularly terraced with misshapen blocks of stone, or by masses of some other hard porous material, the vitrified conglomerations formed in the burning of

bricks being that most commonly substituted. With taste in the distribution of these and suchlike materials, and in the planting of the Ferns, a very pleasing effect may be produced; and on rockwork of this kind, if it be erected in a shaded and sheltered situation, and liberally supplied with percolating (not stagnant) water, and if the soil be of a texture which will admit of being thus constantly moist without becoming soddened and soured, nearly all the English Ferns may be grown successfully.

It will, as a matter of course, suggest itself to the planter, that the most sunny, most exposed, and least moistened positions on the rockwork should be appropriated to those species which grow naturally in situations to which these conditions afford the nearest resemblance; while, on the other hand, the kinds which naturally prefer the deepest shade and the dampest soil, should be placed in the positions where these conditions are most nearly imitated.

Perhaps, however, the most interesting occupation for the amateur Fern-grower consists in the cultivation of them under glass, either in pots, or planted in a Wardian case. All the species admit of being grown in pots, and when developed under the protection of a covering

glass, acquire more than their natural delicacy of appearance.

For the hardy Ferns, the frame or case in which they are grown should have a northern aspect; the eastern and western aspects are less favourable, though, with attention to shading during sunny weather, they may be adopted, and are at least much preferable to the southern, even with the advantage of shading. It is the heat, no less than the brightness of such an aspect, which is to be avoided; and therefore, for all practical purposes, the nearer the situation in which they are grown approaches the northern aspect, the better. The plants must be kept cool in summer, by shading, by sprinkling, by moderate and cautious ventilation in the daytime, and by removing all impediments to a free circulation of air at night, not quite closing the frame, as just intimated, even by day.

Wardian cases for Ferns, in which they may be planted out on rockwork, may be either of the size and nature of a small detached greenhouse, or of those window or balcony greenhouses made by enclosing within a projected sash a greater or smaller area external to the window; or they may be of smaller size and more finished workmanship, for the interior of dwelling-rooms, for staircase-landings,

or any other situations within doors where they can be moderately lighted.

As a general rule, Ferns under cultivation do not require any manure. The most proper soil for Ferns grown in pots or cases, consists of the native earths called peat or bog earth, and sandy loam, mixed in about equal proportions, with a further admixture equal to an eighth of the whole mass for the coarser sorts, and of a fourth of the whole mass for the more delicate sorts, of any pure granulated silicious matter, which is used for the purpose of preventing the too close adhesion and consolidation of the particles; the clean white sand called Reigate sand is that most generally employed. They are not benefited by manure.

The supply of water to Ferns under artificial conditions is a very essential matter; they must never lack moisture, or their fragile texture shrinks as before a burning blast; nor, with few exceptions, must the soil about them be kept continually wet with stagnant water; indeed, stagnant water is in all cases much better avoided.

DISTRIBUTION AND TOPOGRAPHICAL ASPECT.

The species of Ferns known to botanists, including the lesser groups sometimes separated from what have been called the "true" Ferns, amount, according to the published estimates, to something more than three thousand. Their head-quarters are the humid forests of tropical islands, in some of which they acquire a giant size, and in their tree-like habit become rivals to the noble Palms. The tree Ferns are not, however, numerous, the number of species having this habit bearing a small proportion to those of shrubby or herbaceous growth.

From the statistics which have been collected in reference to this question, it appears that the Ferns bear a higher proportion to the flowering plants both towards the equator and towards the poles; and that their proportional number is least in the middle of the temperate zone. They reach their absolute maximum in the torrid zone, amid the heat, moisture, and shade of the tropical forests; and their absolute minimum on the inhospitable shores of the polar regions.

The proportion borne by the Ferns to the whole mass of flowering plants in the torrid zone, is stated at one in twenty; in the temperate zone at one in seventy; and in the frigid zone at an average of one in eight. In the most northern parts of the Arctic zone, none have yet been discovered. In our own country, the proportion existing between these two great divisions of vegetation is reckoned at one Fern to thirty-five flowering plants. In Scotland they stand relatively as one in thirty-one.

The forms which exist among the Ferns are very diversified, and this diversity, no less than their variations of size and habit, renders them conspicuous objects in the scenery where they abound. They may all be classed under three divisions, so far as the leading feature of habit is concerned, namely, arborescent, shrubby, and herbaceous.

It is the former class—the arborescent species—chiefly, which exert a marked influence on the physiognomy of nature, for, as Meyen well remarks, they unite in themselves the majestic growth of the Palms with the delicacy of the lower Ferns, and thus attain a beauty to which nature shows nothing similar. These truly arborescent species are principally confined to the torrid zone, their slender waving trunks often beautifully pitted by the

marks left on the falling away of the fronds; they grow to a height of from twenty to fifty feet or more, from their tops sending out the feathery fronds, often many feet in length, and yet so delicate as to be put in motion by the gentlest breeze. On some of the East-Indian Islands the tree Ferns are said to occur as numerously as the crowded Firs in our plantations; but wherever they are found—from the plains to an elevation of 3000 to 4000 feet—the soil and atmosphere are full of moisture. Very noble arborescent Ferns are also found in New Zealand and Tasmania.

The shrubby Ferns, those with short stems, surmounted by tufted fronds, prevail rather at the tropics than at the equatorial zone, and are found less frequently at the foot of tropical mountains than at an elevation of from 2000 to 3000 feet. Ferns of this aspect abound in the South Sea Islands. Mr. Colenso describes one of the New Zealand species as producing, from a main trunk twelve feet high, fronds which form a droop often of eighteen feet; such plants, standing singly on the bank of a stream, being objects of surpassing beauty.

The dwarf herbaceous species are rather characteristic of the temperate and colder zones: not that their number

in warmer regions is less great, but their influence on the aspect of vegetation there is of a different character. They are frequently epiphytal in the tropics, and by their varied forms and tints, and the way in which they fix themselves, they give an air of peculiar luxuriance to the higher vegetation. Even in the temperate regions some of these herbaceous Ferns attain considerable height, as is the case with the common Bracken, which, in the hedgerows of sheltered rural lanes in the south of England, reaches the height of eight or ten feet, and assumes the most graceful habit that can be conceived.

Wherever the Ferns occur, whether they be the herbaceous species of temperate climates, or the arborescent species of the equatorial regions, or the epiphytal species which clothe the trunks and branches of the trees in tropical forests, they add a marked and peculiar character of beauty and luxuriance to the scenery, and that to an extent which is not realized by any other race of plants.

THE USES OF FERNS.

We cannot make out a long catalogue of the uses of Ferns. Indeed, compared with their numbers and size, their usefulness to man is very limited; and the frigid utilitarian might be almost tempted to ask of Nature, wherefore she gave them birth. Her reply would, however, stay further interrogation: "They are given

> 'To minister delight to man,
> To beautify the earth.'"

The Ferns are not, moreover, altogether without their use; for to the aborigines of various countries they furnish a rude means of subsistence. The pith of the stem or rhizome is the part usually employed for food, and this on account of the starch deposited in its tissue. Among the species which are thus employed as food—chiefly, however, where civilization has not become the dispenser of better fare—there is the *Cyathea medullaris*, *Marattia alata* and *elegans*, *Angiopteris evecta*; *Pteris esculenta*, the Tasmanian *Tara*; *Nephrolepis tuberosa*, *Diplazium esculentum*,

and *Gleichenia Hermanni;* and it is worth remark that these species represent almost all the principal groups in which Ferns are classified.

The Hindoos, according to Dr. Hooker, boil the tops of a kind of *Polypodium* with their shrimp-curries. The watery tubers of *Nephrolepis tuberosa* are eaten in Nepaul, where also the *Botrychium virginicum* is boiled and eaten.

The pith of the stem is the part used in the *Cyathea medullaris,* and other tree-ferns. This pith is a coarse kind of sago. The rootstock, or rhizome, of the *Pteris esculenta,* is the part used in Australia, New Zealand, and the South Sea Islands. This consists principally of starch, with some astringent matter.

While the child of nature turns to the Fern for food, his more civilized brother seeks in it a medicine; and he finds it! Two of our common native species, the Filix-mas and the Bracken—especially the former—have the reputation of being remedies against intestinal worms, in consequence of their bitter and astringent qualities, which properties are possessed by the stems of many other species. Another native Fern, the Royal Fern, is much used as a rustic vulnerary, and as an application to sprains or bruises. From the astringent mucilage present in the green parts

of many Ferns, they are reckoned pectoral and lenitive; and both the native *Adiantum Capillus-Veneris*, and the American *Adiantum pedatum*, are thus employed in the form of *Capillaire*, which is prepared from them by pouring boiling syrup over the fronds, and flavouring it with orange flowers; this preparation is considered undoubtedly pectoral, though if too strong it is said to be emetic. Other species of *Adiantum*, as well as some *Polypodiums*, *Acrostichums*, and *Nothochlænas*, are reported to possess medicinal properties. *Polypodium Calaguala* has an oily disagreeable taste, but in South America is highly valued for its alterative properties. The common Adders-tongue is gathered by country-people for the preparation of adders-spear ointment, which is a popular remedy for recent wounds.

Both the common Bracken and the Male Fern abound in alkali, and are applied to various economic uses, as the manufacture of soap and glass, the dressing of leather, &c. These species have also been used in the preparation of beer; and the *Aspidium fragrans* has been employed as a substitute for tea.

The bruised leaves of *Angiopteris evecta* and *Polypodium phymatodes* are said to yield an aromatic oil, em-

ployed in perfuming the cocoanut oil of the South Sea Islands.

Deserving of especial mention in this place is the vegetable curiosity called the Barometz, or Tartarian or Scythian lamb, of which marvellous tales have been told. This "lamb" consists merely of the decumbent shaggy rhizome of a kind of Fern, which is no doubt the *Cibotium glaucescens*. The rhizome of this plant, when turned upside down, the bases of four of its fronds being retained as legs, may, by a little manipulation, be made to resemble not inaptly some small animal, and may fairly rank as a vegetable curiosity.

The "traveller's tale" on this subject is, that, on an elevated, uncultivated salt plain, of vast extent, west of the Volga, grows a wonderful plant, with the shape and appearance of a lamb, having feet, head, and tail distinctly formed, and its skin covered with soft down. The "lamb" grows upon a stalk about three feet high, the part by which it is sustained being a kind of navel; it turns about and bends to the herbage, which serves for its food; and when the grass fails, it dries up, and pines away. The real facts are, that the rhizome of this plant, as already stated, does present a rude appearance of an animal;

it is covered with silky, hair-like scales, and, if cut into, is found to have a soft inside, with a reddish, flesh-coloured appearance. And no doubt, when the herbage of its native plains fails, its leaves, too, dry up, both perishing from the same cause, but having no dependence the one on the other. Thus it is that simple people have been persuaded that in the deserts of Scythia there existed creatures which were half animal, half plant.

SELECTION AND PRESERVATION FOR THE HERBARIUM.

FERNS are amongst the best of all plants for preservation in the form of an herbarium ; for, in addition to their elegant appearance when nicely dried and arranged on sheets of clean white paper, they are less liable than most plants to the attacks of the destructive pests in the shape of insects, which commit such havoc among dried plants in general. We must give our inexperienced readers a few hints on the selection of specimens for this purpose.

The process of drying need not be described in detail. We shall merely remark, that the fronds should be dried quickly, under moderately heavy pressure, among sheets of absorbent paper, which are to be replaced daily, or every second day, by dried sheets as long as the plants continue to give out moisture. The thicker the bulk of paper placed between the specimens whilst under pressure, the better. Two or three changes will generally be sufficient, if the paper substituted is in each case perfectly dry.

The smaller growing kinds should be gathered, if possi-

ble, in the tufts as they grow, preserving the whole mass of fronds, with the stem and roots, the fronds being spread out in an easy and graceful form, and as far as possible kept quite flat, but not formally "laid out" so as to destroy any peculiarity of habit which the species may possess.

If entire tufts cannot be obtained, and single fronds have to be substituted, they should be taken quite to the base, and must be removed from the stem with care, so that the scales, or hairs, or farinose powder, which may be present on the stalk, may be preserved equally with the frond itself.

Of larger-growing species, single fronds only are manageable, and these, when of larger size than the folios in which the specimens are to be kept, must be folded to somewhat less than the length of the papers, *whilst yet fresh.*

Of the gigantic species, portions only of the fronds, corresponding in size with the paper to be used, can be preserved; but all of our native species, except in cases of extreme luxuriance, may, we believe, with a little judgment in the selection of specimens, be folded so as to allow of their being preserved in ordinary folios measuring eighteen inches by twelve inches, or thereabouts.

It is sometimes recommended to select specimens with

the fructifications mature. We should rather, as a general rule, advise their being gathered just as the masses of spores reach their full growth. If, however, more than a single specimen of each kind is preserved, the perfectly mature and the incipient states of fructification should also be gathered; but in the majority of cases the intermediate state will afford the best materials for subsequent examination and recognition. Certainly the fructification is to be preferred in an early rather than a late stage of development.

Of course, when the species produces two or more kinds of fronds, examples of each must be preserved, as, for instance, in the *Allosorus crispus*, the fertile fronds of which alone would convey but a very indifferent notion of the plant. The necessity of attending to this point is even more strikingly apparent in such exotic genera as the *Struthiopteris*, and almost all the species belonging to the *Acrostichum* group.

After being thoroughly dried under pressure, the specimens, according to their size, should be arranged, singly if large, or in groups resembling the natural tufts if sufficiently small, on one side only of a series of sheets (technically half-sheets, *i.e.* single leaves) of stout white

paper, to which they should be fastened by a few thread ties, or gummed straps; or, if they have to be much turned over, they may, for greater safety, be fastened down with glue. The specimens, no doubt, admit of a much more convenient and searching examination when kept loose in a folded sheet of paper; but if there should be frequent occasion to handle such loose specimens, they will be found much more liable to become injured and broken than such as are fastened to the paper; and the risk is lessened in proportion to the degree in which they are made fast.

The specimens should be fully labelled, the labels giving at least their names, the locality where gathered, and the date. These labels should, as far as possible, be fixed with some degree of uniformity as to the position, so as to be readily referred to by turning up one of the corners of the sheets of paper.

The papers to which the specimens are affixed should be enclosed in paper covers, formed of whole sheets, *i.e.* two leaves, each genus being put in a separate cover, with the name written or printed on the lower left-hand outer corner. The printed labels prepared for the herbarium are very useful for this purpose. These covers should be

placed either on the shelves of a cabinet, or in drawers, or in any convenient place where they may be protected from dust, and preserved against the attacks of insects, and other casualties.

THE CLASSIFICATION OF FERNS.

The first notions of classifying the Ferns, if we may judge from the Latin sentences which served as names for them in former times, were derived chiefly from the size, form, and general resemblance of the fronds, and the situations in which they grew.

As, however, the knowledge of their structure and organization became extended, the insufficiency of such means of distinction and arrangement became apparent; and when the great Swedish botanist, Linnæus, set about the task of distributing the plants known to him into family groups, he selected the fructification as the leading character of association, his groups of Ferns being formed from the resemblances in the form and position of the clusters of "seed-vessels," which we have already mentioned under the names of sori and spore-cases.

Those who immediately succeeded him did but carry out to greater perfection, in accordance with increasing knowledge, the same general idea of family relationship,

the most important additional characteristic called into requisition being that derived from the presence or absence of a general investing membrane or cover to the spore-cases, and its form, origin, and mode of bursting when present. This, in fact, brings us to the basis of the classification which has prevailed till within comparatively very few years, and even, to some extent, up to the present time.

Another feature has, however, latterly been adopted by many botanists skilled in the knowledge of Ferns, as forming the leading characteristic of their family relationship, the groups thus brought together representing the modern classification of Ferns. The feature thus adopted, as affording the marks of family recognition, is the veining of the fronds. This character, as employed at the present day, in conjunction with the characters derived from the clusters of spore-cases and their covers, leaves but little scope for further improvement. The tendency of the system is, however, towards subdivision of the family groups, and in this direction it is perhaps somewhat liable to err.

A TABLE OF THE GROUPS AND GENERA OF THE BRITISH FERNS AND ALLIED PLANTS.

I. FERNS = *FILICES.*

Flowerless plants, bearing seed-vessels (spore-cases) on their leaves (fronds), at the backs (dorsal) or margins (marginal). The British Ferns belong to groups which are called Polypodiaceæ, Osmundaceæ, *and* Ophioglossaceæ.

POLYPODIACEÆ = Ferns having the leaves rolled up in a circinate or crosier-like manner while young; and the spore-cases girt with an elastic ring, and bursting by an irregular transverse cleft. It comprises several lesser groups or sections, called *Polypodieæ, Gymnogrammeæ, Aspidieæ, Asplenieæ, Blechneæ, Pterideæ, Adianteæ, Woodsieæ,* and *Hymenophylleæ.*

§ **POLYPODIEÆ** = *Ferns whose round clusters of spore-cases have no special membranous cover (indusium). It contains the genera* Polypodium *and* Allosorus.

1. **Polypodium** = Dorsal-fruited Ferns, with the circular sori exposed, *i. e.* without covers.
2. **Allosorus** = Dorsal-fruited Ferns, with the roundish sori becoming laterally confluent beneath the reflexed, unaltered margins of the frond.

§ **GYMNOGRAMMEÆ** = *Ferns whose linear clusters of spore-cases have no special covers. It contains the genus* Gymnogramma.

3. **Gymnogramma** = Dorsal-fruited Ferns, having the sori linear, forked, naked.

§ **ASPIDIEÆ** = *Ferns whose sori have special indusia, of a circular or roundish form, and springing here and there, from the back of the veins. It contains the genera* Lastrea *and* Polystichum.

4. **Polystichum** = Dorsal-fruited Ferns, having circular umbilicate indusia, attached by their centre.
5. **Lastrea** = Dorsal-fruited Ferns, having reniform indusia, attached by their indented side.

§ **ASPLENIEÆ** = *Ferns whose sori have special indusia, of an oblong or elongated form, and springing from the sides of the veins. It contains the genera* Athyrium, Asplenium, Ceterach, *and* Scolopendrium.

6. **Athyrium** = Dorsal-fruited Ferns, having oblong reniform indusia, attached by their concave side, the detached side fringed with hair-like segments.

7. **Asplenium** = Dorsal-fruited Ferns, having the indusia straight and elongate, and attached by the side towards the margin of the pinnæ or pinnules.

8. **Scolopendrium** = Dorsal-fruited Ferns, having the sori elongate, and proximate in parallel pairs, the indusia opening along the centre of the twin sori.

9. **Ceterach** = Dorsal-fruited Ferns, having the indusia obsolete, and the sori hidden among densely imbricated, rust-coloured, chaffy scales.

§ **LOMARIEÆ** = *Ferns whose sori have special indusia, forming longitudinal lines between the midrib and margins of the leaflets or divisions of the frond. It contains the genus* Blechnum.

10. **Blechnum** = Dorsal-fruited Ferns, having the spore-cases in a continuous line between the midrib and margin of the divisions of the frond, covered by linear indusia.

§ **PTERIDEÆ** = *Ferns the margin of whose fronds is soriferous, and continuously or interruptedly changed*

into a special indusium. It contains the genus Pteris.

11. **Pteris** = Dorsal-fruited Ferns, having the spore-cases in a continuous line at the edge of the frond, beneath indusia, formed of the altered margin.

§ **ADIANTEÆ** = *Ferns the margin of whose fronds bears reflexed lobes, which are changed to indusia, and bear the spore-cases on their under surface. It contains the genus* Adiantum.

12. **Adiantum** = Dorsal-fruited Ferns, having the spore-cases in patches, on the reflexed, altered apices of the lobes of the fronds, which form indusia.

§ **CYSTOPTERIDEÆ** = *Ferns whose sori have special ovate indusia affixed behind, and inflected hood-like over them. It contains the genus* Cystopteris.

13. **Cystopteris** = Dorsal-fruited Ferns, having cucullate or hooded semi-involucriform indusia, attached by their broad base.

§ **PERANEMEÆ** = *Ferns whose sori have special involucriform or semi-involucriform indusia, round-ish, and springing from the back of the veins It contains the genus* Woodsia.

14. **Woodsia** = Dorsal-fruited Ferns, having the indusia involucriform, *i.e.* attached beneath the sori, and divided at the margin into hair-like incurved segments.

§ **HYMENOPHYLLEÆ** = *Ferns whose sori are produced around the ends of veins projecting from the margin, and surrounded by urn-shaped or two-valved membranes. It contains the genera* Trichomanes *and* Hymenophyllum.

15. **Trichomanes** = Marginal-fruited Ferns, having the sori surrounded by urn-shaped expansions of the frond.

16. **Hymenophyllum** = Marginal-fruited Ferns, having the sori surrounded by two-valved expansions of the frond.

OSMUNDACEÆ = Ferns having the young leaves circinate, the spore-cases destitute of an elastic ring, and bursting vertically by two regular valves. It contains the genus *Osmunda.*

17. **Osmunda** = Marginal-fruited Ferns, having the regular-valved spore-cases in irregular, dense, branching clusters, terminating the fronds.

OPHIOGLOSSACEÆ = Ferns having the young leaves folded up straight, the spore-cases destitute of an elastic ring, and two-valved. It contains the genera *Botrychium* and *Ophioglossum.*

18. **Botrychium** = Marginal-fruited Ferns, having the spore-cases in irregularly branched clusters, on a separate branch of the frond.
19. **Ophioglossum** = Marginal-fruited Ferns, having the spore-cases sessile in two-ranked simple spikes terminating a separate branch of the frond.

II. CLUB-MOSSES = *LYCOPODIACEÆ.*

Flowerless plants, bearing spore-cases, with from one to three cells in the axils of their leaves. They consist of the genera Lycopodium *and* Selaginella.

20. **Lycopodium** = Moss-like plants, with leafy stems, the fructifications consisting only of one-celled spore-cases, containing pulverulous spores.
21. **Selaginella** = Moss-like plants, with leafy stems, the fructifications consisting of one-celled spore-cases, containing pulverous spores, and three or four-celled spore-cases, containing large granular spores.

III. PEPPERWORTS = *MARSILEACEÆ.*

Flowerless plants, bearing axillary or radical spore-cases, having many cells. They comprise the genera Isoëtes *and* Pilularia.

22. **Isoëtes** = Stemless, quill-leaved, water plants, with the fructifications enclosed within the swollen bases of the leaves.

23. **Pilularia** = Creeping, slender-leaved, water plants, with the fructifications in globular, sessile, four-celled spore-cases.

IV. HORSETAILS = *EQUISETACEÆ.*

Flowerless plants, with spore-cases attached beneath peltate scales, which are arranged in terminal cones. This group consists of the genus Equisetum.

24. **Equisetum** = Jointed, tubular-stemmed plants, with terminal cones of fructification.

A TABLE OF THE
SPECIES AND VARIETIES OF BRITISH FERNS, &c.

I. FERNS, or FILICES.

POLYPODIACEÆ § POLYPODIEÆ.

Genus 1. POLYPODIUM, *Linnæus.*

1. **P. vulgare,** *Linnæus.*—Fronds oblong, pinnatifid. Plate I. fig. 2.

   var. **cristatum.**—Fronds pinnatifid, segments and fronds tasselled at the apices.

   var. **semilacerum.**—Fronds pinnatifid, lower segments again pinnatifid, upper fertile.

   var. **cambricum.** — Fronds pinnatifid, segments again pinnatifid, all barren.

2. **P. Phegopteris,** *Linnæus.*—Fronds pinnate below; pinnæ pinnatifid. Plate II. fig. 2.

3. **P. Dryopteris,** *Linnæus.*—Fronds ternate, deltoid, glabrous. Plate II. fig. 1.

4. **P. Robertianum,** *Hoffmann.*—Fronds subternate, elongate-deltoid, glandular-mealy. Plate III. fig. 1.

5. **P. alpestre**, *Sprengel.* — Fronds bipinnate, lanceolate. Plate XXI.

var. **flexile.**—Fronds narrow, flaccid ; pinnæ deflexed.

Genus 2. ALLOSORUS, *Bernhardi.*

1. **A. crispus**, *Bernhardi.*—The only British species. Plate V. fig. 1.

Polypodiaceæ § Gymnogrammeæ.

Genus 3. GYMNOGRAMMA, *Desvaux.*

1. **G. leptophylla**, *Desvaux.* — The only British species. Plate XXII. fig. 1.

Polypodiaceæ § Aspidieæ.

Genus 4. POLYSTICHUM, *Roth.*

1. **P. Lonchitis**, *Roth.* — Fronds pinnate, spiny-serrate. Plate IV. fig. 2.
2. **P. aculeatum**, *Roth.*—Frond bipinnate, rigid, pinnules ovate-subfalcate, auricled, acute, acutely wedge-shaped at the base, nearly all distinct.

var. **lobatum.**—Fronds narrower, pinnules nearly all decurrent. Plate IV. fig. 3.

3. **P. angulare,** *Presl.*—Fronds bipinnate, lax, pinnules oblong or ovate-subfalcate, auricled, bluntish or acute, obtusely angled at the base, stalked. Plate V. fig. 2.

var. **subtripinnatum.**—Fronds ample; lower pinnules large, and again pinnate, otherwise normal.

var. **proliferum.**—Fronds bearing bulbils; pinnules narrow, acute, deeply pinnatifid, with distant attenuate lobes.

var. **imbricatum.**—Fronds very narrow; pinnules oblong-obtuse, overlapping.

var. **alatum.**—Fronds normal in outline; pinnules connected by a broad wing of the rachis, which obliterates the stalk.

var. **cristatum.**—Fronds and pinnæ tasselled at their extremities.

Genus 5. LASTREA, *Presl.*

1. **L. Thelypteris,** *Presl.*—Fronds pinnate, not glandular; sori submarginal, on more or less contracted fronds; caudex creeping. Plate VI. fig. 1.

2. **L. montana,** *Moore.*—Fronds pinnate, covered with sessile glands; caudex tufted. Plate VII.

3. **L. Filix-mas,** *Presl.*—Fronds sub-bipinnate or bipinnate, broadly lanceolate; indusium plain. Plate VIII.

var. **incisa.**—Larger, pinnules elongate, with deep serrated incisions.

var. **paleacea.**—Larger, pinnules truncately-obtuse; stipes very scaly.

var. **pumila.**—Smaller, pinnules contracted or obsolete.

var. **cristata.**—Pinnæ and frond tasselled at their extremities. Plate VIII. upper figure.

4. **L. rigida,** *Presl.*—Fronds bipinnate, without spinulose serratures, glandular; indusium fringed with glands. Plate IX. fig. 1.

5. **L. cristata,** *Presl.*—Fronds narrow linear, pinnate or sub-bipinnate, pinnules oblong, with aristate teeth, the posterior and anterior ones nearly equal; scales ovate, pale; caudex creeping. Plate VI. fig. 2.

var. **uliginosa.**—Fronds (fertile) narrow linear-lanceolate, bipinnate at the base, pinnules oblong, acute, with aristate teeth, the posterior and anterior ones nearly equal; sterile fronds as in 5; scales ovate, pale; caudex creeping.

var. **spinulosa.**—Fronds oblong-lanceolate, bipinnate,

with spinulose serratures; posterior pinnules much largest; scales ovate, pale; caudex creeping.

6. **L. dilatata**, *Presl.*—Fronds oblong or ovate-lanceolate, bi-tri-pinnate, with spinulose serratures; scales lanceolate; caudex usually erect. Plate IX. fig. 2.

var. **collina.**—Pinnules ovate, blunt, bluntly mucronate-serrate; scales dark-centred.

var. **glandulosa.**—Fronds lanceolate-ovate, tall, very glandular; scales pale two-coloured, broader; caudex somewhat creeping.

var. **Chanteriæ.**—Fronds lanceolate, narrowed below, and caudate at the apex; pinnæ and pinnules (the latter short oblong) distant.

var. **dumetorum.**—Fronds oblong-ovate or ovate-triangular, dwarf, very glandular; scales pale, two-coloured, narrower.

7. **L. æmula**, *Brackenridge.*—Fronds triangular, bipinnate, pinnules concave above; scales lanceolate, laciniated.

Polypodiaceæ § Aspleniæ.

Genus 6. ATHYRIUM, *Roth.*

1. **A. Filix-fœmina**, *Roth.*—The only British species. Fronds bipinnate; pinnules flat, linear-oblong, lobed. Plate XI.

var. **rhæticum.**—Pinnules narrow, distinct, linear, convex, lobed.

var. **latifolium.**—Pinnules broad ovate, crowded, irregularly lobed.

var. **molle.**—Pinnules oblong, flat, lobed, connected by wing of rachis.

var. **marinum.**—Fronds narrowed to the base, decumbent, pinnules oblong, with simple marginal teeth, rachis winged.

var. **multifidum.**—Pinnæ and frond tasselled at the extremities. Plate XI., upper figure.

var. **crispum.**—Dwarf, irregularly branched, with the ends tasselled.

Genus 7. ASPLENIUM, *Linnæus.*

1. **A. septentrionale,** *Hull.*—Frond linear-lanceolate, two-three-cleft. Plate XII. fig. 3.
2. **A. germanicum,** *Weiss.*—Fronds linear, alternately pinnate, pinnæ narrow wedge-shaped; indusium entire. Plate XIII. fig. 3.
3. **A. Ruta-muraria,** *Linnæus.*—Fronds bipinnate, pinnules wedge-shaped at the base; indusium jagged. Plate XIII. fig. 1.

4. **A. viride**, *Hudson.*—Fronds linear, pinnate, rachis green above. Plate XIII. fig. 4.

5. **A. Trichomanes**, *Linnæus.*—Fronds linear, pinnate, rachis black throughout. Plate XIII. fig. 5.

var. **incisum.**—Pinnæ deeply lobed.

var. **cristatum.**—Fronds tasselled at the end.

6. **A. marinum**, *Linnæus.*—Fronds pinnate, rachis winged. Plate XIV. fig. 1.

7. **A. fontanum**, *R. Brown.* — Fronds bipinnate, narrow lanceolate, rachis winged, smooth. Plate XIII. fig. 2.

8. **A. lanceolatum**, *Hudson.* — Fronds bipinnate, broad lanceolate, rachis wingless, scaly. Plate XII. fig. 1.

var. **microdon.**—Pinnæ only lobed or subpinnate at the base, wavy.

9. **A. Adiantum-nigrum**, *Linnæus.*—Frond bipinnate, triangular; segments wedge-oblong. Plate XII. fig. 2.

var. **acutum.** — Fronds tripinnate, triangular, much acuminate; segments linear. Plate XXII. fig. 2.

Genus 8. CETERACH, *Willdenow.*

1. **C. officinarum**, *Willdenow.*—The only British species. Plate I. fig. 1.

Genus 9. SCOLOPENDRIUM, *Smith.*

1. **S. vulgare**, *Symons.*—The only British species. Fronds strap-shaped, entire. Plate XV. fig. 1.

   var. **polyschides.** — Fronds long, narrow, irregularly lobed, fertile.

   var. **marginatum.**—Fronds long, narrow, lobed, with a double, *i.e.* split margin, fertile.

   var. **crispum.**—Fronds elongated, much undulated at the margin, usually barren.

   var. **multifidum.**—Fronds usually shortened, multifid and tasselled at the apex; barren or fertile.

   var. **laceratum.**—Fronds broad, short, with the margin lobed, the lobes multifid-crisped; fertile.

Polypodiaceæ § Lomarieæ.

Genus 10. BLECHNUM, *Linnæus.*

1. **B. Spicant**, *Roth.*—The only British species. Plate XVI. fig. 2.

   var. **ramosum.**—Fronds branched, the extremities of the branches tasselled.

Polypodiaceæ § Pterideæ.

Genus 11. **PTERIS**, *Linnæus.*

1. **P. aquilina**, *Linnæus.*—The only British species. Plate XVII. fig. 1.

Polypodiaceæ § Adianteæ.

Genus 12. **ADIANTUM**, *Linnæus.*

1. **A. Capillus-Veneris**, *Linnæus.*—The only British species. Plate XVI. fig. 1.

Polypodiaceæ § Cystopterideæ.

Genus 13. **CYSTOPTERIS**, *Bernhardi.*

1. **C. fragilis**, *Bernhardi.*—Fronds lanceolate, bipinnate, pinnules ovate, acute, toothed or lobed; sori central. Plate X. fig. 1.

   var. **angustata.**—Pinnules ovate, deeply pinnatifid, the lobes with narrow acute teeth; sori central.

   var. **dentata.**—Pinnules ovate, obtuse, bluntly-toothed, distinct; sori marginal.

   var. **Dickieana.**—Pinnules broad, obtuse, slightly blunt-toothed, overlapping; sori marginal.

2. **C. regia**, *Presl.*—Fronds lanceolate, subtripinnate, segments linear. Plate X. fig. 2.

3. C. montana, *Link.*—Fronds triangular, tripinnate. Plate XIV. fig. 2.

POLYPODIACEÆ § PERANEMEÆ.

Genus 14. **WOODSIA,** *R. Brown.*

1. W. ilvensis, *R. Brown.* — Fronds lanceolate, hairy-squamous; pinnæ oblong, lobed. Plate III. fig. 2.
2. W. alpina, *Gray.*—Fronds linear, almost smooth; pinnæ bluntly triangular, lobed. Plate IV. fig. 1.

POLYPODIACEÆ § HYMENOPHYLLEÆ.

Genus 15. **TRICHOMANES,** *Linnæus.*

1. T. radicans, *Swartz.*—The only British species. Plate XVIII. fig. 1.

Genus 16. **HYMENOPHYLLUM,** *Smith.*

1. H. tunbridgense, *Smith.* — Pinnæ vertical, involucres compressed, serrate. Plate XV. fig. 2.
2. H. unilaterale, *Willdenow.*—Pinnæ deflexed, involucres inflated, entire. Plate XV. fig. 3.

OSMUNDACEÆ.

Genus 17. **OSMUNDA,** *Linnæus.*

1. O. regalis, *Linnæus.*—The only British species. Plate XIX. fig. 2.

Ophioglossaceæ.

Genus 18. BOTRYCHIUM, *Linnæus.*

1. **B. Lunaria,** *Linnæus.*—The only British species. Plate XVIII. fig. 2.

Genus 19. OPHIOGLOSSUM, *Linnæus.*

1. **O. vulgatum,** *Linnæus.*—Fronds ovate. Plate XVIII. fig. 3.
2. **O. lusitanicum,** *Linnæus.*—Fronds very small, linear-lanceolate, obtuse, fleshy. Plate XXII. fig. 3.

II. CLUB-MOSSES, or LYCOPODIACEÆ.

Genus 20. LYCOPODIUM, *Linnæus.*

1. **L. Selago,** *Linnæus.*—Leaves in eight rows, imbricated on the usually erect stems; fructifications in the axils of leaves, not spiked. Plate XX. fig. 5.
2. **L. annotinum,** *Linnæus.* — Leaves indistinctly five-rowed, linear-lanceolate, patent; spikes solitary, sessile.
3. **L. clavatum,** *Linnæus.* — Leaves scattered, incurved, hair-pointed; spikes two or more on a stalk. Plate XX. fig. 6.

4. L. inundatum, *Linnæus.*—Leaves scattered, curved upwards, linear ; spikes solitary, sessile. Plate XX. fig. 4.
5. L. alpinum, *Linnæus.* — Leaves in four rows, of two forms, imbricate ; spikes solitary, sessile.

Genus 21. **SELAGINELLA,** *Spring.*

1. S. spinosa, *Pal. de Beauvais.*—Leaves scattered, half-spreading, lanceolate ; spikes solitary, sessile.

III. PEPPER-WORTS, or MARSILEACEÆ.

Genus 22. **ISOETES,** *Linnæus.*

1. I. lacustris, *Linnæus.*—The only species. Plate XIX. fig. 1.

Genus 23. **PILULARIA,** *Linnæus.*

1. P. globulifera, *Linnæus.* — The only species. Plate XVII. fig. 2.

IV. HORSETAILS, or EQUISETACEÆ.

Genus 24. **EQUISETUM,** *Linnæus.*

1. E. Telmateia, *Ehrhart.*—Stems dissimilar, the sterile branched, smooth, with about thirty ridges ; sheaths

of the branches with subulate two-ribbed teeth ; the fertile stems simple, short, with large crowded sheaths. Plate XX. fig. 2.

2. **E. pratense,** *Ehrhart.* — Stems dissimilar, the sterile branched, rough, with about twenty ridges, the sheaths of the branches having subulate one-ribbed teeth ; fertile simple, with approximate appressed sheaths.

3. **E. arvense,** *Linnæus.* — Stems dissimilar, the sterile branched, slightly rough, with from ten to sixteen ridges, the sheaths of the branches having long-pointed one-ribbed teeth ; the fertile simple, with distant, loose sheaths.

4. **E. sylvaticum,** *Linnæus.* — Stems similar, with about twelve ridges, and having loose sheaths terminating in three or four large blunt lobes ; branches deflexed. Plate XX. fig. 3.

5. **E. limosum,** *Linnæus.* — Stems similar, smooth, with numerous slight ridges, the sheaths green, close, with from sixteen to twenty sharp-pointed, dark-coloured teeth ; branches short, few, often wanting.

6. **E. palustre,** *Linnæus.* — Stems similar, slightly rough, with from six to eight broad prominent ridges, the

sheaths pale, loose, with acute wedge-shaped, brown-tipped teeth ; branches erect.

7. **E. ramosum,** *Schleicher.*—Stems similar, very rough, with from eight to twelve ridges, and having close sheaths, which ultimately become wholly black, and have narrow subulate teeth ; almost branchless.

8. **E. hyemale,** *Linnæus.*—Stems similar, very rough, with from fourteen to twenty ridges, and having close whitish sheaths, banded with black at the top and bottom ; the teeth slender, deciduous ; almost branchless. Plate XX. fig. 1.

9. **E. Moorii,** *Newman.*—Stems similar, annual, rough, tapering, with about twelve ridges, and having loose striated sheaths, black at the base, white above, with black tips to the blunt teeth, which are tipped by flaccid membranous awns ; almost branchless.

10. **E. variegatum,** *Weber et Mohr.*—Stems similar, very rough, with from four to ten ridges ; sheaths slightly enlarged, green below, black above ; teeth obtuse, tipped by deciduous awns ; almost branchless.

var. **Wilsoni.**—Stems less rough, taller.

THE BRITISH FERNS.

"Sweet to muse upon His skill display'd
(Infinite skill) in all that He has made!
To trace in Nature's most minute design
The signature and stamp of power Divine;
Contrivance intricate, express'd with ease,
Where uninstructed sight no beauty sees!"

Genus I. POLYPODIUM, or POLYPODY.

The Polypodies, which bear the Latin name of *Polypodium*, are known from all the other British Ferns, by their having the spore-cases arranged in little round patches placed here and there on the back of the frond, these patches not being at any time, or at any stage of their development, covered by the membranous film which, it has already been explained, is called the indusium; hence they are said to be naked, or non-indusiate. This family includes five distinct kinds, as well as many variations of the common sort. In the common species the fronds continue green through the winter, so that it is an evergreen

fern ; while in others, they last but from spring to autumn in each succeeding year.

The Polypodies derive their common name from *Polypodium*, which literally means, many-footed, and has been explained to apply to the branching of their creeping stems, the protuberances on which, in the earlier stages of development, have some supposed resemblance to the Polypes.

Polypodium vulgare, *Linnæus.*

The Common Polypody. (Plate I. fig. 2.)

This is an evergreen Fern, growing abundantly on pollard trunks, mossy banks, moist rocks and walls, and old thatched roofs ; and pretty generally distributed over the United Kingdom. When sheltered the fronds are of a cheerful but not bright green, and it may be then recognized by the comparatively large circular patches of golden orange or brown spore-cases ; indeed, it may generally be known by this feature alone, no other native sort having the fructification at all similar in appearance.

This species has a creeping stem or rhizome as thick as one's finger, which is covered over with pale brown chaffy taper-pointed scales. From its upper side spring the

fronds, and from its lower side chiefly the branching fibrous roots by which it clings to its support. The fronds, if exposed to frost, perish; but if at all sheltered, they remain green during winter, and until after young ones have been produced, which happens generally towards the end of May. The stipes, or stalk, of the full-grown fronds is usually nearly equal in length to the leafy portion; the entire frond measuring from six to eighteen inches in length. The leafy part of the frond is lance-shaped in outline, but cut in from the margin along both sides nearly as far as the midrib or rachis, and thus becomes what is called pinnatifid. The portions into which it is divided are called the lobes, or segments, or divisions of the frond; and, in this case they are usually oblong in form, generally rounded at the end, but sometimes tapering to a blunt point, and occasionally notched along the margin. Each lobe has a slightly wavy midvein, producing alternate lateral veins (venules), which generally have about four veinlets or little veins disposed alternately; it is the lowest of these veinlets, on the side towards the point of the frond, which produces the sorus when it is present; the rest, which are barren, terminate in club-shaped apices, which are very readily seen when a

fresh frond is held between the eye and a strong light. Most of the fronds of this kind of Fern produce fructification, which, however, is usually confined to the upper half of the fronds, and has generally become mature by the end of September.

The most remarkable variety is **cambricum**, the *Polypodium cambricum* of Linnæus, commonly called the Welsh Polypody. The lobes of the frond in this variety are broader, and, instead of being simple, are deeply and irregularly lobed a second time, the segments being rather sharply toothed. This form, which is certainly only a variety of the common Polypody, is always found without fructification. Under slight shelter, where its fronds are persistent, it is one of the most beautiful of what are called hardy Ferns. The Irish Polypody, an equally elegant form, called **semilacerum**, is found in Ireland and elsewhere; the lower half of its fronds are a second time lobed, and the upper half usually fertile, and not twice-lobed. The variety **omnilacerum** is a fertile form resembling *cambricum*, found in Herefordshire. These three have a certain general resemblance.

There are many other varieties which have been proposed; of which we may mention—**bifidum**, in which the

lobes are more or less regularly two-cleft at the apex; **serratum**, in which they are deeply saw-edged; **crenatum**, in which the margin has rounded notches, and is wavy; and **acutum**, in which they are drawn out to a long narrow point. The varieties are fully enumerated in our "Handbook of British Ferns."

The species and its varieties grow readily under cultivation, either planted in pots, or on rockwork in a shady situation. They should have a light, open soil.

The name of *Ctenopteris vulgaris* has been proposed for this plant; but as it is the type of *Polypodium*, such a change of name would be quite inadmissible.

Polypodium Phegopteris, *Linnæus.*

The Beech Fern, or Mountain Polypody. (Plate II. fig. 2.)

This is a somewhat fragile plant, enduring no longer than till autumn, or the appearance of the first frosts. It grows wild in moist mountainous situations and in damp woods, often common enough where present, but rather limited in its range; occurring, however, in England to the southward, westward, and northward; pretty generally distributed in Scotland; but rarely met with in Ireland.

This species has a slender but extensively creeping and

slightly scaly stem, producing black fibrous roots. From these stems spring up, about May, the delicate hairy pale green fronds, which, when full grown, measure from six inches to a foot in height. The stipes, which is fleshy and very brittle, is generally twice as long as the leafy part of the frond; near its base are a few small almost colourless scales. The fronds are triangular, extended into a long narrow point. In the lower part they are pinnate; but this distinction of the parts is seldom carried beyond the two lowest pairs of branches, those of the upper portions of the frond being connected at the base, in what is technically called a pinnatifid manner: hence this Fern is said to be subpinnate, which, in this case, means partially pinnate, or pinnate at the very base only. The pinnæ have a narrow and acutely lance-shaped outline, and are deeply pinnatifid; they usually stand opposite each other in pairs, the lowest pair being directed downwards, towards the root, and set on at a short distance from the rest. The united bases of the pairs of the other pinnæ, when they happen to stand exactly opposite each other, exhibit a cruciform figure more or less obvious; and by this mark, in conjunction with the triangular outline and subpinnate mode of division, this species may be

known from the other British Polypodies. The veins in the lobes of the pinnæ are pinnate; that is to say, there is a slender midvein, from which alternate venules, mostly unbranched, extend to the margin; those near the base of the lobes bearing each one small circular sorus near their extremity—the fructification thus becoming almost marginal.

It is a very delicate and graceful Fern for pot-culture or for a Wardian case, and requires plenty of percolating moisture. On the damp, shady sides of sheltered artificial rockwork, in the open air, it grows with tolerable vigour.

Polystichum Phegopteris, *Lastrea Phegopteris*, *Gymnocarpium Phegopteris*, *Phegopteris polypodioides*, and *Phegopteris vulgaris*, are names which have been proposed for the Beech Fern.

Polypodium Dryopteris, *Linnæus.*

The Smooth Three-branched Polypody, or Oak Fern.

(Plate II. fig. I.)

This is at once known among the Polypodies by having its fronds smooth and divided into three branches; when the fronds are but partially developed, this latter charac-

teristic is very obvious, for the three branches appear rolled up separately at the tips of three little wire-like stalks, supported by one which is longer and stouter. It is a slender and delicate plant, its height being commonly not more than six inches, often less, though sometimes more; and its texture is fragile. Hence, it is at once destroyed by frost, and soon becomes rusty and withered by exposure to heat and drought. When growing in a cool, shady situation, however, it continues fresh and cheerful-looking from April, when it usually starts into growth, onwards until it is affected by autumnal cold. In pots, in Wardian cases, or on sheltered shady rockwork, it is alike desirable for cultivation.

The fronds of this delicate little Fern grow from a slender creeping stem, which often forms densely matted tufts. They are quite smooth, and of a bright light green colour, supported by stipes which are usually about twice as long as the leafy part, and are slender, brittle, and dark-coloured. The outline is almost pentagonal, the frond being divided into three branches, each of which is of a triangular form. One peculiarity about this species, which is in a slight degree shared by its near ally *P. Robertianum*, is the deflection of the rachis at the point where the

lateral branches of the frond take their rise, but this feature is much more obvious in *P. Dryopteris.* The fronds are divided so that each branch is pinnate at the base, and pinnatifid towards its point ; the pinnæ are also pinnate at their base, then pinnatifid, becoming acute and nearly entire at the point ; the pinnules and ultimate lobes are oblong and obtuse. The pair of pinnules at the base of each pinna, close to the principal rachis, are placed so that when the pinnæ are exactly opposite they stand in the form of a cross ; the two towards the apex of the branch being smaller than the opposite pair, and more nearly parallel with the rachis. The pinnules or lobes have a rather wavy midvein, from which the venules branch out alternately, being, in those of moderate size, simple, with a sorus near their extremity, and in those which are larger and more compound, branched, with a sorus on the lower branch. The fructification is very unequally produced in different seasons and localities, being sometimes crowded, and at other times very sparingly scattered over the fronds.

P. Dryopteris is not an uncommon species, but it occurs only in mountainous situations and the drier parts of damp woods : in England it is found mostly in the north ;

in Scotland it is distributed pretty generally; it is very rare in Ireland.

This species has been called *Polystichum Dryopteris*, *Lastrea Dryopteris*, *Phegopteris Dryopteris*, and *Gymnocarpium Dryopteris*.

Polypodium Robertianum, *Hoffman.*

The Limestone Polypody. (Plate III. fig. 1.)

This Fern is known from *P. Dryopteris*—to which it is so nearly related that some botanists do not consider it distinct—by having its fronds less decidedly, though somewhat three-branched, and by having its surface covered with small stalked glands, which give a mealy appearance to every part. In addition to these points of difference, the fronds in this species are of a dull deep green, more rigid, and without the marked deflection of the rachis so obvious in *P. Dryopteris*. The young fronds, moreover, instead of being rolled up in three little balls, have their pinnæ all rolled up separately. The glandular surface of the frond is very readily seen with a good pocket lens, which is a very necessary aid to the study of Ferns.

The Limestone Polypody grows from six inches to a foot in height. The fronds are nearly triangular, with the

base shorter than the sides, the stipes about equalling the leafy portion in length. They are partially three-branched, but the lateral branches are much smaller than the central one, and attached to the stipes by a more slender rachis. The lower branches are pinnate, with pinnatifid pinnæ; the upper branch pinnate, with its lower pinnæ again pinnate, and the upper ones pinnatifid, as also is the apex of the frond and of the lower branches. The pinnules or lobes have a distinct midvein, with simple or slightly-branched venules, near the termination of which, in a marginal series, the sori are produced.

This is one of the few Ferns which are found in calcareous or chalky soils. It is rare, and local in its distribution, being, we believe, almost confined to rocky limestone districts, and occurring chiefly in the northern and western parts of the island. In cultivation this species does not require so much moisture and shade as most other Ferns, but a limestone soil is not at all essential to its well-being.

The names of *Polypodium calcareum*, *Phegopteris calcarea*, *Lastrea Robertiana*, and *Gymnocarpium Robertianum*, have been given to this species.

Polypodium alpestre, *Sprengel.*

The Alpine Polypody. (Plate XXI.)

This Fern has so remarkably the aspect of the common Lady Fern (*Athyrium Filix-fœmina*), that although common on the Scottish mountains, it has been till very recently overlooked, the plants having been supposed to belong to that species. It would appear to be plentiful on the higher parts of the mountainous districts of the counties of Perth, Forfar, and Aberdeen, accompanying the Lady Fern in its lower range, but ascending to a considerably higher elevation than that plant. The fronds appear in May, and perish early in autumn.

The plants of this Fern have a short decumbent caudex, producing fronds in tufts from the crown. They are from six inches to three feet or more in height, broadly lance-shaped, and attached by comparatively short stipes, clothed with broadish-pointed membranous scales. They are bipinnate, or sometimes subtripinnate. The lower pinnæ are gradually shorter, so that the outline is truly lanceolate. The pinnæ are linear-lanceolate, taper-pointed, spreading at an obtuse angle with the rachis. The pinnules have a slightly wavy midvein, from which alter-

nately branch the veins which ramify in the lobes ; these veins, in average specimens, are pinnately branched, with a simple venule directed towards each marginal tooth. The sori are sometimes produced only on the lowest anterior venule of each lobe, and they then form a series on each side the midvein ; but sometimes more of the venules are fertile, and the sori then range in short lines near the margin of the lobes.

The very distinct and constant variety called **flexile**, the *Pseudathyrium flexile* of Newman, has so peculiar an aspect, that it is scarcely to be wondered it was thought a distinct species. It differs in its lax spreading habit, narrow gracely-curving fronds, and short deflexed pinnæ, with fewer and smaller pinnules. The cultivated plants, which are very constant in character, generally produce almost stalkless fronds, and these often bear their sori abundantly at the base, but scarcely, if at all, on the upper parts. These latter marks—the almost sessile fronds, and the usually basal sori—disappear in some instances, both in the wild and cultivated specimens. An imperfect indusium has been observed, on some of the sori, in the plant under culture, but this occurs only on the least perfect sori, and appears to be rather an abnormal development of

the receptacle than a proper investing membrane. A similar membrane has been observed in the species. The sori, both in *P. alpestre* itself, and in the variety *flexile*, are not in all cases strictly punctiform, but occasionally, though rarely, lateral but hardly elongated on the veins ; and this is perhaps what induced Mr. Newman to propose the genus *Pseudathyrium*. We, however, agree with those who retain the plant in the Polypody family, and regard *flexile* rather as a variety than as a species, though it is certainly a remarkable one. This very interesting plant was found in Glen Prosen, in 1852, by Mr. Backhouse and Mr. Westcombe ; and the same botanists again found it plentifully in the same district of the Clova Mountains, in the summer of 1855.

Genus II. ALLOSORUS, or ROCK BRAKES.

Of this family we have but one British species, the *Allosorus crispus*. It is known from all its fellow-country ferns by the coincidence of the following features. It bears fronds of two kinds, one being leafy and barren, *i. e.* without sori, the other contracted, and bearing sori ; and hence

called fertile. The edges of the lobes of the fertile fronds are rolled under (which is what gives them the contracted appearance), and cover the sori in the stead of a special indusium; the sori when young form distinct circular clusters beneath this recurved margin; but as they grow, they join laterally (in technical language, they become confluent), forming two lines of fructification lengthwise the segments of the fronds.

The name *Allosorus* is compounded from the Greek, and comes from *allos*, which means various, and *sorus*, which means a heap: the intention probably being to indicate the variation or change which occurs in the apparent arrangement of the sori, from the distinct patches to the continuous lines in which they are seen to be disposed, if examined at different stages of development—the change, after all, being only apparent, and not real. The name, however, may have been intended to express the variation in the character of the sorus in the different species originally assigned to this genus.

Allosorus crispus, *Bernhardi.*

The Rock Brakes, or Mountain Parsley. (Plate V. fig. 1.)

This elegant little plant, which has considerable first-

sight resemblance to a tuft of parsley, and is hence sometimes called Mountain Parsley, grows in a dense tuft, throwing up its fronds in May or June, and losing them in the course of the autumn. The fronds average about six inches in height, and are generally somewhat three-cornered in outline, with a longish, slender, smooth stalk. They are of two kinds; both kinds being twice or thrice pinnate, and of a pale green-colour. The segments into which the sterile fronds are cut, are more or less wedge-shaped, and notched or cleft at the end. The fertile fronds have the segments of an oval or oblong, or linear form. The divisions of the fertile frond have a slightly tortuous midvein, producing simple or forked venules which extend nearly to the margin, each, for the most part, bearing near its extremity a circular sorus. There is no true indusium, but the sori are covered by the reflexed and partially bleached margins which sometimes almost meet behind, so that the spore-cases are quite concealed. These patches are at first distinct, but ultimately meet laterally, and become more or less blended together.

The Rock Brakes is a mountain Fern, choosing to grow in stony situations. It is comparatively rare and local; most abundant in the north of England and Wales, and

less plentiful in Scotland and Ireland. This plant grows readily in pots, and also in a Wardian case, if not too much confined; for either of these modes of cultivation its small size and elegant aspect render it a very desirable object. It is, however, very impatient of root-moisture.

This Fern has been called by several other names; of which the principal are—*Cryptogramma crispa*, *Pteris crispa*, and *Osmunda crispa*. The two latter are now quite obsolete.

Genus III. GYMNOGRAMMA, or GYMNOGRAM.

A small species of this tropical genus has been found to inhabit Jersey, and is thus brought—politically, not geographically—within the limits of the British Flora. The characteristic feature in this family is to have the spore-cases scattered in lines along the veins, extending in many cases below the point where the latter separate into branches; so that the sori become what is technically called, linear and forked. They have also no cover.

The name is derived from the Greek words, *gymnos*,

naked, and *gramme*, a line ; alluding to the lines of sporecases, without covering membranes.

Gymnogramma leptophylla, *Desvaux.*

The Slender Gymnogram. (Plate XXII. fig. 1.)

This is a small Fern, of short duration, springing up from the spores in the autumn of each year, attaining maturity early in the following summer, and afterwards quickly drying up and disappearing. Each plant consists of a tuft of about half a dozen fronds, of which the earlier are short and fan-shaped, divided only into two or three lobes ; succeeding ones grow an inch or two in length, and become pinnate, with obliquely fan-shaped three-lobed pinnæ ; and finally others appear taller and more erect in growth, and more abundantly fertile. These more perfect fronds, the latest produced by the plant, are from three to six inches high, ovate in outline, and two or three times pinnate. The pinnæ are alternate, ovate, with alternate pinnules. The ultimate pinnules are roundish wedge-shaped, three-lobed at the apex, the lobes rather distinct, and usually notched at the end. The veins in each pinnule become branched, so that one of the small veins proceeds towards each of the teeth into which the pinnule

is divided; and the spore-cases are borne along these branches of the veins. The lines of sori on the pinnules often become united into a mass, after they have been some time developed, especially in parts where they are rather crowded.

Though a minute species, this Fern is widely scattered over the face of the globe; it is plentiful in many parts of the south of Europe, and extends as far northwards as Jersey.

It grows readily, as an annual or biennial, sown on sandy loam, and kept in a rather warm damp situation.

Genus IV. POLYSTICHUM, or SHIELD FERN.

The group of Ferns formerly called *Aspidium*, or Shield Fern, is now commonly divided into several lesser groups, forming the modern genera. The English species of this group are now classed under three genera, bearing the names of *Polystichum*, *Lastrea*, and *Cystopteris*.

The *Polystichums* form a small and very distinct group of evergreen Ferns, some forms of which rank among the most beautiful of our native species. They once, along

with *Lastrea*, formed part of the genus *Aspidium*, in consequence of their having round seed-patches covered by a scale. From *Lastrea*, however, the *Polystichums* are known by their having the scale-like cover of the sori circular, without a lateral notch, its attachment being by a little stalk in the centre of the under side; which form of attachment is called peltate. To a practised eye they are also known by their more rigid texture, and by their having altogether a more spiny appearance than even the spinulose species of *Lastrea*. The *P. Lonchitis*, the alpine form of the genus, is strictly evergreen; and the other species acquire this character when in a sheltered situation; but if they are much exposed, the fronds will be killed by severe frosts. In general, they retain their fronds without much disfigurement from frost quite through the autumn, and often far into winter. The British species of *Polystichum* are three in number, one of these being very prolific of interesting varieties.

The name *Polystichum* is compounded of two Greek words—*poly*, and *stichos*, signifying *many*, and *order;* and it is applied to these plants in allusion to the numerous regular lines of sori, which are seen distributed over the fronds.

Polystichum Lonchitis, *Roth.*

The Alpine Shield Fern, or Holly Fern.

(Plate IV. fig. 2.)

This Holly Fern is a rigid and prickly-looking species; whence comes one of its English names. It has a scaly tufted stem, from the crown terminating which the young fronds are produced early in each spring. The fronds remain fresh and vigorous until after those of the succeeding year are developed; so that the species is truly evergreen in its habit of growth. The size of the fronds is very variable; sometimes they are not more than six inches long, and cultivated plants do not often much exceed this stature. In damp and but slightly elevated situations it becomes more luxuriant, the fronds sometimes attaining a foot and a half in length, and then having a vigour and robustness of aspect never acquired, as far as we know, in cultivation, at least in England. The climate of Ireland seems more congenial to it. The fronds are once pinnate, and narrow in outline, their figure being linear-lanceolate. The pinnæ are short, crowded, and between sickle-shaped and crescent-shaped, the upper side at the base having an ear-shaped projection, called an

auricle, while the lower side of the base is, as it were, cut away. The margin is set with spinous teeth. The veins are twice branched, the branches extending to the margin without joining with others. The clusters of spore-cases form a line parallel with, and on each side of the midrib, and are covered each by a membranous circular scale, which is attached by a short central stalk.

This is a true Rock Fern, occurring on the bleak mountains of Scotland and in the milder climate of Ireland, as well as, rarely, in the north of England and Wales. It is very distinct, and, when vigorous and healthy, not inelegant, but is exceedingly difficult of cultivation, and is seldom seen thriving under artificial treatment.

The Holly Fern has been at different times called *Aspidium Lonchitis* and *Polypodium Lonchitis.*

Polystichum aculeatum, *Roth.*

The Common Prickly Shield Fern.

This species is almost evergreen in a sheltered situation, and is one of those which are well suited by boldness of character for the decoration of rocky scenery. It is a stout plant, having the fronds a couple of feet or more long, and springing from a stout tufted stem or crown, whence they

grow up in a circle, about the month of April, and take a somewhat erect position. Their form is lanceolate,—in the most perfect state of the species broadly lanceolate, but in a variety presently to be referred to, very narrowly lanceolate. The texture is harsh and rigid, the upper surface dark green, and shining, and the short stipes densely enveloped in rust-coloured membranous pointed scales. The fronds are bipinnate, with alternate pinnæ, these pinnæ being again more or less perfectly divided into a series of pinnules, which are either decurrent,—that is, insensibly merging in the substance of the rachis which supports them,—or else, are tapered to a wedge-shaped base, and attached to the rachis by the point of the wedge. The general form of these pinnules is somewhat elongately crescent-shaped, the upper base being extended into a small auricle, or enlarged lobe, and the lower base, as it were, sloped away; while the apex is tapered off to an acute point, and the margin is serrated with spiny teeth. The veins are alternately branched, and do not join together or anastomose, but extend free to the margin; and the fructification, which is generally abundant, and often crowded, is ranged in a line on each side the midrib of the pinnules, and also on the larger pinnules on each side

the midvein of the basal lobes or auricles. The indusium is circular, and attached by a little depression or stalk in its centre.

The variety **lobatum**, considered a distinct species by some botanists, differs chiefly in the narrow outline of the frond, and in the pinnules being much more decidedly decurrent, that is, running together at the base. Every possible variation in the consolidation of the pinnules is to be met with, between the typical bipinnate form of *Polystichum aculeatum* and a simply pinnate form of the species, which, from its resemblance to *P. Lonchitis*, has been called *lonchitidioides*. This latter form, owing its origin to the peculiar circumstances of growth only, cannot be considered as a permanent variety, but the intermediate state,—that which bears the name *lobatum*, which is the most common of these abnormal forms, is at least sufficiently different to be considered a variety.

This common and free-growing Fern is found in hedge-banks, and similar situations; and being abundant, easily cultivated, nearly evergreen, and withal possessing considerable elegance of growth, has much to recommend its admission to a prominent position in the Fern-garden.

This plant is often even now referred to the genus

Aspidium, and was formerly included under that of *Polypodium*.

Polystichum angulare, *Presl.*

The Angular-lobed, or Soft Prickly Shield Fern.

(Plate V. fig. 2.)

This is a strong-growing, tufted-stemmed species, sometimes forming large masses. The fronds are lanceolate, from two to four or five feet high, persistent through ordinary winters, and in sheltered situations retaining their verdour unimpaired until the new fronds are produced. It is one of the most graceful of all the native species. The stipes, which varies from a third to a fourth of the length of the entire frond, is very shaggy, with reddish chaffy scales, which scales, though of smaller size, are continued throughout the upper parts of the frond. The fronds are bipinnate, with numerous tapering, distinct pinnæ, having their pinnules flat, somewhat crescent-shaped, from the prominent auricle at the anterior base, often bluntish at the apex, but sometimes acute, always with spinulose marginal serratures, and sometimes, in a few of the lower pinnules, with deep lobes, so that the pinnules become pinnatifid. The pinnules are tapered to

a broad-angled base, the lines of which usually exceed a right angle, and they are attached to the rachis of the pinnæ by a short, distinct, slender stalk, which does not form a line with either margin. The pinnules have branched free veins; and the sori are generally ranged in a row on each side the midrib, and are covered by a peltate scale or indusium.

The highly-developed form of the species alluded to as having its basal pinnules deeply lobed, is the variety **sub-tripinnatum.** It is not uncommon, and does not differ materially in any other particular but that of the division of the pinnules; being, however, rather more lax than the usual forms, it is one of the most elegant of them all. The variety **decompositum** is a form still more divided in the same way.

The variety **proliferum** is another very elegant and highly-developed form. This has the pinnules narrowed and attenuated, more or less lobed; and the stipes and rachis bear freely little buds or bulbils, which become young plants. It has been found in Devonshire.

The variety **imbricatum** is a very remarkable form, differing from the type in the very narrow linear-lanceolate outline of the frond, as well as in having the pinnules,

which are roundish-oblong, so closely placed that they overlap each other. It also bears young plants on the stipes below the surface of the soil. It was found in Somersetshire.

Another exceedingly curious form is that which we have called **alatum**. In this the fronds are rather small; and the pinnules are connected by a very obvious leafy expansion which margins the rachis, forming along the side of the latter what is technically called a wing. This is also a Somersetshire variety.

The variety **cristatum** is one of much beauty. The extremity of the frond, and the extremities of all the pinnæ, are expanded into tassel-like tufts, as occurs in the tasselled or crested varieties of the Male Fern and the Lady Fern.

There are many other variations; some with narrow acute pinnules, some with blunt rounded pinnules, others with the pinnules deeply serrated, and some very conspicuously spinulose. In certain very elegant forms, the pinnæ and pinnules, and lobes and teeth, are exceedingly irregular in size and form. The varieties, too numerous to enumerate here, will be found in our "Handbook."

This is a not uncommon Fern, growing in hedge-banks

and in lowland woods, preferring, as do most if not all the larger Ferns, the presence of plenty of free (not stagnant) water. As a cultivated plant, either for pots or rockwork, it is most desirable, and acquiring, as it does, considerable size, it may be made to produce some striking effects in ornamental scenery.

Like its congeners, this was formerly, and now is by some, considered to be an *Aspidium.*

Genus V. LASTREA, or BUCKLER FERN.

The *Lastreas* are known from the other groups formerly included with them in *Aspidium*, by having their indusium, or seed-cover, roundish in outline, with a lateral notch, so that it becomes kidney-shaped, and is attached to the frond by the notched part. This group includes some of the largest and most common of our native species, and nearly all of them are remarkable for their elegance. Several of them retain their fronds through the winter in sheltered situations; but, with one exception, they are not strictly evergreen, and in exposed situations are bare during winter.

Of the *Lastreas*, seven or eight British species are usually recognized, the number varying according to the value put upon certain differences in the plants by different authors.

The name *Lastrea* commemorates a zealous botanist and microscopical observer, M. Delastre, of Chatelleraut. It is often incorrectly written *Lastræa*.

Lastrea Thelypteris, *Presl.*

The Marsh Buckler Fern. (Plate VI. fig. 1.)

This is called the Marsh Fern from its growing in marshes and boggy situations. It has a slender, extensively creeping caudex or stem, which is usually smooth and of a dark colour, producing matted fibrous roots. The annual fronds, produced about May, and perishing in the autumn, usually grow about a foot high, the fertile ones taller; but sometimes, when the plants are vigorous, they reach the height of two or three feet. They are of a delicate texture, pale green in colour, lanceolate, and pinnate. The pinnæ are mostly opposite, a short distance apart, and pinnatifidly divided into numerous crowded, entire, rounded lobes. The lobes in the fertile fronds appear narrower and more pointed than those of the

barren, but this is on account of their margin being revolutely bent under. The venation of the lobes of this Fern consists of a distinct, somewhat wavy midvein, from which alternate venules branch out, these being usually forked, and both branches bearing a sorus half-way between the margin and the midvein. The sori, which are numerous and closely placed, often become confluent, and are partially concealed by the bent-back margin. The indusium, or cover of the spore-cases, is in this species small, thin, and shapeless, and is soon thrown off and lost.

The Marsh Buckler Fern has a wide geographical range, and in England and Wales occurs in numerous localities; in Scotland and Ireland it is rather uncommon.

It is not a very attractive species for cultivation, but grows freely if planted in a moist peaty situation, where its rambling stems have room to spread. It has been severally referred, under the individual name of *Thelypteris*, to the families of *Aspidium*, *Polypodium*, *Acrostichum*, and *Polystichum*, by various botanical writers. The names of *Thelypteris palustris* and *Hemestheum Thelypteris* have also been given to it.

Lastrea montana, *Moore.*

The Mountain Buckler Fern, or Heath Fern.

(Plate VII.)

This is a very elegant species, the fronds growing shuttlecock fashion around the central crown which terminates the stem, to the height of from two to three feet. The plant is so fragrant, that when drawn through the hand it may be recognized from its kindred by this circumstance alone. The fragrance is due to the presence of numerous minute glandular bodies on the lower surface, which, being bruised when the plant is handled, give out a strong peculiar balsamic fragrance, by no means disagreeable, accompanied, if more roughly handled, by the peculiar starchy odour which many Ferns possess.

The fronds are annual, springing up about May, and enduring through the summer. They are erect, lance-shaped in their outline, pinnately divided; and there is this about them remarkable, that the stipes is unusually short, the leafy part being continued nearly down to the ground, and the lower pinnæ becoming so short that the frond tapers downwards as much, or perhaps more, than it does towards the point. The pinnæ generally stand oppo-

site, and are narrow, tapering, and pinnatifidly divided, bearing their fructifications almost close to the margins of the segments, and in most cases very abundantly. In this species the divisions of the fronds are flat, not revolute, as in *L. Thelypteris*, which most resembles it. Each segment or lobe has a distinct and slightly sinuous mid-vein, which is alternately branched, the branches simple or divided, and bearing the spore-cases in clusters near their extremity.

This plant is found most luxuriant in woods, but occurs profusely on mountainous heaths. It may be considered common in England, Wales, and Scotland—in the latter country often very profuse on the mountain-sides; but in Ireland is much more rare. As a garden plant, it is effective for shady rockwork, and when established, grows freely if kept sufficiently moist.

Besides the name we have here adopted, this Fern has borne the following titles:—*Aspidium Oreopteris*, *Polypodium Oreopteris*, *Lastrea Oreopteris*, *Phegopteris Oreopteris*, *Polypodium montanum*, *Polystichum montanum*, and *Hemestheum montanum*

Lastrea Filix-mas, *Presl.*

The Male Fern, or Common Buckler Fern.

(Plate VIII.)

The Male Fern is so called from its robust appearance, in contrast with the more delicate, though similar, Lady Fern, or *Filix-fœmina*. It is one of the species which grow up annually, the fronds being destroyed by the frosts of winter, unless the situation be very sheltered, when the old fronds often remain green until the young ones are produced in spring. The fronds are produced in a tuft around a central crown, and when vigorous and perfectly developed, the whole mass forms a very striking object. The ornamental qualities of this Fern are, however, often unheeded, on account of its commonness; but surely it is not wise, that objects imbued with that mystery—vitality, and possessing intrinsic grace and beauty in no ordinary degree, should be despised because a beneficent Creator has scattered them about our path with a lavish hand.

The Male Fern is a robust-growing species, having the stipes of the fronds densely scaly. The fronds grow from about a couple of feet to three or four feet in height, and are of a broad lance-shaped figure. In division they are

what is called bipinnate, though less decidedly so than occurs in some other species, for here those pinnules only which are nearest to the main rachis are quite separated from each other. The pinnæ are narrow and tapering, with a few of the lowest pinnules distinct, the rest united at the base. These pinnules are of an obtusely oblong form, and serrated on the margin. The fructification of this plant is generally very copious, and is usually confined to the lower half of the pinnules, where it is crowded.

This is one of the best of the British species to study with the view of understanding the fructification of Ferns; for here the indusium, a very important organ, is seen to be remarkably prominent in fronds which have about reached their full development. In that state the indusium is as yet closed over the clusters of spore-cases, and will be seen to consist of a lead-coloured, tumid, kidney-shaped, conspicuous scale, which, at the proper time, becomes elevated on one side, to allow the dispersion of the spores. This may readily be noticed by watching the progress of the fronds just as they reach their full growth. If they are gathered in that state for preservation in the herbarium, they burst open more or less, in the pro-

cess of drying, before they yield up their vitality. These covers are at first little white scales.

The veins of this species are also readily seen, and each pinnule will be found to have a flexuous midvein, with alternate venules, which are simple or forked, or sometimes three-branched in different parts of the pinnule, the three-branched ones, if present, occurring at the base, and the unbranched ones at the apex. The sori are borne on the branch towards the apex of the pinnule, and form a line of dots at a little distance on each side of the midvein.

The variety of this Fern we have called incisa in our "Handbook of British Ferns," has been named *Lastrea erosa*, and *L. Filix-mas erosa*, by others, in the belief of its being identical with a plant called *Aspidium erosum* by Schkuhr,—a belief to which we do not conform. It has also been called *Lastrea affinis*. It is a magnificent Fern, much larger than the commoner form of the plant, growing four or five feet or more in height, and having the same general features as those already described, only that it is larger in every part, and its pinnules are more elongated and tapering towards the point, more deeply cut along the margin, the branches of the venules more numerous, and the sori produced over a larger proportion of the surface

of the pinnule, so as, in fact, usually almost to reach to its apex.

The variety **paleacea**, the *L. Borreri* of Newman, is chiefly remarkable for the abundant and usually golden-tinted scales which clothe its stipes and rachis. It is normal in form, variable in size, deep green above, and of a pale glaucous green beneath ; the pinnules are remarkably blunt at the apex, and the margin of the indusium is strongly inflected, so that the sori are not liable to spread out as they do in the other forms. It is a not uncommon variety.

The variety **pumila** has the pinnules changed into small rounded lobes, and the fructification reduced to a single row of spore-cases on each side the rib of the pinnæ. This has also been called *Lastrea Filix-mas abbreviata*, and is very distinct and permanent.

One of the most remarkable variations occurs in the variety **cristata**, which is one of the most beautiful of British Ferns. In this, the points of the frond and of the pinnæ are dilated into a fringe or tassel, a very curious kind of transformation of the parts, and quite constant. There are two or three modifications of this mode of variation. Several other varieties are known.

The Male Fern is found abundantly all over the country in shady situations; the larger varieties are met with here and there in similar places; the other varieties are rare. It is one of the most easy of all Ferns to cultivate, and is very suitable for cool, shady rockwork, or for shady walks in woody scenery.

Like its allies, this species has been at different times called *Polypodium*, or *Aspidium*, or *Polystichum;* but the specific name *Filix-mas* seems to have been generally preserved to it.

Lastrea rigida, *Presl.*

The Rigid Buckler Fern. (Plate IX. fig. 1.)

This very elegant Fern is of moderate size, growing upright or spreading, and from one to two feet in height. It is one of the most elegantly divided of the *Lastreas*, the pinnules being all doubly and very evenly toothed. The fronds issue from the crown of a comparatively thick stem, and are annual in their duration, greeting the approach of summer with the fresh green of youth, and shrinking dead and shrivelled from the icy touch of winter. The fronds are narrowly triangular, rarely somewhat lanceolate; and they are bipinnate, with narrow tapering

pinnæ and oblong blunt pinnules, which are cut into broad rounded segments, again notched into a varying number of pointed but not spinulose teeth. The stipes is densely scaly. The veining is very similar to that of the large variety of *L. Filix-mas;* the pinnules having a flexuous midvein, with alternate venules again pinnately branched. The clusters of spore-cases are borne on the lowest anterior branch of each venule, that is, on the lowest veinlet on the side towards the apex of the pinnule, and they are covered by a kidney-shaped indusium, which does not fall away. Over the fronds are scattered numerous small sessile glands, which, when slightly bruised, give out a faint and not unpleasant odour.

This Fern seems confined to the limestone districts of the north of England, growing at considerable elevations. It was first found at Ingleborough, in Yorkshire, and has been since met with on the limestone ranges of Westmoreland and Lancashire. In cultivation it is usually a free-growing plant, more lax than in the wild state, and one of the most elegant of the larger kinds.

The generic names of *Polypodium*, *Aspidium*, and *Polystichum*, have been applied to this plant; and it has been more recently separated, with others, by Mr. Newman,

under the name of *Lophodium*, a perfectly unnecessary and characterless group.

Lastrea cristata, *Presl.*

Crested Prickly-toothed Buckler Fern. (Plate VI. fig. 2.)

This is the simplest of the British forms of a group of species intimately related to each other, and formerly known as the Crested Shield Ferns. This group consists of the plants to which the several names of *L. cristata*, *uliginosa*, *spinulosa*, *dilatata*, and *æmula*, have been given; and they form a series so closely connected, that some very eminent botanists consider them as all belonging to two species only, *cristata* and *dilatata*, the other forms being regarded as mere varieties. This view of the subject is, we believe, almost exclusively confined to those whose lot it has been to study the Ferns in a general way, and mainly from a large suite of herbarium specimens. The magnitude of the subject, in such a form, necessarily leads to generalizations, and the acknowledgment only of the most obvious differences. Those, on the other hand, who study a smaller series, confined to certain geographical limits—our own country, for example—being unperplexed by the magnitude of their subject, are content to admit

of differences of another kind, less obvious, perhaps, at the first glance, but doubtless of sufficient importance for the separation of species. This book being intended for the use of those who are only likely—at least whilst they require its aid—to study the smaller group, we shall point out the minuter differences which serve to separate the series of Crested Ferns into several recognizable forms.

Lastrea cristata grows with very erect, narrow, oblong fronds, whose deltoid pinnæ are not quite divided down to the central rib, and the lobes into which they are separated are attached by the whole width of their base, and are oblong, with a rounded apex. The stipes is sparingly furnished with broad, obtuse, membranous, whole-coloured scales, and the caudex is creeping.

Lastrea uliginosa has two or three sorts of fronds; one set, the barren earlier ones, has much resemblance to those of the preceding, the other sets producing fructification, being bipinnate at the bases of the pinnæ, the fronds narrow-oblong, the lobes tapering to a point; the scales of the stipes are broad, blunt, and whole-coloured; and the caudex is creeping. This connects *cristata* with *spinulosa*.

Lastrea spinulosa grows erect; has narrow, lance-shaped,

bipinnate fronds, rather more deeply divided than the foregoing; it has whole-coloured blunt scales to the stipes, and a creeping caudex.

Lastrea dilatata grows more spreading; has still broader or ovate lance-shaped fronds; the stipes is clothed with lance-shaped scales, which are darker-coloured in the centre than at the margins; and the caudex is erect. This is a very variable plant.

Lastrea æmula grows spreading, is evergreen, and has fronds smaller than the last; they are triangular, bipinnate, and the segments have their edges curved back, so as to present a hollow upper surface; the scales of the stem are narrow, pointed, and jagged; and the caudex is erect.

The true Crested Buckler Fern, *L. cristata*, though not a very elegant plant, is of considerable interest on account of its rarity. It forms a thick creeping stem or root-stock, from which a limited number of narrow, very upright fronds arise early in May, and attain the average height of a couple of feet. The fronds are destroyed in autumn by the frosts. Their outline is linear-oblong; that is, from a narrow width at the base of the leafy portion—say two and a half or three inches in the case of fronds of the

average height—the margins run nearly parallel almost to the apex, where they narrow to a blunt point; the stipes rather exceeds a third of the length of the entire frond, and is proportionally stout, maintaining this proportion upwards through the leafy portion of the frond; on its lower part it bears a few scales, which are blunt ovate, membranous, and of a uniform light brown colour. The pinnæ are elongate-triangular in their outline, the broadest occurring at the base of the frond, the upper ones becoming gradually narrower, but all of the same general form, namely, widest at the base, gradually tapering to the apex. They are not divided quite down to their midrib, so as to become, in technical terms, pinnate, but each segment is attached by the entire width of its base, and connected by a narrow extension of its base with the segment next behind it; all the segments having their apices inclined rather towards the apex of the pinna. These lobes of the pinnæ are themselves oblong, with a rounded apex, and a crenately-toothed margin.

The midvein of the lobes takes a tortuous course, and gives off lateral branches, which divide into several secondary branches, one only of which, that nearest the apex of the lobe, bears a sorus. The fructification is confined to

the upper portion of the frond, and often remarkably so; less frequently it extends downwards to the pair of pinnæ next above the basal ones. The spots of spore-cases are covered by a kidney-shaped scale or indusium, having an entire margin, and become mature in August and September.

This species occurs only on boggy heaths, and that in but few places in Britain, confined, we believe, to the following counties:—Nottinghamshire, Cheshire, Norfolk, and Suffolk. It is easily cultivated, either in a pot, or planted in a damp somewhat shady situation, and prefers a peaty soil.

The variety uliginosa, the *L. uliginosa* of Newman, is exactly intermediate in its general appearance and its characters between *cristata* and *spinulosa* — these three plants agreeing, in their erect habit, pallid blunt scales, and creeping caudex. This Fern forms a stout creeping crown or root-stock, having a tendency to multiply by lateral offshoots. The stipes has ovate pallid scales. The fronds grow nearly erect to the height of from two to three feet; and these erect fronds bear the fructification. Other fronds, however, are produced, which are barren, and do not grow so erect, nor put on the same form as the fertile

ones, but closely resemble those of *cristata*, the fertile ones having much more the appearance of those of the *var. spinulosa*, only that they are narrower, and have narrow pinnæ. The outline of these fertile fronds is narrow lance-shaped, the pinnæ having a narrow tapering form, and the pinnules being oblong-pointed, with rather deep, serrated, marginal notches, the serratures terminating in a fine point. The midvein of the pinnules is tortuous, giving off branched lateral veins, the anterior of which bears a sorus, so that these latter are placed in two regular lines lengthwise on each pinna; the sori are produced from the base to the apex of the frond, and are covered by even-margined, kidney-shaped scales or indusia. The barren fronds are broader, usually shorter, less erect, and their pinnules are of a broader, blunter form, and more closely placed, than those which are fertile. Sometimes after the growth of the first set of fertile fronds others spring up which are also fertile, but have the appearance described above as peculiar to the barren ones; these fronds being undistinguishable from cultivated fronds of *L. cristata*. This plant is found on boggy heaths, generally in company with *cristata* and *spinulosa;* but it is comparatively rare.

The variety **spinulosa**, known as the Narrow Prickly-

toothed Buckler Fern, is a rather erect-growing kind, with a stout creeping stem or root-stock, which becomes branched, so that several crowns are generally found forming one mass, these crowns being readily separable; and in this way the species may be increased with much facility. The stipes is rather sparingly furnished with semi-transparent scales of a broad or bluntly ovate form, in which particular it agrees with *cristata* and *uliginosa*, but differs from *dilatata* and *æmula*. The fronds grow from one to three feet high, and are bipinnate, the pinnæ having an obliquely tapering form, from the inferior pinnules being larger than the superior ones; this is most obvious at the base of the fronds, where the pinnæ are broader than they are towards the apex. The lower pinnules on the basal pinnæ are of an oblong form, somewhat narrowing upwards, the margins deeply incised, the lobes being serrated, and the teeth somewhat spinulose; those towards the apex of each pinna, as well as the basal ones of the pinnæ nearer the apex of the frond, become gradually less and less compound; so that, although the margins are still furnished with spinulose teeth, they gradually lose the deep lobes which are found on the lowest pinnæ. In all the more compound Ferns, there is a similar difference of form according to the

position of the pinnules, and in all such cases it is usual to describe only those which are the most complete, namely, such as are situated at the base of a few of the lowermost pinnæ. The venation in the less divided pinnules consists of a midrib, less tortuous than in *cristata*, which gives off branched veins; the lower anterior venules proceeding from these bear the sori, about midway between the rib and the margin; the clusters of spore-cases thus forming an even double row on each pinnule. When the pinnule is more divided, the same arrangement of the sori occurs on the lobes, the branches of the lateral veins or venules being then more numerous. The sori are covered by kidney-shaped indusia, having the margin entire. This Fern is met with in marshy places and damp woods; and in such places it does not appear to be uncommon. It is very easily cultivated on damp banks or rockwork, and, when grown in pots, requires to be plentifully supplied with water.

Lastrea cristata has received the additional names of *Polypodium*, *Aspidium* and *Polystichum cristatum*, *Dryopteris cristata* and *Lophodium Callipteris*. A similar series of synonymes belong to the variety *spinulosa*.

Lastrea dilatata, *Presl.*

Broad Prickly-toothed Buckler Fern. (Plate IX. fig. 2.)

This is one of the most compound and handsome as well as common of our native Ferns. It forms a large tufted stock or stem, and has broad arched fronds, which average about a couple of feet in height, though it is sometimes met with smaller, and often, when luxuriant, reaches a height of five feet. They are almost always more or less drooping or curved, and seldom grow erect, as those of *cristata*, *uliginosa*, and *spinulosa* do. The general outline is ovate-lanceolate, though in this, one of the most variable of Ferns, the form varies considerably, becoming sometimes narrow elongate lanceolate on the one hand, and short broad almost triangular on the other. The following description applies to the more usual, or what is considered the typical form.

The fronds are ovate, lance-shaped in outline, on a stipes of moderate length, which stipes is much thickened at the base, and densely clothed with entire, lance-shaped, pointed scales, of a very dark brown colour in the centre, but nearly transparent at the margins. They are bipinnate, with elongate-triangular or tapering pinnæ, placed

nearly opposite, and having more or less of obliquity, from the larger development of the lower side. The pinnæ are pinnate, and the pinnules near their base often so deeply divided as to be again almost pinnate; the rest are pinnatifid, or in the upper parts merely deeply-toothed, but the margins, whether deeply or shallowly-lobed, are set with teeth which end in short spinous points. The veining is very similar to the more compound parts of the allied species. The fructification is produced in great abundance, the sori being ranged in two lines crosswise the pinnæ on the larger lobes, or lengthwise on the less divided parts. The sori are covered by kidney-shaped scales or indusia, which are fringed around the margin with projecting glandular bodies.

There is met with a variety or form of this Fern, which has the fronds shorter, almost triangular in outline, and often remarkably convex; it has, moreover, usually a dark green colour, often with a brownish tinge. It is found in more exposed places than the normal form, and is not uncommon.

Another variety, sometimes called nana, seems chiefly remarkable for its small size, seldom exceeding six or eight inches in height, which peculiarity it maintains under cul-

tivation. It is rather rare, or at least local in its occurrence.

The variety **collina**, the *Lastrea collina* of Newman, is a distinct-looking plant. The form of its fronds is ovate, drawn out to a long narrow point, or narrow oblong lanceolate ; the pinnules, which are obtusely ovate, and have a broad attachment at the base, have the serratures on their margin broader and less spinulose than in the common form. It has narrow scales with a darker centre. It was first noticed by the Rev. G. Pinder on the hills of Westmoreland, and has been found elsewhere.

The variety **glandulosa**, another form of this plant, is of larger growth, and its surface is covered with glands ; the scales of its stipes are broader and paler, and it has a somewhat creeping habit, so that it approaches near to the *spinulosa* form of *L. cristata.* This Mr. Newman proposes to name *Lastrea glandulosa.* It is intermediate both in character and aspect, between *spinulosa* and *dilatata ;* and was originally found in the Forest of Dean.

The variety **dumetorum** is of comparatively small size, and has oblong-ovate or ovate-triangular fronds, covered with glands ; the stipes is covered with narrow, pointed,

pale-coloured scales. It occurs on the hills of Westmoreland and Wales, and what seems the same plant, from the Scotch Isle of Arran, has been called *L. maculata* by Dr. Deakin.

A more detailed account of the foregoing and of several other variations of this species, will be found in our *Handbook of British Ferns*, and in *The Ferns of Great Britain, Nature-printed.*

Lastrea dilatata was the *Aspidium cristatum* of some of the older botanists; and has since received numerous names; among which occur—*Lastrea multiflora*, *Polystichum multiflorum*, *Lophodium multiflorum*, and *Aspidium dilatatum.*

The common forms of this species, though found in drier places than *cristata* and *spinulosa*, are nevertheless partial to moisture, being found in damp, shady hedge-banks and woodlands. It is hardy, and easily cultivated.

Lastrea æmula, *Brackenridge.*

Hay-scented, or Triangular Prickly-toothed Buckler Fern.

This species is the *Lastrea recurva* of some writers, and the *Aspidium recurvum*, *Lophodium recurvum*, *Nephrodium fœnisecii*, and *Lastrea fœnisecii* of others.

It proves, however, to be the old *Polypodium æmulum* of the last century, which name must be restored.

This Fern is a moderate-sized and very elegant plant, of drooping habit, and possessing a crisped appearance, from the recurving of the margins of all the segments of the fronds. It grows from one to two feet high, and from its tufted stem produces a spreading circle of triangular arching fronds, the stipes of which, of about the same length as the leafy part, is thickly clothed with small, narrow, jagged, pale-coloured scales. The fronds are bipinnate, the lowest pair of pinnæ always longer and larger than the rest, and the pinnules on the inferior side of the pinnæ larger than those on the superior side. The pinnules are of oblong-ovate figure, and the lowest of them often divided again into a series of oblong lobes, for the most part decurrent, but sometimes slightly stalked ; the margin is cut into short spinous-pointed teeth. The veins of the pinnules are alternately branched from a sinuous midvein, and these veins give off two or three alternate venules, the lowest anterior one bearing the sorus. The exact ramification of the veins depends upon the degree in which the pinnules or lobes are divided. The fructification is distributed over the whole under-surface, the sori being

pretty evenly distributed in two lines along each pinnule or lobe; they are covered by small reniform indusia, which have their margin uneven, and fringed with small round stalkless glands. The whole frond is covered with similar glandular bodies.

This Fern, which is most abundant in Ireland and the western parts of England, occurs in damp sheltered woods, and on shady banks and rocks. It is of an elegant drooping aspect, and is cultivated without difficulty. It is the more valuable as a pot plant, from its moderate size and its evergreen character.

Genus VI. ATHYRIUM.

The genus *Athyrium*, that to which the Lady Fern is referred, is one of the most variable among our native Ferns; though the varieties it presents, and which have been from time to time looked upon as so many distinct kinds, are now almost universally considered as different phases of one species. The species certainly puts on many appearances, which fact seems inappropriate to its name;

but all the various forms are plants of great delicacy and beauty. The fronds are of annual duration, varying in size from tufts of a few inches high, to plumy masses of the height of three or four feet; and the texture is thin, and almost transparent; on which account the nature of the venation, and of the connection of the parts of fructification, may be here very well seen and studied. The genus serves to connect the *Aspidium*-like and the *Asplenium*-like groups of Ferns, being of intermediate character. It differs from the former in having the sori elongate instead of round. The sori, which form short lines, are sometimes curved at the end, or even horseshoe-shaped, and in age, being short, and often dilated, approaching the rounded form, the Lady Fern has, by many writers of discrimination, been placed in the old genus *Aspidium*; but if the fructification is examined while young, immediately before or after the indusium has burst, its true character will readily be seen. We have here an illustration of the inconvenience which arises from the preservation as herbarium specimens, only of such as have the fructification quite mature; for this, without doubt, was the cause of the Lady Fern having been referred to the family of *Aspidium*, with which it has no real

affinity. The affinity of the Lady Fern is properly with the *Aspleniums*, and there is less reason to dispute the conclusions of those who actually place it as a species of *Asplenium;* although, as the hippocrepiform sori indicate a real difference between them, and the genus *Asplenium* is rather a crowded one, it is a convenience to have them separated. The mark by which the *Asplenium*s and their allies are known, in addition to the elongated form of the sorus, is its position on the *side*, not the back, of the veins; the receptacle being lateral, as it is said. The *Athyrium* group is known from *Asplenium* by having its indusium fringed on the free margin by capillary segments, and by the horseshoe-shaped basal sori; while in the *Asplenium* the margin of the indusium is without the membranous fringe, and the sori are not turned back along the reverse side of the vein. There is, as already mentioned, only one indigenous species of *Athyrium*. The *Asplenium fontanum* is sometimes admitted, but it does not properly belong to this genus.

The name is derived from the Greek, and comes from *athyros*, opened; the allusion being to the position into which the indusium is forced by the swelling spore-cases, bursting out, as it were, like an opened door, after the

growth of the spore-cases has disrupted its anterior margin, and eventually becoming quite turned back.

Athyrium Filix-fœmina, *Roth.*

The Lady Fern. (Plate XI.)

The Lady Fern claims precedence over every other British species, on account of the exquisite grace of its habit of growth, the elegance of its form, and the delicacy of its hue. This is more or less true of every one of the various conditions in which it occurs. The habit of the plant is tufted, the caudex of the larger varieties often with age acquiring some height, and elevating the circlet of fronds on a low, rude pedestal; this stem, however, never acquires more than a few inches in length. In winter, the summit of this stem, whether a tuft seated close to the ground, or a few inches elevated, is occupied by a mass of incipient fronds, each rolled up separately, and nestling in a bed of chaffy scales. In May or June, these fronds become developed, a score or upwards being usually produced, from large vigorous stems. They reach maturity early in the summer, during which time a few additional fronds are generally developed from the centre; and the whole of them are, under ordinary circumstances,

destroyed by the autumn frosts. The form of the fronds is lanceolate, more or less broad; and they are supported on stipites which are scaly at the base, and usually about a third of the entire length of the fronds. The division of the fronds is what is called bipinnate; the pinnæ are always lanceolate, more or less drawn out at the point, and they are always again pinnate, though sometimes with the bases of the pinnules connected by a narrow leafy wing, but not so much so as to render them merely pinnatifid. The pinnules, however, are more or less lobed or pinnatifid, the lobes being sharply toothed in a varying manner. The delicate herbaceous texture of the frond renders the venation very distinct; it consists, in each pinnule, of a wavy midvein, from which proceed alternate veins, which again produce alternate venules, and on the anterior side of this series of veins, at some distance from the margin, is borne an oblong sorus. In the larger and more divided pinnules the veining is more compound, and more than one sorus is produced from each primary vein, which thus becomes a midvein, with branches on a smaller scale. The sori are themselves oblong, a little curved, the basal ones usually hippocrepiform, or horseshoe-shaped, and they are covered by indusia of the same form as them-

selves. The hippocrepiform sorus is formed by the lateral line of spore-cases crossing the vein and returning on the opposite side; sometimes in the case of the curved, or horseshoe-shaped sori, the indusium is apparently almost circular, with a lateral notch, and in this state the fructification somewhat resembles that of *Lastrea*. One side of the indusium is fixed longitudinally to the side of the vein which forms the receptacle; its other margin, the anterior one, or that towards the midvein of the pinnule, becomes free, and is fringed, or split into a number of hair-like segments. This description applies to the commoner forms of the Lady Fern; but even these are very variable in size, according to the situation and circumstances which influence their development, sometimes scarcely exceeding a foot in height, and at other times reaching the height of four or five feet, the latter being the result of growth in a damp, shady situation, the former the consequence of a more exposed and drier locality.

The variety **rhæticum**, sometimes called *convexum*, differs from the forms already described in its more lady-like proportions, both its fronds, its pinnæ, and its pinnules being often smaller and usually more slender and narrower, or narrower-looking, than in them. The fronds

seldom exceed two or three feet in height ; they are erect, and their form is narrow-lanceolate ; the pinnæ are taper-pointed ; the pinnules set quite clear of each other, very narrow, that is, linear, with sharp points, the margins bluntly toothed, but rolled under so that very little of the toothing is seen ; the sori are very often confluent. It occurs in boggy places.

The variety **latifolium**, found a few years since in Westmoreland, is another very distinct and a strong-growing form. It differs from the common sort, in the elongate or oblong-lanceolate outline of its fronds, and in the broad, leafy, crowded development of its ovate irregularly-lobed pinnules, which are deeply toothed at the margin, with the curved sori lying near the sinus of the lobes.

The form called **molle**, which is perhaps only one of the smaller states of the common plant, has ovate-lanceolate fronds growing nearly erect, the lower pair of pinnæ being short and deflexed ; it has flat toothed pinnules, connected at their base by a slender wing to the midrib, and produces its sori distinct. This is a small form, often not more than about a foot in height.

The variety **marinum**, a very curious and distinct-looking plant, found by Dr. Dickie in a sea-cave at Aberdeen,

has now for several years stood the test of cultivation, its peculiarities being retained. It has rather small fronds, usually about a foot, or a foot and a half long, lanceolate, and remarkable for the manner in which they taper from their broad centre, equally towards the base and apex. These fronds have a spreading or horizontal mode of growth; their pinnules are oblong and bluntly toothed, the teeth being almost always quite simple, not two or three-notched, as is usual in the other forms; they are attached closely together, at right angles with the continuously-winged rachis of the pinnæ. The sori are very short, often curved in a horse-shoe form, and crowded.

There are, besides, several curious monstrous varieties of considerable horticultural interest. One called **multifidum**, of which several variations have now been met with, has the tips of all the pinnæ, as well as of the frond itself, multifid or tasselled, which gives it a very elegant appearance. Another, called **depauperatum**, or *ramosum*, is smaller, with the pinnæ reduced and irregularly tasselled, and the apex of the frond more deeply split into ragged-looking tasselled lobes. Another, called **crispum**, is a dwarf tufted plant, no larger than a bunch of curled parsley, which it much resembles, its fronds being curiously

branched, crisped, and tasselled. These, which are, strictly speaking, monstrosities, have retained their characteristics for many years in cultivation, and are very elegant plants, and great favourites in the garden.

The common Lady Fern is abundant in warm moist woods and hedgerows throughout Great Britain, and especially so in Ireland; it also occurs throughout Europe, and in Asia, Africa, and North America. The monstrous varieties were first found in Ireland; though the parsley-like one has also been found in Scotland, and in the Lake district; and some fine forms, in the way of *multifidum*, have been gathered in Guernsey.

None of our native Ferns are more easily cultivated than this. A rather boggy soil suits it best, and it loves shade and moisture; indeed, these latter conditions being fulfilled, soil becomes a secondary consideration. The moisture, however, though abundant, should not be stagnant. The Lady Fern is occasionally seen planted in the mouth of a cave or recess, by water, among shady rockwork; nothing is so lovely as a finely-grown plant of it so situated. As a pot plant it requires plenty of room, both for its roots and fronds, and must be liberally watered.

By the older botanists this plant was called *Polypodium*

Filix-fœmina. It was then transferred to *Aspidium*, under the name of *Aspidium Filix-fœmina;* and subsequently by other botanists it has been called *Asplenium Filix-fœmina*, which latter name is still generally given to it by those who do not adopt the genus *Athyrium.*

Genus VII. ASPLENIUM, or SPLEENWORT.

The British *Aspleniums* are small evergreen Ferns, with long narrow single sori lying in the direction of the veins which traverse the fronds; and by these marks they may be known from all other indigenous Ferns, excepting the *Ceterach*, which latter is readily distinguished from them by having the back of its fronds coated with brown scales, among which the sori are hidden. The genus is the type of the tribe *Asplenieæ*, which consists of Ferns having the elongate masses of fructification attached along the side of the veins, and covered by an indusium of the same elongated form as the sori themselves. The *Aspleniums* are known from their nearest allies, the *Athyriums*, by the latter having hippocrepiform sori, and the free

margin of the indusium fringed with capillary or hair-like segments, while the sorus in *Asplenium* is not thus curved, and the margin of the indusium is either quite entire or very slightly jagged. The Spleenworts are also evergreen, while *Athyrium* is deciduous. There are nine species of *Asplenium* indigenous to Britain, all of them small plants, interesting to the cultivators of Ferns.

The word *Asplenium* comes from the Greek *asplenon;* a name applied by old authors to some kind of Fern possessed of supposed virtues in curing diseases of the spleen.

Asplenium septentrionale, *Hull.*

The Forked Spleenwort. (Plate XII. fig. 3.)

A rare and diminutive Fern. The habit is tufted, large masses being sometimes formed; the fronds themselves are very small, from two to four or six inches long, seldom longer, slender, dull green, with a longish stipes, which is dark purple at the base. The leafy part—if, indeed, it can here be called leafy—is of a narrow elongate lance-shaped form, split near the end into two or sometimes three alternate divisions, or in the smaller fronds into the same number of teeth; each of the divisions of the frond

has its margin cut into two or more sharp-pointed teeth, the points of the larger teeth being very frequently bifid. The veins are reduced to a minimum; one vein enters each lobe, or if the frond is not lobed the stipes is continued upwards in the form of a vein; this becomes forked so as to send up one vein to each of the teeth into which the part is divided; and three or four long linear sori are produced in a very crowded manner within this small space; so that when, from age, the sori burst open the indusium, the spore-cases form a confluent mass over the whole under-surface.

The confluent mass of spore-cases arising from the crowded position of the sori, has led some authors to consider this plant an *Acrostichum*, the mark of which is to have the whole under-surface thus covered. Some of the sori being face to face, growing as they do from the inward side of each vein, and almost in juxtaposition, other botanists have been led to think it a *Scolopendrium*, the mark of which is to have the sori confluent in pairs face to face. If, however, the plant is examined while young, it will be seen that these resemblances are unreal, and that it is truly an *Asplenium*. It is thus that it has been called by the names of *Acrostichum septentrionale* and *Scolopen-*

drium septentrionale; to which *Amesium septentrionale* has to be added as another synonym.

In cultivation it requires sandy peat-soil mixed with rubbly porous matter; and in uncongenial situations the shelter of a close frame or bell-glass.

Asplenium germanicum, *Weiss.*

The Alternate Spleenwort. (Plate XIII. fig. 3.)

One of the rarest of our native Ferns, and perfectly distinct from *A. Ruta-muraria,* of which some botanists have thought it to be a variety.

The plant grows in little tufts, the fronds being from three to six inches high, sub-evergreen, narrow-linear in form, pinnate, divided into distant, alternate, wedge-shaped pinnæ, one or two of the lowest having generally a pair of very deeply-divided lobes, the upper ones more and more slightly lobed, all having their upper ends toothed or notched. The whole frond is quite small, and the parts narrow, which, added to their opacity, renders the venation indistinct; there is no midvein, but each pinna or lobe has a vein entering from the base, which becomes two or three times branched as it reaches the broader parts upwards, six or eight veins generally lying near together,

in a narrow fan-shaped manner, in each of the larger pinnæ, the smaller ones having a proportionately less number. Two or three linear sori are produced on a pinna, and these are covered by membranous indusia, the free margin of which is entire, or slightly sinuous, but not jagged; the sori at length become confluent.

It grows, but very rarely, in Scotland, and in the Lake district; and is found, but with a limited range, in other parts of Europe.

This kind is not only rare, but one of those which does not freely yield to artificial culture. It grows tolerably freely if potted in sandy peat-soil well drained by an admixture of rubbly matter, and kept under a bell-glass in a shaded frame or greenhouse; but the plants are very liable to die in winter. The safeguard is, not to allow any water to lodge about their crowns, nor to keep the bell-glass too closely or too constantly over them, especially in winter.

This species is often named *A. alternifolium* by British authors; but the name we have adopted claims precedence. It has also been called *Asplenium Breynii*, *Amesium germanicum*, and *Scolopendrium alternifolium*.

Asplenium Ruta-muraria, *Linnæus.*

The Rue-leaved Spleenwort, or Wall Rue.

(Plate XIII. fig. 1.)

A very diminutive, and not very attractive Fern, occurring abundantly on old walls, often in such situations little more than an inch high. It grows in tufts, insinuating its wiry roots, as is the case with all the mural species, into the crevices and joints of the masonry, and is not easily removed from such places in a condition suitable for planting.

The fronds are numerous, of a glaucous-green, varying between one and six inches long, with a stipes about half the entire length, the leafy part usually triangular in outline, and bipinnate. The pinnæ are alternate, with rhomboidal, or roundish-ovate, or obovate pinnules, sometimes wedge-shaped, with the apex abruptly cut off. The more luxuriant fronds are once more divided, so as to become almost tripinnate, the pinnules being deeply pinnatifid, and the lobes formed like the ordinary pinnules. When the plants are quite young, the fronds are simple and roundish kidney-shaped. At a later stage of development they are occasionally only once pinnate, with pinnatifid

pinnæ. The upper margins of the pinnules are irregularly toothed. The veins are rather indistinct, and there is no midvein ; but a series of veins arise from the base, becoming branched in their progress towards the apex, the number of ultimate branches usually corresponding with that of the marginal teeth. Several sori are produced near the centre of the pinna, covered by indusia which open inwardly with a jagged or irregularly sinuated margin.

A common species, confined to rocks and walls, occurring throughout Europe and in many parts of North America. It is not difficult of cultivation.

Other names for this plant are the following :—*Amesium Ruta-muraria, Scolopendrium Ruta-muraria.*

Asplenium viride, *Hudson.*

The Green Spleenwort. (Plate XIII. fig. 4.)

This Fern has such a general resemblance to *A. Trichomanes* as to have been mistaken for it by casual observers. It is, however, quite distinct, and is most readily known from *A. Trichomanes* by the colour of its rachis, which is green in the upper part, while in the latter it is black throughout. It is an evergreen tufted species, producing narrow, linear, simply pinnate, bright

pale-green fronds, ranging from two to eight or ten inches in length, supported by a short stipes, which is dark-coloured at the very base, but otherwise green, the rachis being entirely green. The pinnæ are small, generally roundish-ovate, rather tapered towards the base, and attached to the rachis by the narrowed stalk-like part, the margin being deeply crenated.

The venation is distinct : the midvein sends off alternately a series of lesser veins, which are either simple or forked, bearing the sori on their anterior side. The sori are oblong, covered at first by membraneous indusia, which are soon pushed aside ; the free margin is jagged or crenate.

A native of moist, rocky, mountainous districts in England, Scotland, and Wales; occurring also, though less frequently, in Ireland, and throughout Europe.

This neat-habited plant may be cultivated in pots in a close, damp, cold frame ; or on moist, shady rockwork, if covered over by a bell-glass. If exposed, it is apt to suffer from occasional excessive wet, which often does not properly drain away ; and also from the dry hot air of our summers. The object of covering it with a glass is to avoid both these casualties, and provided it is not kept too

close, it will then thrive well. The proper bell-glasses for these half-hardy Ferns are those with a small opening in the crown, which may be closed or not at pleasure, but in general is best left open. In pots it should have a gritty, porous soil.

Asplenium Trichomanes, *Linnæus.*

The Common Maidenhair Spleenwort. (Plate XIII. fig. 5.)

This is rather a diminutive plant, but, when in a vigorous state, has a very interesting appearance, from the contrast between its black stipes and rachis, and the bright green pinnæ, and from the regularity with which the latter are disposed. It grows in tufts, naturally introducing itself into the joints of old masonry and among the crevices of rocks, and producing numerous small slender fronds, of a linear form, in its most vigorous state nearly a foot long, but generally from three to six inches.

The fronds are evergreen, simply pinnate, on a rather short stipes, which is of a purplish black, the rachis also being of the same dark colour. The pinnæ are deep green, small and numerous, equal-sized, of a roundish-oblong figure, attached to the rachis by a stalk-like projection of their posterior base ; the margin is rather entire or crenated.

The pinnæ are jointed to the rachis, and when old are readily displaced, so that eventually the black rachis is left denuded among the tuft of fronds. A distinct midvein passes through each pinna, giving off on each side a series of veins bearing venules, the anterior of these producing the linear sorus just within the margin of the pinnæ. The sori, which in the young state are covered by thin indusia having a somewhat crenulated free margin, very frequently in a later stage become confluent, and cover the whole of the under-surface.

A very rare and very curious variety of this species, named **incisum**, has the pinnæ deeply pinnatifid, with linear notched segments. Another, equally rare and still more beautiful, has the ends of the fronds tasselled; this is called **cristatum**. There are some forms with the fronds two or three times forked, the pinnæ depauperated, and in one instance deeply lobed.

The species occurs rather plentifully, growing on rocks, old walls, and ruins, and less frequently on hedgerow banks. It is pretty generally distributed throughout the United Kingdom and Ireland; and also occurs throughout Europe, and in each of the other divisions of the globe.

This is one of the species of Ferns which has enjoyed a medicinal reputation, a tea and a syrup prepared from it being country remedies for coughs and colds.

When once established, this plant grows readily either in pots or on rockwork: but its roots being wiry, and generally inserted into the crevices of the walls or rocks on which it grows, it is sometimes found to be difficult to transplant. In general the smaller and younger plants may be removed with greater success than the larger and older ones. The newly-transplanted roots should be kept rather close, if possible, for a short time; but after they are established, shade is not so essential to this species as to most other Ferns, although it grows most vigorously under the influence of shade and shelter. In a Wardian case, for which its size is suitable, it should have the upper and drier parts of the rockwork.

Asplenium melanocaulon is another name which has been given to the common Maidenhair Spleenwort.

Asplenium marinum, *Linnæus.*

The Sea Spleenwort. (Plate XIV. fig. 1.)

This very handsome maritime evergreen Fern grows profusely on our south-western rocky coasts and in the Channel Isles, and extending to France and Spain, to Madeira and the Canaries. In cultivation it thrives most luxuriantly in the atmosphere of a damp hothouse, where it forms, in a comparatively short time, a dense mass of the deepest green, and often reaching a foot and a half in length. In a cold frame, if kept closed, well-established plants will continue in health, progressing slowly, and never acquiring half the size of those grown in heat. In the climate of London it does not prosper, nor, as far as we know, survive, if planted on exposed rockwork.

It is a tufted-growing species, with linear or linear-lanceolate fronds, usually six or eight inches long, of the deepest glossy green, with a smooth, rather short, dark-brown stipes. The fronds are simply pinnate, with stalked pinnæ, connected at their base by a narrow wing, which extends along the rachis; their form is either obtusely ovate or oblong, unequal at the base, the anterior base being much developed, while the posterior is, as it were,

cut away, the margin being either serrated or crenated. They are of leathery texture, but the veins are nevertheless tolerably evident, each pinna having a midvein, from which veins are given off alternately on either side, these again producing a series of venules. The sori are produced on the anterior side of each venule, lying obliquely, and forming two rows on each side the centre; they are oblong or linear, covered by a persistent indusium, which opens along the anterior margin as the spore-cases grow towards maturity.

The chief variation to which this Fern appears subject is that of the elongation of its parts. Sometimes the pinnæ are much elongated, tapering to a narrow point; sometimes, besides being narrowed, they are auricled at the base, and deeply lobed.

This species, with the Lanceolate Spleenwort and the Maidenhair, are exceedingly well adapted for Wardian cases in warm sitting-rooms. All of them enjoy the warmth; and being all evergreens of moderate size, and very elegant in structure, they supply just what is wanted in such situations. They should be planted on elevated rockwork, in sandy peat-soil lying in the interstices between the fragments of stone; and when once established

will grow freely, provided they are not much exposed to the sun, which they do not like.

Asplenium fontanum, *R. Brown.*

The Smooth Rock Spleenwort. (Plate XIII. fig. 2.)

This is a small tufted-growing species, seldom seen more than three or four inches high under ordinary circumstances; in a hothouse, where its parts become more lengthened, it sometimes reaches eight or ten inches high, but this stature is but rarely attained. The small fronds are evergreen, and mostly grow nearly upright; they are of a narrow, lanceolate form, rather rigid in texture, of a deep green above, paler beneath, and supported on a very short stipes, which has a few narrow pointed scales at the base. They are bipinnate, the pinnæ oblong-ovate, and the pinnules obovate, tapering to the base, the superior basal pinnule of each pinna having the margin divided by four or five deep sharp teeth, the rest of the pinnules and lobes having from one to three similar teeth. The main rachis of the frond, as well as the partial rachis of each pinna, has a narrow winged margin; that is to say, a very narrow leafy expansion along their sides, throughout their length; and this is, perhaps, the most obvious technical

point, except size, by which to distinguish the present plant from *A. lanceolatum.* In structural details they very much resemble each other ; so that, although quite distinct, their descriptions appear very similar.

The fronds being rigid and opaque, the venation is often less evident than is usual in Ferns. It consists, in each pinnule, of a central vein, or midrib, which throws off a vein towards each lobe or serrature, and in the larger pinnules some of these veins become divided, so that a venule is directed towards each of the serratures into which the margin is divided. On two or more of these veins a sorus is produced ; these in form are short compared with those produced by most of the genus, being oblong, rather flat on the side by which they are attached ; and they are covered by an indusium of similar form, which is waved and indented on the free margin. Sometimes the sori keep quite distinct, but it is not uncommon for them to become confluent, so as to cover nearly all the under-surface of the whole of the little pinnules.

There are some who doubt this species being really a native of Britain, on the ground that it is not now to be found in the places where it is said to have been originally met with. The most recently recorded stations are a very

old wall at Tooting, a wall near Petersfield, and rocks near Stonehaven. Bearing in mind the circumstantial records of its discovery by the older botanists, and considering that it is a very small plant, and that the places where it would be most likely to occur are generally the most inaccessible, and, therefore, the least likely to be searched,—considering, moreover, the many probable localities which exist, and have not been carefully explored by any keen botanical eye, it is a fair presumption that the plant is really indigenous, though, from these causes, it has been overlooked. While so many probabilities exist in favour of its being native, we are not justified in rejecting the statements which the older botanists have left us.

This species is too rare to be often trusted on rockwork, unless where every provision, such as shade, shelter, and moisture, has been made for it; but planted in a well-drained pot, and kept in a close cold frame, or in a damp hothouse, it grows freely, becoming much more vigorous under the influence of heat.

The other names which have been given to this Fern are these:—*Aspidium fontanum*, *Athyrium fontanum*, *Polypodium fontanum*, and *Aspidium Halleri*.

Asplenium lanceolatum, *Hudson.*

The Lanceolate Spleenwort. (Plate XII. fig. 1.)

We have here an evergreen Fern of variable size, seldom in cultivation having the vigour which it exhibits near the coast in our south-western counties, and especially in the Channel Islands. As might be expected, it evidently requires a mild and sheltered climate, so that in a hot-house, where the temperature is not kept too high, it grows freely, which cannot always be said of plants kept in a cold frame in the climate of London, and never of plants fully exposed.

Under the least favourable circumstances, the fronds of this Fern are from four to six inches long; but under the most favourable conditions they reach the length of a foot, or even a foot and a half. They are of a lanceolate form, supported on a brownish-coloured stipes of about a third of their entire length, the stipes as well as the rachis having, scattered throughout their length, numerous small bristle-like scales. In the more vigorous wild plants the habit seems to be erect, but the cultivated plants mostly assume a spreading or even decumbent mode of growth. This species is very closely related to the common *Asplenium*

Adiantum-nigrum, which, in some of its states, very much resembles it; but the outline of the fronds will, we believe, almost always separate them, those of *lanceolatum* being lance-shaped, or tapering from near the middle towards the base, while those of *Adiantum-nigrum* are triangular, or broadest at the base. The pinnæ spread at nearly right angles with the rachis, often, but not always, opposite, and have an ovate-lanceolate form; they are again pinnate, so that the frond is bipinnate. The pinnules are of irregular form, often obovate, or nearly so, sometimes unequally quadrate, but always indented on the margin with deep sharp teeth, the larger pinnules being first lobed, and the lobes toothed, the smaller ones simply toothed. The venation is tolerably distinct; the pinnules each having a tortuous midvein, which produces forked veins, and these produce veules, one of which extends towards each serrature. The sori have no very definite order; they are at first oblong, and covered by an indusium of the same form, having a lacerated free margin; but as they become old, the sides become bulged out so as to give them a roundish form, and the indusium becomes obliterated.

The variety **microdon** is a very rare plant, met with in Guernsey, in Cornwall, and in Devon. It has pinnated

fronds, the pinnæ being merely undulated and lobed, not again pinnate.

This is rather a local species, being found only in the southern and western parts of England, and in Wales, almost always near the coast. It is found very luxuriant in the Channel Islands.

This species has been named *Tarachia lanceolata.*

Asplenium Adiantum-nigrum, *Linnæus.*

The Black Maidenhair Spleenwort. (Plate XII. fig. 2.)

This is a rather common evergreen Fern, and a very conspicuous ornament of the situations where it occurs in a vigorous state. The fronds grow in tufts, and vary much in size, from a height of three or four inches when it occurs on walls, to a foot and a half, and even two feet, including the stipes, when it occurs on shady hedge-banks in congenial soil. They are triangular, more or less elongated at the point, the shining dark purple stipes being often as long as, or longer than, the leafy portion ; but in stunted plants growing in sterile situations very much shorter. They grow erect or drooping, according to the situations in which they occur. They are bipinnate, or sometimes tripinnate ; the pinnæ pinnate, triangular-ovate

drawn out at the point, the lower pair always longer than the next above them. The pinnules, especially those on the larger pinnæ, are again pinnate ; the alternate pinnules being deeply lobed, and the margins sharply serrate.

The fronds are of a thick leathery texture, with numerous veins. To each pinnule there is a distinct midvein midrib or costa, bearing simple or branched veins, on which the sori are produced. All the ultimate divisions of the fronds, as well as all the larger lobes, have midveins producing these simple or branched veins, and these bear the sori near their junction with the midvein, so that the sori are placed near the centre of every pinnule or lobe. At first the sori are distinct, and have the elongate narrow form common to this genus ; but as they become older, they often spread and become confluent, so that almost the entire under-surface of the frond is covered with the spore-cases. The indusium is narrow, with its free margin entire : this soon becomes pushed away by the growing sori, and is lost.

This species is very variable. In dry and exposed places it is small, and obtuse in its parts, whilst in sheltered, shady places it is much drawn out or elongated. The extreme states have been considered as varieties ; that in

which this bluntness of the parts seems characteristic being named **obtusatum**. This difference often becomes less marked in the cultivated plants than in those which occur in a wild state; and there exist, even among the wild, many gradations of form. The species has also been met with having the fronds variegated with white.

The variety **acutum**, sometimes called the Acute Spleenwort (Plate XXII. fig. 2), differs principally in the more decidedly three-cornered fronds, which, in consequence of their shortness and breadth, and the high development of their basal pinnules, form a nearly equilateral triangle; in the very much attenuated apices of the fronds and their pinnæ, which are, in fact, what is called caudate; and in the extreme narrowness of the ultimate segments into which the very much divided frond is cut, these segments being narrow, linear, and acute. The fronds grow a foot or upwards in length, including a long brown stipes. In large specimens the leafy portion is about six inches long, and as much across the base, triangular, tripinnate. The lower pinnæ are considerably larger than the next pair, and elongately triangular. The primary pinnules are ovate-acuminate; the secondary pinnules lozenge-shaped, these latter being cut down almost to the centre into linear

sharply two- to five-toothed segments. The venation consists of a midvein, which enters each lobe of the pinnule, and branches alternately into as many nearly parallel veins as there are marginal teeth, one venule being directed into each tooth. The narrow linear elongate sori are borne, rather close together, on these venules. This is a very rare plant. It has been found in a few Irish counties, and in Jersey; and is also met with in the North of Europe, and more plentifully in the Canaries, Azores, and Madeira. It has usually been treated as a frame or greenhouse plant. The other names belonging to it are, *Asplenium acutum*, *Asplenium Virgilii*, and *Asplenium productum*.

The ordinary forms of the plant are very commonly met with growing on rocks or old walls, and on hedge-banks in a sandy soil. The latter situations, where they grow most vigorously, are often beautifully adorned by their drooping tufts. The extreme forms are more rare.

This is one of the more useful evergreen Ferns for shady rockwork, as it will grow with freedom if planted in sandy soil which is just kept moistened either by natural or artificial means. As a pot plant it is easily manageable.

Genus VIII. CETERACH, or SCALE FERN.

Of the genus *Ceterach* there is only one British species, and this is so different from all others as to be distinctly recognized at a glance. The mark by which it is known is this:—the back of every frond is covered by densely-packed, brown, pointed, chaffy scales. Among these scales, and concealed by them, lie the elongate sori, which are anomalous, in regard to their relationship, in having no indusium. The affinity of *Ceterach* is without doubt with the *Asplenium*-like Ferns; and this being the case, they ought to have an indusium; the *Polypodium*-like and *Acrostichum*-like Ferns chiefly, among the dorsal groups, wanting this cover to the sori. No indusium, however, exists here, unless it be represented by a kind of membranous ridge, which is to be found on the receptacles just behind the sori, and is the part which has been sometimes called an indusium. The probability is, that it does represent that organ, which is not largely developed in consequence of the presence of so dense a covering of scales, these not only serving the purpose of a cover to the sori,

but perhaps, from their crowded position, preventing its proper formation.

The name *Ceterach* is said to be an alteration of the word *Chetherak*, which was applied to this plant by Persian and Arabian medical writers.

Ceterach officinarum, *Willdenow.*

The Scaly Spleenwort, or Common Scale Fern.

(Plate I. fig. 1.)

A dwarf, evergreen, distinct-looking, and very pretty Fern, growing in tufts. The fronds when fresh are thick and fleshy, and from this cause they are perfectly opaque when dry. Their size varies according to the circumstances of their growth, from two to six inches in length, rarely exceeding the latter. They grow on a short scaly stipes, and are either pinnatifid, as is commonly the case, or more rarely pinnate, the difference being, that in the latter the fronds are divided rather more deeply than in the former. The upper surface is a deep opaque green; and the under surface is densely crowded with rust-coloured brown closely-packed overlapping scales, which, being just seen projecting from the margin, and still more fully in the exposed under-surface of the young partially-

developed fronds, prettily contrast with the deep green of the upper surface. The pinnæ or lobes are of an ovate form, and either entire or lobed on the margin.

The opacity of the fronds renders the venation indistinct, and indeed it is only to be made out by examining young fronds, removing the covering of scales, and the outer skin of the frond itself. It is then seen, that from the lower corner the principal vein enters, taking a sinuous course towards the upper side of the apex ; it branches alternately, the veins being again branched, and the venules becoming joined more or less near the margin. The sori are borne along the sides of the venules in a very irregular manner, the majority of them being directed towards the apex of the pinna. At first, the sori are quite concealed by the scales, but the spore-cases ultimately protrude between them, although, being very similar in colour, the latter are never very obvious.

The *Ceterach* is a mural species, occurring on the walls of old buildings and ruins, and in rocky places. It is pretty generally distributed in the United Kingdom, but is considered somewhat rare in Scotland. It occurs also throughout central and southern Europe, and in the north of Africa. In the Canaries, a closely-allied but much

larger plant is met with, which some botanists regard as a mere form of the common species, but which is probably distinct.

Like other wall Ferns, this is often difficult to establish in cultivation when first transplanted; but when once this is overcome, its cultivation is not difficult. It is best grown in a cold frame, potted rather high, among loam mixed with a large proportion of brick rubbish, and not over-watered. Though generally found in exposed and rather sunny situations, the finest examples we have seen were found in a shaded, moist situation, under trees, where sunshine never visited them.

Among other names, this plant has borne those of *Asplenium Ceterach*, *Scolopendrium Ceterach*, *Grammitis Ceterach*, *Notolepeum Ceterach*, and *Gymnogramma Ceterach*.

Genus IX. SCOLOPENDRIUM, or HARTS-TONGUE FERN.

This genus is botanically very distinct from all our other native Ferns; and from other points of view is

exceedingly interesting. There is only one British species, but of this there are numerous varieties, which have a perfectly distinct aspect, owing to peculiarities in their development. They are all evergreen, and on this account, as well as by reason of their hardihood and bold striking appearance, they are among the most ornamental of all Ferns for out-door rockwork. The genus is known by the peculiarities of its sori, which, though forming parallel oblique lines at intervals on each side the midvein, and having the appearance of being single if seen when mature, are in reality composed of two sori, set face to face, and so close together as to become confluent along their whole length. This is best seen just at the stage when the indusia are bursting; indeed, at a later stage of development an unpractised eye would probably fail to observe any evidence that such was really the structure. The fructification, technically speaking, consists of sori confluent in pairs, the two sori forming each pair being placed face to face.

Scolopendrium is merely an alteration of *Scolopendra*, the scientific name of the insect better known as the centipede; and the name is applied from a fancied resemblance (in the position, we suppose) between the feet of

a centipede and the lines of fructification produced on the fronds of the Fern.

Scolopendrium vulgare, *Symons.*

The Common Hartstongue. (Plate XV. fig. 1.)

This is a common plant; nevertheless its shining bright green, though simple fronds, contrasting so beautifully with the feathery aspect much more common among the Ferns, secures for it admirers, whether seen in a wild or cultivated state. It grows in tufts.

The fronds, which are evergreen, vary in length from six inches to a foot and a half, and even more, and are either stiff and erectish when growing under circumstances which render them dwarf, or more or less spreading and drooping when in situations which are favourable to enlarged development: in the former case the fronds are thicker and more leathery in texture; in the latter, thinner and less rigid, from being produced in very damp shady situations. The usual form of the fronds is what is called strap-shaped, that is, narrow oblong-lanceolate, much elongated; they taper towards, and are acute at, the apex, narrowing a little downwards, and becoming cordate at the base; the margin is entire, or very slightly wavy, and

they are supported on shaggy stipes averaging about a third of their entire length.

The fronds have a strong midrib or costa, extending throughout their whole length, from which are produced forked veins, the branches of which (venules) lie parallel, and proceed direct towards the margin, terminating just within the edge in a club-shaped apex. The veins are usually forked twice, but they are not constant to any exact number of divisions. The sori, which are oblong patches of unequal length, lying in the direction of the veins at short intervals along the upper two-thirds of the length of the frond, are each composed of two proximate lines of fructification laterally united; each of these lines, however, consists of a complete sorus, so that the two united are properly called a twin sorus. This is the mark of the genus *Scolopendrium.* This twin sorus is always produced between two fascicles of veins; that is, the lowermost venule produced by one vein, and the uppermost venule produced by the vein next below—these two venules lying, of course, contiguous, each become a receptacle upon which one of the two contiguous lines of spore-cases is produced. The indusia which cover these, have their attachment respectively on the upper and lower sides of their venules, the other edges overlapping

one the other; the free margin, therefore, is exterior with reference to the fascicle of venules to which it belongs. When very young there is no evident trace of separation at the part where they overlap, but as they advance towards maturity the separation becomes apparent, and they eventually open down the centre, one indusium turning upwards and the other downwards, the two lines of spore-cases they had covered becoming confluent and undistinguishable without manipulation.

This is the ordinary form of *Scolopendrium;* but there are a great number of very curious and some very distinct varieties, differing only, however, rather in the form of the fronds than in the fructification. Of these varieties it is deserving of especial mention that they are for the most part perfectly constant under cultivation, although they have, no doubt, originated in aberrations—that is to say, accidental variations, from the original species, which have been perpetuated naturally or by art. It is, moreover, a curious fact, that most of them are reproduced from spores.

One of the most beautiful of these varieties is that called **crispum**, in which, the same outline of frond prevailing, the leafy portion is so much more developed than the midrib, that the margin becomes excessively undulated, giving the

fronds a very elegant curled or crisped appearance. This sort is barren, though there is an allied form less curled which produces the usual fructification.

A curious and distinct variety is called **polyschides,** or *angustifolium* by some. The fronds of this are linear, and blunt at the apex, much narrower than in the common sort, and the margin is deeply and irregularly lobed and crenated. This sort is fertile, and its sori are short, and, instead of being ranged in a single series on each side the midrib, as is usual in the common sort, they form two irregular lines on each side.

Another curious and very beautiful variety, called **marginatum,** is lobed in the same manner as *polyschides,* but has the fronds broader; it is remarkable in having, behind, a longitudinal excurrent membrane on each side between the midrib and margin, on which membrane, as well as exterior to it, the short interrupted sori are produced. This was found in Somersetshire, by Sir W. C. Trevelyan's gardener, Mr. Elworthy. Another beautiful form—**fissum**—is lobed like *polyschides,* but broader, and without the membrane present in *marginatum.*

Another striking variety is **multifidum.** This has the fronds forked either near the apex or sometimes near the

base; each branch is again more or less repeatedly forked, and the apices of all the forks are developed into irregular fan-shaped leafy expansions, to which the term multifid is applied. Sometimes the fronds are merely forked once or twice, without being multifid, and this state has been called **lobatum**; in other cases the stipes itself becomes forked, bearing multifid branches, and this has been called **ramosum.** This multifid sort is fertile, and occurs in many variations.

A dwarf and highly ornamental variety is that called **laceratum,** or sometimes *endiviæfolium*, which was found by Mr. Young, near Taunton, in Somersetshire. In this the fronds are often nearly as broad as long, with the margin deeply gashed into irregular lobes, the lobes being numerous, crowded, and much undulated, sometimes tapering, sometimes more or less dilated at the apex, the basal pair often considerably enlarged, and so much developed as to produce an approach to the palmate form.

The common Hartstongue is an inhabitant of hedge-banks, of old walls, and sometimes of the interior of wells, in which latter situation it acquires great luxuriance. It is one of the more commonly distributed species in England and in Ireland, less abundant in Scotland; and also found

all over Europe. The varieties are rare in a wild state, and are better known as cultivated plants; they admit of propagation, and are mostly permanent.

Being an evergreen, and a plant of free growth, the Hartstongue is one of the most desirable hardy Ferns we possess for open rockwork. Its simple fronds contrast well with the more compound forms; and its varieties all have a different aspect, combined with the same good qualities of hardiness and endurance. Shady and rather humid places are those in which this plant most delights, although, as is evident from its sometimes growing on walls, it will live in more exposed and arid situations. The plants, however, never acquire much vigour under such circumstances, and have mostly a starved and stunted aspect. They are not particular as to soil, sandy loam, containing fibrous or half-decayed vegetable matter, or the damp surface of some porous stone, is much preferable to soil which is much spent and comminuted; as indeed is the case with respect to all Ferns.

The Hartstongue is sometimes called *Scolopendrium officinarum*, and has been named *Scolopendrium Phyllitidis*, *Asplenium Scolopendrium*, or *Phyllitis Scolopendrium*.

Genus X. BLECHNUM, or HARD FERN.

English botanists are not agreed whether this plant should be considered to belong to the genus *Blechnum* or *Lomaria*. We think it most nearly related to the former, although in the contraction of its fertile fronds it approaches very near to the latter. Among the British ferns, the one species of this genus is known by having its fructification extended longitudinally on the pinnæ, so as to form a linear or continuous sorus on each side the midvein, and about midway between it and the margin. No other British Fern has its fructification in extended lines lying parallel with the midrib except the *Pteris*, or Bracken, in which, however, the sorus is on the margin, and not within the margin and near the midvein, as in *Blechnum*. The *Blechnum* may, however, be at once known from the *Pteris*, by the division of its fronds, which are merely pinnate, while those of *Pteris* are decompound.

The name *Blechnum* is an adaptation of the Greek *blechnon*, which signifies a Fern. There is but one native species, for which the specific name *Spicant* has unquestionably the right of priority over *boreale*, which is

often used in this country. The specific name *Spicant* has, indeed, been used to distinguish this plant by nearly all the older botanists, though they may have held conflicting views as to its genus, referring it, for example, among others, to *Osmunda*, to *Onoclea*, to *Acrostichum*, and to *Asplenium*.

Blechnum Spicant, *Roth.*

The Common Hard Fern. (Plate XVI. fig. 2.)

The common name of this species is very appropriate, from the rigid harshness of its texture. It is one of the few native kinds which produce two distinct-looking kinds of frond—fertile and barren. The fertile ones have their pinnæ much narrowed, or contracted, as it is called, while the fronds themselves are considerably taller than the barren ones. These fronds grow in large tufts, and being very gracefully disposed, the plant becomes one of the most ornamental of our wild species during the summer season, when its fronds are in a fresh state. Both kinds of fronds are of a narrow lanceolate form ; the barren ones being only deeply pinnatifid, while the fertile ones are pinnate ; but the segments in both are long and narrow, like the teeth of a comb. The barren fronds, which are from one-half to two-

thirds the height of the fertile ones, assume a spreading or horizontal position, and are attached to the caudex by a very short scaly stipes. The fertile ones, which are situated in the centre of the tufts, are erect, from one to two feet high, the stipes, which is sparingly furnished with long pointed scales, being nearly half the length, and of a dark-brown colour.

The veins are not very evident in the fertile fronds, on account of the contraction of the parts, but they resemble those of the barren ones, except in having a longitudinal venule on each side the midvein, forming the receptacle to which the spore-cases are attached. The midvein is prominent, and produces a series of veins on each side, these becoming forked, and extending almost to the margin, terminating in a club-shaped head. In the fertile fronds the veinlets are necessarily shorter, and connected, as already mentioned, by the longitudinal venules which bear the fructification. The spore-cases are thus arranged in two linear sori, one on each side the midvein; these are distinct while young, but often become confluent, covering the whole under-surface of the pinnæ. The indusia, by which they are first covered, when mature, burst along that side towards the midrib, and

eventually become split across here and there, at points opposite some of the venules.

The Hard Fern is a rather common plant, occurring in heathy and stony places, and preferring localities which are rather damp than otherwise. It is found in various parts of Europe. In cultivation, it is a very suitable plant for damp shady rockwork, and in such situations, planted in peaty soil, it grows freely, and without requiring any special attention.

The principal of its synonyms are—*Lomaria Spicant*, *Blechnum boreale*, *Asplenium Spicant*, *Onoclea Spicant*, *Acrostichum Spicant*, *Struthiopteris Spicant*, *Osmunda Spicant*, and *Osmunda borealis*.

Genus XI. PTERIS, or BRACKEN.

The *Pteris*, or *Bracken*, is the most common of all our Ferns. It is that which occurs almost everywhere in woods and in sandy wastes, often appropriating to itself the whole surface of the ground, but seeming to possess the peculiarity of avoiding chalky soil. It is very variable in its appearance, owing to differences in its size and develop-

ment, dependent on the circumstances in which it grows. Its more usual size is from three to four feet in height. Sometimes in dry, very sandy soil, the plant becomes a pigmy, not reaching a foot in height, and being merely bipinnate. The opposite extreme occurs when the plant is growing on damp hedge-banks, in warm shady lanes, where it attains eight or ten feet in height, and is proportionately compound in its development. Under circumstances which favour the most luxuriant development, this common and usually vulgar-looking plant combines the most noble and graceful aspect, perhaps, which is borne by any of our indigenous species, its fronds scrambling up among the bushes, which sustain them at the base, while their graceful feathery-looking tops form, overhead, a living arch of the tenderest green.

The *Pteris* is known among our native Ferns by having the edges of all the little divisions of its fronds furnished with a line of spore-cases. No other of our native species has the fructification arranged in continuous lines except this and the *Blechnum;* and the *Pteris* may be readily known from that by the lines being in it confined to the margin, leaving the centre unoccupied, while in *Blechnum* the extreme margin is unoccupied by the sori.

Pteris is a Greek name for a Fern, and is derived from the word *pteron*, which signifies a feather ; and, of course, is here applied in reference to the graceful feather-like aspect which the fronds of Ferns generally possess. When the plant is very luxuriant, this name is quite as applicable to the Bracken as to any other known Fern. This consideration is perhaps enough to justify the application to this species, by the older writers, of the name of Female Fern, which scarcely seems appropriate to the commoner uncouth-looking form which the plant more usually bears.

Pteris aquilina, *Linnæus.*

The Common Brakes, or Bracken.

(Plate XVII. fig. 1.)

This Fern has a creeping caudex, and one that creeps very extensively too, just beneath the surface of the soil, though in some cases descending to a great depth perpendicularly ; it is recorded by Mr. Newman that he has found the stems thus penetrating to a depth of fifteen feet. This caudex is thickish, black-looking, and succulent, containing a good deal of starch. From it are produced, at intervals, the annual fronds, which generally make their appearance about the latter end of May, when there is

little risk of frosts, for the least frost would destroy them, and, indeed, it is not uncommon for the earlier growth to be destroyed in exposed places by the very slight frosts which occur at that season of the year.

The fronds themselves have been variously described, and often erroneously, for they are not unfrequently said to be three-branched, a form which really occurs in one of the smaller Polypodies (*P. Dryopteris*). They are not properly three-branched, and except when very much starved and stunted, do not approach that form very nearly. They are, in reality, bipinnate, or, when very luxuriant, tripinnate, the pinnæ standing opposite in pairs, each pair in succession becoming fully developed, while the main rachis is extending upwards, and the next pair is beginning to unfold. The mature fronds are thus truly bi- or tri-pinnate, with the pairs of pinnæ standing opposite. When the fronds are much diminished in size by the sterility of the soil which sustains them, they become almost triangular, and then have somewhat the appearance of a three-branched frond, the development of the lower pair of branches not leaving the plant energy enough to carry up its rachis, and produce the other pairs of pinnæ which it would normally possess. That this is the true habit of the

species is still more clearly exhibited when it attains its greatest luxuriance, for the full-grown fronds then consist merely of a series of pairs of branches from the bottom to the top. The unrolled young fronds are very curious objects, and the watching of their development will be found full of interest.

The stipes is downy while young, and furnished with sharp angles, which, when mature, will wound the hand severely, if it be incautiously pulled. The part underground is black, like the creeping stem itself, and is spindle-shaped just at the base, where it permanently retains the downy or velvety surface which was present in the upper portions while young. Average specimens of the fronds are tripinnate, that is, they produce a certain number of pairs of branch-like pinnæ, which branches are bipinnate. We must confine our further description to one of these branches, selected from the lower part of the frond, where they are more perfectly developed than in the upper parts,—such a branch, in fact, as is represented in Plate XVII. The general form is ovate, a little elongated ; that of its pinnæ (the secondary pinnæ) narrow lanceolate. These latter are placed rather closely together, and are again divided into a series of pinnules, which are

either undivided, and attached to the rachis by their base without the intervention of any stalk, bearing a line of spore-cases along each margin; or, are larger, more elongated, and deeply pinnatifid or sinuate, the margins of these lobes bearing the lines of spore-cases. The apices of the primary and secondary pinnæ, and of the pinnatifid pinnules, become less and less divided, until at last the extreme points form an entire lobe, more or less elongated.

In its venation there is some variety, dependent on the differences of structure and development which we have already pointed out. We shall be most intelligible by explaining the form represented in Plate XVII., which shows the least divided form of the plant. Each pinnule, as is there shown, has a distinct midvein, producing alternate lateral veins, which become twice forked, and extend to the margin, where they meet a longitudinal marginal vein which forms the receptacle. The indusium consists of a bleached, membranous, fringed expansion of the upper skin or epidermis of the fronds, which reflexes so as to cover the spore-cases; but there is here another membrane which lies beneath the spore-cases, and is no doubt a similar expansion of the skin of the under-surface. The two very dissimilar forms of this plant we have pro-

posed to distinguish as varieties, applying to the pinnatifid form the name **vera**, and to the more entire form that of **integerrima.**

This, which is the most abundant of our indigenous species, is also widely distributed in other parts of the world, and bears a variety of names, from having been supposed to be distinct by those who have met with it from such widely-separated localities.

Being so common, and in an ordinary state uncouth-looking, it is not a plant for cultivation to any extent. In warm, damp wilderness scenery, however, where it would attain great luxuriance, and the situation is such as would enable it to develop the arching character already mentioned, it might very properly be introduced.

Genus XII. ADIANTUM, or MAIDENHAIR FERN.

The *Adiantum*, or Maidenhair, may be known among the British Ferns by its almost fan-shaped leaflets or pinnules, which are attached by their narrow end to the little black hair-like stalks. This, however, though suffi-

cient by which to recognize it, among the very limited number of kinds which are found in a wild state in Britain, is not its proper distinctive mark. The real characteristics lie in the veins and in the sori. The former may be readily seen by holding a pinnule between the eye and a strong light, and the latter by lifting up the little reflexed lobes which occur here and there at the margin on the under-surface. The veins are dichotomously forked, that is, separating into two equal branches, beginning from the base upwards, the forking being several times repeated, producing close parallel radiating venules which extend to the margin. The sori are produced on the reflexed (or bent-under) membranous expansions of the margin of the fronds, which form the indusia, these indusia being traversed by veins which bear the sori. There is only one native species which possesses these characteristics, and this is certainly one of the most beautiful, as it is also one of the rarer of our indigenous Ferns ; and being of small size and of evergreen habit, it is one of the most desirable of all for culture in a Wardian case.

The name of the genus comes from the Greek *adiantos*, which signifies dry, or unmoistened ; and is applicable to these plants, from their possessing in a remarkable degree

the property of repelling water. It is, in fact, impossible to wet the surface of their pinnules, when the fronds are in a fresh state and in good health, the water being cast off as though from a waxy surface.

Adiantum Capillus-Veneris, *Linnæus.*

The Maidenhair Fern. (Plate XVI. fig. 1.)

A small evergreen species, furnished with a very short creeping stem, which is clothed with small black scales, and bears delicate, graceful, somewhat drooping fronds, of six inches to a foot high. These fronds are usually of an irregularly ovate form, sometimes elongate, occasionally approaching to linear. When highly developed, the fronds are about thrice pinnate; but the less vigorous fronds are usually only twice pinnate, with alternate pinnæ and pinnules; and sometimes fronds are found which are only once pinnate. The ultimate pinnules, or leaflets, are very irregular in shape, but for the most part have a wedge-shaped or tapering base, and a more or less rounded and oblique apex, and they have generally some variation of a fan-shaped or rhomboidal outline. The margin is more or less deeply lobed, the apices of the lobes in the fertile pinnules being reflexed and changed into membranous in-

dusia, whilst the lobes of the barren fronds are serrated; their texture is thin and membranaceous, their surface smooth, their colour a cheerful green. The stipes, which is about half as long as the frond, and furnished with a few small scales at the base, is black and shining, as also are the rachides, the ultimate ramifications of which are small and hair-like.

The veins throughout the pinnules are forked on a dichotomous or two-branched plan, from the base upwards, the venules lying nearly parallel and extending in straight lines towards the margins, those of the barren fronds terminating in the serratures of the margin, but those of the fertile fronds extending into the indusium, there forming the receptacles to which the spore-cases are attached. The sori are oblong, covered by indusia of the same form, each consisting of the apex of one of the lobes of the frond, changed to a membranous texture, and folded under. The sori are, as already mentioned, seated on this membranous reflexed lobe, and by this circumstance the genus may at once be detected by those who are not conversant with its easily recognized *primâ-facie* appearances.

The Maidenhair is a local plant, though it has a wide geographical range. It is found here and there in the

warmer parts of Great Britain and Ireland, evidently preferring cavernous and rocky situations within the influence of the sea. The same species is found in the warmer parts of Europe, in Asia, in the north of Africa, and in the Canaries and Cape de Verd Islands.

It is, moreover, a tender plant, and does not thrive under cultivation in the climate even of the south of England, unless sheltered in a frame or greenhouse, or by being covered with a glass. In a Wardian case it grows well; and attains great luxuriance in a damp hot-house. The proper soil for it is very light turfy peat, mixed with a considerable proportion of silver sand, and it is beneficial to plant it on or around a small lump of free sandstone.

Genus XIII. CYSTOPTERIS, or BLADDER FERN.

The species of *Cystopteris* are all small fragile Ferns, yet, notwithstanding, they are very beautiful and very interesting, and furnish some remarkable differences of form. They are much more delicate and herbaceous in their texture than the majority of our native species, and hence

are well adapted for the purpose of minute investigation into the nature of their venation and fructification. Their texture alone almost suffices to tell a practised eye their family position; but the tyro needs a more precise characteristic, and this is found in the structure of the scale or indusium which covers the sori. The sori of these plants are round, as in *Lastrea* and *Polystichum*, all, equally with *Cystopteris*, once included under the old family name of *Aspidium*; but here, instead of being almost flat and circular, the cover is inflated or bulged out like a hood, or, while young, even flask-like or bladdery in appearance; hence these plants are called Bladder Ferns. This indusium is attached at the back (towards the base of the pinnule) of the sorus by its broad base, covering the spore-cases while in a young state, but becoming ultimately reflexed at the point, which is more or less jagged or fringed. There are three native species, of one of which numerous distinct forms or varieties occur.

The technical name comes from two Greek words, *kystos* and *pteris*, which respectively mean bladder and fern; so that in this case the English appellation is a literal translation of the scientific name.

Cystopteris fragilis, *Bernhardi.*

The Brittle Bladder Fern. (Plate X. fig. 1.)

This is a tufted-growing plant, spreading, if undisturbed, under congenial circumstances, into large patches of numerous crowns, each of which throws up a tuft of several fronds, growing from six inches to a foot, sometimes more, in height. The stipes, which is very brittle, dark-coloured, and shining, with a few small scales at the base, is usually rather more than a third of the length of the frond, and generally erect. The frond is lanceolate, bipinnate; the pinnæ lanceolate, the pinnules ovate-acute, cut more or less deeply on the margin, the lobes furnished with a few pointed teeth. In some of the plants, and usually owing to their vigour, the pinnules are so very deeply cut as to become pinnatifid, almost pinnate, the lobes themselves then resembling the smaller pinnules nearer the apex of the pinnæ and frond.

The venation is very readily seen, owing to the delicate texture of the frond. In the ordinary-sized pinnules there is a somewhat tortuous midvein, which gives off a lateral branch or vein to each of the lobes into which the margin is cut, these veins branching again into two,

three, four, or more venules, according to the size of the lobes, and each branch generally bearing a sorus at about midway its length. The sori are thus generally numerous, and rather irregularly disposed; and it often occurs that they are so numerous as, when fully grown, to become confluent into a mass of fructification covering the whole under surface of the frond. The number of sori produced, and consequently the sparse or crowded disposition of the fructification, is a matter altogether dependent upon the circumstances of growth, and hence exceedingly liable to vary even in the same plant, and within the same year, as heat or cold, drought or moisture, may preponderate. The sori, which are nearly circular, are covered while young as already explained, by a concave or hood-shaped indusium, which usually becomes torn or split at the point into narrow segments, and the whole soon becomes pushed back or cast off by the growing spore-cases.

There are many forms or varieties of this species. In the form called **angustata**, the points of the pinnæ and the apex of the frond itself are often considerably narrowed or elongated. One form, which is certainly the *rhæticum* of Bolton, and nearly allied to *angustata*, is rather larger, generally, than the typical form, and differs in having its

upper basal pinnules largest; the stipes, too, is tough, not brittle.

Another distinct variety, called **dentata**, is generally smaller, and almost always blunter in the form of its parts; this grows from six to eight inches high, and has ovate-lanceolate pinnæ, with ovate, obtuse, pointless pinnules, which are again divided on the margin into a series of short blunt notches or teeth; the venation is more simple, and the fructification is more marginal, than in any of the preceding forms. It is reproduced from the spores.

The most distinct of the varieties, however, is one called **Dickieana**, after Dr. Dickie, who discovered it in a sea-cave near Aberdeen. It is of a more compact habit of growth than any of the preceding, and grows from four to six inches in height; the outline almost ovate, terminating in a point; the pinnæ ovate-lanceolate, deflexed, overlapping each other; the pinnules decurrent, broad, obtuse, with a few shallow, marginal notches; the texture very delicate and herbaceous; and the fructification marginal. It is of a deep green. It is a constant variety under cultivation, and is reproduced by spores.

The usual forms of this species occur abundantly in moist mountainous districts, and also on walls, but generally in moist rocky situations throughout the United Kingdom, Ireland excepted, where it is comparatively rare. The same species is very widely dispersed in various parts of the world. The varieties are more rare. *Cystopteris fragilis* may be said to have rather a preference to limestone. Under cultivation it is one of the most manageable of the smaller sorts, growing freely on rockwork or in pots. Its fronds are produced very early in spring, are often renewed during summer, and continue to grow up in succession until the frosts cut them off. Being so very delicate in texture, the first frosts which have access to them do this.

The names of *Cyathea fragilis*, *C. cynapifolia*, *C. anthriscifolia*, *C. dentata*; *Cystea fragilis*, *C. angustata*, *C. dentata*; *Polypodium fragile*, *P. cynapifolium*, *P. anthriscifolium*, *P. dentatum*, *P. rhæticum*; *Aspidium fragile*, *A. dentatum*, and *A. rhæticum*, have been given by various authors to the different forms of this variable species.

Cystopteris regia, *Presl.*

The Alpine Bladder Fern. (Plate X. fig. 2.)

This diminutive but very elegant plant is quite a gem. It has a close-tufted stem, producing from its crown numerous bright green fronds, usually four to six, but sometimes as much as ten inches high. These grow up in May, and die away in autumn. Their form is lanceolate, the mode of division bipinnate, with the pinnules so deeply pinnatifid as to render them almost tripinnate. The stipes is short, smooth, and scaly at the base. The pinnæ are nearly opposite, with a winged rachis, ovate, divided into bluntly ovate pinnules, these latter being deeply cleft, almost down to their midvein, into short, blunt, linear lobes, which are either entire, or have two or three blunt teeth. The midvein of the pinnules is nearly straight, with a vein, simple or divided, branching off to each lobe, one branch extending to the point of each marginal tooth. The small roundish sori are rather numerous, but not confluent, borne near the margin, and covered by concave membranous indusia.

This species, which may be cultivated without difficulty in pots under shelter, provided they are guarded against

the effects of damp in winter, has been found on an old wall at Leyton, in Essex. Its claim to aboriginality is strongly suspected, a small, much-divided form of *Cystopteris fragilis* being supposed to have been mistaken for it. The Scotch and Welsh plants which have been called *Cystopteris alpina* are probably open to this objection, but the Essex plant is no doubt genuine; and fronds of the true plant have been communicated by Mr. Shepherd of Liverpool, as having been gathered in Derbyshire and Yorkshire; and we have seen others from the Lake district. It occurs in the alpine parts of southern Europe.

Cystopteris alpina is another name for this elegant plant, which has also been called *Cyathea regia and Cyathea incisa, Cystea regia, Polypodium regium, Polypodium alpinum, Aspidium regium,* and *Polypodium trifidum.*

Cystopteris montana, *Link.*

The Mountain Bladder-Fern. (Plate XIV. fig. 2.)

This is one of the rarest of our native Ferns, and hence is a plant of great interest. It is a small species, growing with a slender creeping stem, by the division of which it is increased. The fronds, which grow up from this caudex, are from four to six or eight inches high, triangular in

outline, from the great development of the lowest pair of pinnæ ; and they are remarkable for the comparative length of the slender stipes, which is about twice as long as the leafy portion. The fronds are tripinnate in the lower part, and bipinnate upwards, the pinnæ spreading, and standing opposite in pairs, the lowest pair considerably larger than the next above, and unequally developed, the inferior side being very much larger than the superior ; this disproportion is not maintained to the same extent in the upper portions of the frond. The lower pinnæ, on the inferior side, are first divided into ovate or lanceolate pinnules, and these are again cut into a second series of pinnules, of an ovate or oblong form, these ultimate pinnules being coarsely and irregularly notched or toothed ; on the upper side, the pinnules correspond with the secondary pinnules of the lower side. The inferior pinnules of the next pair of pinnæ also correspond in size, outline, and subdivision with the scondary pinnules of the lower pinnæ ; and above this the parts become gradually smaller and less divided up to the apex of the frond.

The whole texture of the fronds is delicate and herbaceous, as in the more common species, and hence the veins show very distinctly. In the ultimate pinnules the central

vein is somewhat flexuous, and gives off alternate lateral veins, one of which is directed towards the sinus or marginal indentation between two serratures. The sori have the roundish form common in this genus, and, being often numerous, they then become very conspicuous when full-grown; but though crowded, they do not appear often to become confluent. These sori are covered, in the young state, by blunt, concave, jagged-edged indusia.

This rare species was supposed to occur wild in the United Kingdom only, among the Breadalbane mountains of Scotland, on one of which, Ben Lawers, it was originally found in 1836 by Mr. Wilson, in company with Sir W. J. Hooker and Professor Graham. It has subsequently been found in other parts of the same region; and more recently by Mr. Backhouse in the Clova Mountains. It grows in very wet shady places, on the ledges of the rocks. In the European Alps this Fern is met with, most abundantly northwards; and it also occurs on the Rocky Mountains of the New World.

The synonyms of this species are *Polypodium montanum, Aspidium montanum, Cyathea montana, Cystopteris Allioni,* and *Cystopteris myrrhidifolia.*

Genus XIV. WOODSIA.

The *Woodsias* form a family group consisting of two diminutive kinds, which, however, possess much interest among the British species on account of their extreme rarity. These Ferns are furnished with indusia, and by the peculiar construction and position of this organ, they may readily be known. The peculiar nature of the indusia consists in their being placed not as a cover to the sori, but attached underneath them; when very young they indeed enclose them, but subsequently they split from above into narrow scale-like segments not easily distinguished, without optical assistance, from the hairs which occur along with them on the fronds. In the full-grown state, the sori are consequently seated in the centre of a spreading tuft of hair-like scales, which are formed of the lacerated margins of the indusium—the latter being attached to the frond at the point beneath the capsules. No other native Ferns possess a structure at all approaching to this.

These Ferns were formerly ranked with the Polypodies and *Acrostichum*, but when the structure of this race of

plants became better understood, they were very properly separated, and they now, in conjunction with some few foreign kinds, form a distinct family circle. The name *Woodsia* was given in compliment to the clever veteran English botanist, Joseph Woods, Esq., author of a very useful 'Tourist's Flora.'

Woodsia ilvensis, *R. Brown.*

The Oblong Woodsia. (Plate III. fig. 2.)

A deciduous species, dying down to the ground annually in winter, and reviving with the returning spring. Its very short stems form tufts, which, if thriving and not disturbed, and situated under favourable circumstances, grow into masses, large comparatively with its diminutive stature. The fronds average about four inches in height, and are less frequently found larger than smaller than this. Their form is lanceolate, more or less broad; and they are pinnate, the pinnæ usually set on nearly or quite opposite in pairs, and having an obtusely oblong outline, with a deeply-lobed or pinnatifid margin. They are of a thick dull-looking texture, and are more or less clothed on both surfaces, but especially on the veins beneath, with minute bristle-like scales, and shining jointed hairs, among which the sori

are almost concealed. The stipes is also scaly, and, as occurs in a whole group of these *Woodsias*, has a joint or articulation at a short distance from its base, at which point separation takes place if the fronds are left to attain a good old age, the lower part remaining attached to the caudex, while the upper part falls away. The veining of the segments of the pinnæ consists of a rather indistinct midvein, from which the veins, either simple or branched proceed towards the margin, near to which the sori are produced.

There seems no reasonable doubt that the Fern which Linnæus called *Acrostichum ilvense* is that now under notice. It has also been called *Polypodium ilvense.*

Woodsia alpina, *Gray.*

The Blunt-leaved, or Alpine Woodsia.

(Plate IV. fig. 1.)

This is a diminutive species, never exceeding a few inches in stature, and renewing its fronds annually in the spring, the older ones being destroyed by the frosts and cold of winter; when this influence is felt by the plants, the fronds quickly lose their vitality, and are cast off at the articulation or joint near the base of the stipes, which occurs in this

family. The Alpine Woodsia, like its congener, grows in a tufted manner, sending up several fronds from the crown, from the base of which the dark-coloured wiry roots are protruded. In form these fronds are longish and comparatively very narrow, almost linear, as it is termed ; and they are pinnately divided into several roundish triangular pinnæ, which are shallowly lobed on the margin, and are usually set on alternately along the opposite sides of the stalk or rachis ; those towards the lower part are usually placed at a greater distance apart than those near the upper end. They are nearly smooth on the surface, and, in this respect, unlike those of the kindred species, which have a much more hairy appearance ; small hair-like scales, in company with hairs, are however present in this species. The mid-vein of the pinnæ is indistinct, and throws out veins into each lobe, these veins being more or less branched according to the size of the lobes. The sori are placed near the extremity of the veins, and are often abundantly produced, so as to become crowded on the pinnæ.

The Alpine Woodsia is also named *W. hyperborea*, and formerly *Acrostichum alpinum*, *Acrostichum hyperboreum*, *Polypodium hyperboreum*, and *Polypodium arvonicum*.

The two species of *Woodsia* are, in Great Britain, found

only in high mountain regions, where they grow from the crevices of the moistened rocks. They are both rare, though, from the inaccessible localities in which they only occur, they may really be more abundant than is generally supposed. Both also appear to be confined to the northern parts of our hemisphere.

Their rarity rather than their beauty invests these plants with interest for the cultivator. They require to be kept in a cold shady frame, to be potted in porous soil amongst lumps of stone, to be carefully guarded against drought or stagnant moisture, and to be rarely disturbed at the root.

Genus XV. TRICHOMANES, or BRISTLE FERN.

The *Trichomanes* is the most tropical genus among our native Ferns; it is also one of the rarest; the one indigenous species being among the few which are met with very sparingly, and within a comparatively narrow range. It is not, however, the rarest of our species, although very unfrequent, and local. Unlike in texture all the other native kinds excepting the *Hymenophyllums*, being quite pellucid, and of the most delicately-crisped appearance

imaginable, it may be distinguished by this mark alone. The fructification, too, is here totally unlike that of all others, except the *Hymenophyllums*, from which, in the native species, it is easily distinguishable, although in some exotic kinds the differences almost vanish. The technical mark by which to distinguish *Trichomanes* and *Hymenophyllum* among the British Ferns, lies in the fact of their spore-cases being contained within deep urn-shaped pits or recesses at the margin; that is to say, in these two families the fructification is at the *margin* instead of being situated at the *back* of the fronds. *Trichomanes* is known from *Hymenophyllum* by its urns, or involucres as they are called, being entire, while those of *Hymenophyllum* are split lengthwise into two valves. In both, the spore-cases are clustered around hair-like receptacles, which are, in fact, the ends of the veins of the fronds projecting into the urns. In *Hymenophyllum* these hairs are always shorter than the urn, but in *Trichomanes* it is usual for them to project more or less, so that the fronds become somewhat bristly when very full of fructification; and hence has arisen the common name of Bristle Fern, which is applied to the group.

The name *Trichomanes* itself has the same signification:

it comes from two Greek words, meaning *hair*, and *excess*, in reference to these projecting hair-like receptacles.

Trichomanes radicans, *Swartz.*

The Bristle Fern. (Plate XVIII. fig. 1.)

This very beautiful plant exists only in the immediate neighbourhood of waterfalls, and in situations where a constant moisture is maintained. Such conditions are, indeed, quite necessary to it, on account of its semi-membranous texture, which shrinks before an arid atmosphere; and hence it can only be successfully cultivated when kept quite close, and constantly wetted over head. This species has a creeping, wiry, black-looking stem, clothed with pointed scales. The fronds are three or four times pinnatifid, cut up into small linear segments, which are entire or bifid at the apex, and have a stout nerve or vein running up their centre, and rendered very conspicuous in consequence of the thin pellucid texture of the leafy expansions which surround it. Or the frond may be described as consisting of a series of three or four times branched rigid veins, margined throughout by a thin, pellucid, cellular expansion, or wing, a greater or less number of the apices of the veins becoming surrounded by the cellular membrane

in the form of an urn or vase, and within them bearing the fructification.

The fronds are pendulous, and vary from an angular-ovate to a lanceolate form, the divisions being considerably undulated, so that they acquire a crisped appearance. The first series of lobes are usually of an ovate-lanceolate form; the next series shorter, more ovate, and the third series of divisions narrow, more or less linear. The ultimate branches of the veins which extend into the divisions of this third series, end just at or within the apex of the lobes if they are barren; but if they are fertile, they are produced beyond the margin, and surrounded at the base by the urn-shaped involucre, within which the spore-cases are placed. Sometimes the involucre is so placed as to appear immersed within the margin, but it more frequently projects beyond the margin. There is also considerable variation as to the length to which the bristle-like receptacle is extended beyond the involucre; sometimes scarcely exceeding it in length, and sometimes being four or five times as long.

The variety **Andrewsii**, is the lanceolate form of this plant, in which the pinnæ or first set of divisions are narrow and distant; it is tolerably distinct from the

broader form. The name *Andrewsii* is given to it in compliment to W. Andrews, Esq., of Dublin, by whom it was first brought into notice.

The Sister Isle now claims, so far as the British Isles are concerned, sole parentage of this lovely, half-transparent species; there, amidst dripping rocks, it thrives with a degree of luxuriance which charms every one who has seen it creeping over their shelving ledges. It is said to have been formerly found in Yorkshire. The same species is widely distributed in the warmer parts of the world.

The rarity and elegance of this plant make it a favourite species for cultivation. The conditions of success are, a close atmosphere, shade, moderate warmth, constant but not stagnant moisture, and a porous surface to which the roots may cling.

Among the many names which have been applied to this plant, the following are the most likely to occur in English books:—*Trichomanes speciosum*, *Trichomanes brevisetum*, *Trichomanes alatum*, and *Hymenophyllum alatum*.

Genus XVI. HYMENOPHYLLUM, or FILM FERN.

The British *Hymenophyllums*, or Film Ferns, are small moss-like plants, with pellucid fronds, distinguished, along with *Trichomanes*, by having their fructification at the edges of the fronds; and known from that genus by having the involucres, which surround the clusters of spore-cases, two-valved instead of urn-shaped or entire. So far as our native species go, these distinctions serve; but they become puzzling in some exotic forms. They are the smallest of all our native Ferns, and, being somewhat rare, or at least local in their distribution, they have always been regarded with much interest. Two native species are recognized, much like each other in general aspect, and distinguished by one or two rather minute technicalities, which, however, are sufficiently obvious to those who have learned how to look for them.

The name *Hymenophyllum* is compounded from the two Greek words *hymen* and *phyllon*, which mean a membrane, and a leaf; and is applied to those plants with

much propriety, from the membranous texture of their leaves or fronds.

Hymenophyllum tunbridgense, *Smith.*

The Tunbridge Film Fern. (Plate XV. fig. 2.)

This is so named in consequence of its having been found in the neighbourhood of Tunbridge, though occurring also in many other parts of the United Kingdom. It grows in the form of matted tufts, on the surface of damp rocks, in the sheltered, humid localities which are congenial to it ; the black, wire-like, creeping stems being entangled together, and interlaced with the mosses and allied plants which are often found in its company. The fronds are very short, from one to three or six inches long, membranous and semitransparent, almost erect, and of a dull brownish-green even when fresh, which gives them in some measure the appearance of being dead. These fronds are lanceolate, or somewhat ovate ; they are pinnate, with the pinnæ pinnatifid or bipinnatifid, and having their branches mostly produced on the upper side, though sometimes alternately on each side the pinna. The fronds are virtually, as is the case with the *Trichomanes*, a branched series of rigid veins, winged throughout,

except on the lower part of the short stipes, by a narrow, membranous, leafy margin. The clusters of spore-cases are produced around the axis of a vein, which is continued beyond the margin of the fronds, this vein or receptacle being enclosed within an urn-shaped involucre, consisting of two nearly orbicular compressed valves, which are spinosely serrate on the upper margin.

This species is widely distributed throughout the United Kingdom, and is found in many other parts of the world. It requires the same conditions for its successful cultivation as does the *Trichomanes*, to which genus the reader is referred.

It is the *Trichomanes tunbridgensis* of Linnæus.

Hymenophyllum unilaterale, *Willdenow.*

Wilson's Film Fern. (Plate XV. fig. 3.)

This plant is by English botanists most commonly called *Hymenophyllum Wilsoni*, but it is identical with *H. unilaterale*, a name published long antecedently by Willdenow. The species is a small moss-like plant, with numerous creeping filiform stems, generally growing in dense tufts, and producing a crowded mass of semi-droop-

ing, brown-green, half-transparent fronds, averaging three or four inches in height. The fronds are of a linear-lanceolate form, and pinnate ; the rachis is usually somewhat curved, and the pinnæ are convex above, all turned one way, so that the fronds become more or less unilateral ; the outline of the pinnæ is wedge-shaped, cut in a digitate-pinnatifid way, the lobes being linear-obtuse, with a spinulose-serrate margin. The rigid veins, branching from the principal rachis, which is very slightly winged in the upper part, become themselves branched so as to produce one venule to each segment ; or, in other words, the veins are twice-branched, and throughout their entire length, after they leave the central rib, they are furnished with a narrow membranous leafy wing or border, this rib itself being almost quite without any such border. The clusters of spore-cases are collected around the free ends of veins, which usually occupy the place of the lowest anterior segment, and are included within an urceolate involucre, which is divided into two oblong convex inflected valves, which are quite entire at the flattened edges where they meet.

This kind of Film Fern is equally diffused with the allied species ; indeed, it seems to be the more common of

the two in some parts of Scotland and in Ireland. It is widely distributed in other parts of the world.

Genus XVII. OSMUNDA, *Linnæus.*

The *Osmunda* is called the Royal Fern, and well it deserves the regal honours, for it is the most majestic of our indigenous Ferns. It is known by its large size, by having its fronds entirely leafy in the lower part, and entirely fertile at the top, the pinnæ or branches at the apex of the fronds being changed from the ordinary leafy form into dense masses of spore-cases, arranged in the aggregate in the same way as the leafy pinnules would have been. This mode of bearing the fructification renders it so strikingly obvious at first sight, and gives the plant an aspect so entirely different from that of those in which the fructification is more or less concealed by its position on the under-surface, that the *Osmunda*, though one of what are classified as flowerless plants, is often anomalously called the Flowering Fern. In truth, the contracted chocolate-coloured apex looks not unlike a dense panicle of

small brown flowers crowning the tall straight stem, whose lower pinnæ have much the appearance of broad green leaves. There is but one native species.

The name of the genus has given rise to some speculation as to its derivation. The question involved we leave antiquarians and philologists to settle. Some derive it from the Saxon *mund,* which they say signifies strength. Others consider the word expressive of domestic peace, and derive it from the Saxon *os,* house, and *mund,* peace. Others, again, have thought it commemorative, as the following legendary passage bears evidence :—

At Loch Tyne dwelt the waterman old Osmund. Fairest among maidens was the daughter of Osmund the waterman. Her light-brown hair and glowing cheek told of her Saxon origin, and her light steps bounded over the green turf like a young fawn in his native glades. Often, in the stillness of a summer's even, did the mother and her fair-haired child sit beside the lake, to watch the dripping and the flashing of the father's oars, as he skimmed right merrily towards them over the deep-blue waters. Sounds, as of hasty steps, were heard one day, and presently a company of fugitives told with breathless haste that the cruel Danes were making way towards the ferry. Osmund

heard them with fear. Suddenly the shouts of furious men came remotely on the ear. The fugitives rushed on. Osmund stood for a moment; then snatching up his oars he rowed his trembling wife and fair child to a small island covered with the great Osmund Royal, and helping them to land, bade them to lie down beneath the tall Ferns. Scarcely had the ferryman returned to his cottage, when a company of Danes rushed in; but they hurt him not, for they knew he could do them service. During the day and night did Osmund row backwards and forwards across the river, ferrying troops of those fierce men. When the last company was put on shore, Osmund, kneeling beside the river's bank, returned heartfelt thanks to Heaven for the preservation of his wife and child Often, in after-years, did Osmund speak of that day's peril; and his fair child, grown up to womanhood, called the tall Fern by her father's name.

Osmunda regalis, *Linnæus.*

The Osmund Royal, or Flowering Fern.

(Plate XIX. fig. 2.)

This plant has a very stately aspect, growing to the average height of three or four feet, but sometimes found

eight or ten feet high. The tufted stem by degrees acquires height, so that in very old and luxuriant plants there is a trunk formed from a foot to two feet in elevation. From the crown of this trunk (whether that is seated close to the ground, or elevated) grow the fronds, which are seldom less than two feet high in weakly plants; more usually from three to four feet, and forming a mass of a couple of yards across; or sometimes, as upon the margins of the Irish lakes, eight, ten, or twelve feet high, noble and majestic almost beyond conception. In the lovely lake scenery of Killarney this plant is very prominent; and we need not be surprised at the rapturous descriptions which have been given of its arching fronds, dipping in the crystal lakes, and sheltering, with its broad green pinnæ, the numerous aquatic birds which seek its canopy from the prying eyes of pleasure-hunting tourists. When young, the fronds have generally a reddish stipes, and a glaucous surface, which at a later period becomes lost. These fronds are annual, growing up in spring, and perishing in the autumn. Their form when mature is lanceolate; they are bipinnate, the pinnæ lanceolate or ovate-lanceolate; with pinnules of an oblong-ovate form, somewhat auricled at the base, especially on the posterior

side, bluntish at the apex, and finely saw-edged along the margin. Some fronds are entirely barren, and these differ from the fertile ones only in having the leafy pinnules continued all the way to the apex, instead of having the apex contracted, and bearing the spore-cases. It is not always, however, that the spore-cases when present are produced at the apex of the frond; abnormal developments are not uncommon, and in these cases any portion of the pinnules may be seen converted into spore-cases—sometimes a few pinnæ at the middle of the frond, while the apex is leafy; sometimes the base of a pinna, while its apex retains the leafy form; sometimes the base of a pinnule here and there, just its apex too, being broad and leafy; but the usual condition is to find a few of the shortened pinnæ, which form the apex of the frond, contracted and soriferous throughout.

The venation, as seen in the barren fronds, consists of a prominent midvein, bearing once- or twice-forked veins proceeding to the margin in direct lines. In the fertile parts of the frond, only the midrib of the pinnules is fully developed, and the spore-cases are attached to a small portion of the veins which becomes developed just to serve as a receptacle. The spore-cases are subglobose,

shortly stalked, reticulate, and two-valved, the valves opening vertically.

The Osmund Royal is a widely-distributed plant, occurring in favourable localities, that is, marshy and boggy situations, throughout the United Kingdom, and, as already mentioned, extremely abundant and luxuriant in some parts of Ireland. It is common throughout Europe, and a very similar plant occurs in the United States of America.

This plant is especially suited, in cultivation, to occupy the base of rockwork abutting upon a piece of water, where its roots may be placed within the reach of the water. For the margins of ponds or lakes, or for any other damp localities, it is also well adapted ; and in such situations only does it acquire anything like its natural vigour. It should have peat earth for its roots. The best way to establish it is, to procure strong vigorous patches from localities where it abounds, and these, if removed carefully any time before growth commences—or even after it is considerably advanced — will succeed perfectly. This course is far more satisfactory than to make use of weaker plants in the hope of their eventually gaining vigour to produce a bold and characteristic effect.

Genus XVIII. BOTRYCHIUM, or MOONWORT.

This small and very distinct plant is easily known by two circumstances,—first, it has two fronds or rather two branches of its frond, the one of which is leafy, the other seed-bearing; and secondly, the pinnæ of the leafy branch are crescent-shaped, with the outer margin jagged. There is no other native plant which has these peculiar features, and hence the Moonwort is a plant very easily recognized when it is met with. It is rather local in its range, but not scarce in the localities where it is found, which are open heaths and pastures, rather dry than otherwise. The spore-cases are collected into branched clusters at the end of the fertile branch; the little branches of the cluster are all turned one way, and the spore-cases themselves are numerous and globular, and somewhat resemble in the aggregate a miniature erect bunch of grapes.

There is another peculiarity in this Fern which also serves to distinguish it, and its near ally the *Ophioglossum*, from all other native species—the venation is straight, not circinate; that is, the fronds, before they are developed,

are not rolled up spirally, unrolling as they expand, but in the incipient state the parts are merely folded together by a flat surface. Only one species of *Botrychium* is indigenous.

The name is derived from the Greek *botrys*, signifying a cluster.

Botrychium Lunaria, *Swartz.*

The Common Moonwort. (Plate XVIII. fig. 2.)

This is a very peculiar plant, exceedingly interesting to the student, from the differences of structure and development it exhibits as compared with the majority of Ferns. It is an almost stemless plant, furnished with a few coarse brittle fibres, and a bud springing from the permanent point which represents the stem. Within this bud, before the season at which the fronds are developed, they may be found in an embryo condition, perfectly formed, the two branches of the frond placed face to face, the fertile being clasped by the barren one. This new frond springs up annually, and perishes before winter, and in the majority of cases is not very conspicuous. The size varies from three to eight or ten inches in height, the lower half consisting of a smooth, erect, cylindrical, hollow stipes, the

base of which is invested by a brown membranous sheath, which had covered it while in the bud. Above, the frond is separated into two branches, one of which is spreading, pinnate, leafy, oblong; the pinnæ are crescent-shaped, or somewhat fan-shaped approaching to lunate, filled with a radiating series of two or three times forked veins, such as occur in *Adiantum*, one vein extending into each of the crenatures into which the margin is divided. The other branch is erect, fertile, compoundly branched, that is, it is first divided into branches corresponding with the pinnæ, and these again into another series of branches, on which, distinct, but clustered, the globose stalkless spore-cases are produced. The spore-cases are two-valved, and open transversely when ripe; the valves are concave.

Occasionally, though very rarely, two fertile branches are produced, and there is a variety in which the pinnæ are pinnatifid.

This species is widely distributed, but local, occurring in open heaths and pasture, where the soil is peaty or sandy, and not wet. The same plant occurs in other parts of Europe, and also in North America.

The Moonwort is not very easily cultivated. It may, however, be preserved in pots in a cold frame, if trans-

planted while dormant, or when just starting, into peaty or sandy loamy soil, and kept from either of the extremes of drought or saturation. The roots should not often be disturbed when once established.

The Moonwort is the *Osmunda Lunaria* of Linnæus.

Genus XIX. OPHIOGLOSSUM, or ADDERS-TONGUE.

This is very nearly related to the Moonwort, though at first sight having a very different aspect. The points in which it agrees are, that the parts are folded up straight in the incipient state, and the fronds are two-branched, one branch being leafy, the other fertile. *Ophioglossum* differs from *Botrychium*, most obviously, in its parts being all simple, while those of *Botrychium* are compound. Its habit of growth is precisely the same, but the fructification is very different, consisting of a distichous spike of imbedded spore-cases. There are but two native species.

The name *Ophioglossum*, literally means Adders-tongue, which is the English name borne by this plant. It is

derived from the Greek *ophis*, *ophios*, a serpent, and *glossa*, a tongue ; and is applied in consequence of the resemblance of the fertile fronds to the tongue of a serpent.

Ophioglossum vulgatum, *Linnæus.*

The Common Adders-tongue. (Plate XVIII. fig. 3.)

A small stemless plant, producing a few coarse brittle roots from a central crown which represents the stem, and which annually produces a bud from which the new frond arises. The young fronds are produced about May, and perish by the end of the summer. They grow from six inches to ten or twelve inches in height, with a smooth, round, hollow, succulent stipes of variable length. In the upper part this becomes divided into two branches, the one branch leafy, entire, smooth, ovate-obtuse, traversed by irregularly anastomosing veins, forming elongated meshes within which are free divaricating veinlets. The fertile branch is erect, contracted about half its length, being soriferous, forming a linear slightly tapering spike, which consists of two lines of crowded spore-cases imbedded in the substance of the spike, and occupying its two opposite sides. The spore-cases are, therefore, considered as being produced on the margins of a contracted frond. When

mature, the margin splits across at intervals corresponding with the centre of each spore-case, so that eventually the spike resembles a double row of gaping spherical cavities.

The Adders-tongue is very abundant in the localities where it is found, which are damp meadows and pastures, on a loamy soil. It is generally distributed over England, but is less abundant in the other parts of the United Kingdom. The species is a common European plant, and is found in North America as well as in Africa.

There is no difficulty in cultivating the Adders-tongue, whether in pots, or among an out-door collection of Ferns; the essentials are a stiff loamy soil, and the constant presence of water enough to prevent drought.

Ophioglossum lusitanicum, *Linnæus.*

The Dwarf Adders-tongue. (Plate XXI. fig. 3.)

This species of Adders-tongue is technically distinguished by the small lanceolate and somewhat fleshy barren branch of its fronds, and by its being altogether much smaller than the common species. It may, indeed, be at once known from that by this difference of size, as well as by its difference of form. The stem forms a short oblong

fleshy body, producing a few coarse spreading roots chiefly from its upper extremity. At the top it tapers abruptly into a short conical crown. From this crown rises the frond, which attains from about one and a half to three inches in height, and is divided above at about one-third of its height, into a barren leafy branch, and a spicate fertile branch. Occasionally a barren radical frond, of lanceolate form, accompanies the two-branched frond. The stipes is slender, smooth, round, sheathed at the base by broad taper-pointed scales, which are dilated below, and envelop the crown. The barren branch is spreading, lanceolate, narrowing towards but bluntish at the apex, and tapering at the base into a slender petiole; it is from three-fourths of an inch to an inch and a half long, somewhat hollow along the centre, from the elevation of its margins, thick and fleshy in texture when fresh, so that the very slender veins are not seen; they are, however, united in very much elongated meshes. The fertile branch or spike is somewhat taller than the barren branch, and is supported by a footstalk, which is thickened upwards, becoming broad, fleshy, and flattened at the base of the spike. The spike itself is about half an inch long, linear, rather widened a little above the base, with a tapering

apex, fleshy, and bearing along each margin about six imbedded spore-cases, which at length burst transversely.

The existence of this curious little plant in Guernsey was first made known in 1854, by Mr. G. Wolsey, who met with it above the rocks bordering on Petit Bot Bay, in that island. One remarkable feature of the plant is the very early period of the year at which its growth is made. By the middle of January it is fully developed, and the fronds no doubt perish early in the spring.

The range of this *Ophioglossum* appears to be extensive; for it is recorded to inhabit the sandy coasts both of Europe and Africa, washed by the Mediterranean Sea; and to extend to the Canary Islands and Madeira. It is not improbable that a diligent search might be rewarded by its discovery in the western counties of England or in Ireland. Its early development and speedy decay should, however, be borne in mind by those who may undertake the search.

THE BRITISH CLUB-MOSSES.

Genus XX. LYCOPODIUM, or CLUB MOSS.

The *Lycopodiums*, commonly called Club-mosses, are moss-like plants, mostly of creeping or decumbent habit; with slender fork-branched stems, consisting of spiral vessels and tubular ducts running longitudinally among the cellular tissue; they are throughout their whole length clothed with leaves, so placed as to overlie each other like the tiling of a roof. The fructification is produced in the axils of the leaves, and is in most of the species confined to the apices of the branches, where it forms a cone-like head.

The organs of reproduction at once distinguish the Club-mosses from all other plants. They consist, in the true *Lycopodiums*, of kidney-shaped spore-cases, containing minute powdery or granular spores, which, by reason of lateral pressure, acquire the form of irregular polygons.

These have been called antheridia. In the *Selaginellas*, another kind of spore-case is produced, which contains three or four roundish fleshy spores, many times as large as the granular spores, and marked at the apex by three elevated radiating ridges. These larger bodies are called oophoridia.

The true explanation of these parts is a matter of doubt. All that seems certainly known is, that the larger spores, or oophoridia, do germinate, or at least vegetate. According to Willdenow, however, the smaller ones germinate also. Dr. Lindley formerly suggested that the powder-like grains are true spores, while the larger ones are buds or viviparous organs; and this view was apparently supported by the descriptions given of the supposed germination of these larger bodies, in which a process quite analogous to the vegetation of a bud was clearly pointed out. Recent observers, however, consider the larger bodies rather as the true spores.

It has been usual to regard both sets of organs, when present, as axillary to the leaves or bracts; and so they may be considered for all practical purposes. A different theoretical explanation has, however, been given by Müller, who considers the oophoridium as the entire metamor-

phosed terminal bud of a main axis, and the smaller granules, as lateral buds, or twig buds, only to be distinguished from the terminal bud which is developed into the oophoridium, by the circumstance that the latter is a principal branch, possibly capable of a more extensive development into branch and foliaceous organs; while the twig, which is developed into an antheridium, is but a small particle of such a main branch.

These plants, like the Ferns, are most abundant in hot, humid, and especially insular situations in the tropics, becoming scarcer northwards, but often, even in very northerly regions, covering large tracts of land. Our native species, with one exception, have a boreal and alpine tendency; being found most abundantly on the high lands of the north, and decreasing in quantity as they advance southwards. Many of the tropical *Lycopodiums* are extremely beautiful: some are of scandent habit, and many of them attain considerable size.

Though of humble growth, and altogether unattractive in appearance, the Club-mosses are not without their use. More than one species is used in dyeing operations, and several have a medicinal reputation. The powdery spores, often called pollen, produced in considerable quantities by

our common species, is highly inflammable, and is used in pyrotechny under the name of vegetable brimstone. Being of a drying and healing nature, it is also used to prevent excoriation ; and in pharmacy is used sometimes for coating pills, as it is with difficulty wetted. The Common Club-moss is emetic, and the Fir Club-moss is a cathartic and a powerful irritant ; the former is used in the treatment of cutaneous disorders, and is a reputed remedy for the *plica Polonica.*

The tiny species of Lycopods now known to botanists have been thought to be the direct representatives of the vast tree-like *Lepidodendra* met with in a fossil state, and which, in former ages, must have rivalled our coniferous trees. The evidence in support of this view has been questioned ; but there seems no good reason to doubt, at least, that there is a very close affinity between the two races ; and, indeed, some of the most skilful investigators of this subject find an almost complete agreement between them.

The British species of this order are, with one exception, included in the genus *Lycopodium,* the name of which comes from *lycos,* a wolf, and *pous, podos,* a foot, and is given in allusion to the supposed resemblance of its forked

fertile stems to the claw of some animal, as of the wolf. Hence one species, and that which probably suggested the name, has been called Wolfs-claw.

Lycopodium Selago, *Linnæus.*

Fir Club-moss. (Plate XX. fig. 5.)

The Fir Club-moss is one of our commoner and stouter kinds. It is usually of upright growth, the others being decumbent; though of this there is a variety, or mountain form, sometimes met with, in which the stems are constantly prostrate. Indeed, in the commoner forms the upright habit, which is evidently natural to it, often gives way before the force of gravity, and in such cases the lower part of the stems is found to be somewhat recumbent, while the upper parts retain their upright position. The stems vary from three or four to six or eight inches high, and are branched two or three times in a two-forked manner; they are stout, tough, rigid, nearly level-topped, and thickly clothed with imbricated leaves arranged in eight rows. These leaves are lance-shaped and acute, of a shining green, rigid and leathery in texture, and smooth on the margin; in plants which have grown in exposed places, they are shorter and more closely pressed to the

stem ; while in plants developed in more confined and humid situations, they are longer, less rigid, and more spreading.

The fructification is, in this species, not borne in terminal spikes, as in the other kinds, but is produced in the axils of the leaves along the upper branches of the stem. The spore-cases are rather large, sessile, kidney-shaped, two-valved, and filled with minute pale-yellow spores.

Besides the ordinary spores, the plant is furnished with other means of propagation in the shape of deciduous buds, produced for the most part in the axils of the leaves, about the apices of the branches. These buds separate spontaneously, fall to the ground, and there vegetate, first producing roots, and then elongating into a leafy stem. They are formed by an altered leaf, which, becoming somewhat swollen on the outside, protrudes from its inner margin five small lanceolate leaves or teeth, the whole being elevated on a short hardened footstalk. Mr. Newman describes these changed leaves as becoming transformed into irregular six-cleft calices or cups, the outermost lobe of the six being longer and larger than the rest, and of the pair on each side, one being generally incumbent on the other, so as to nearly conceal it. Within this is a whorl of

five parts representing a gemma, or bud; the three inner lobes of this series are large and prominent, and of an ovate oblong acute form; the two outer lobes are very small, scale-like, one closely appressed to the anterior, the other to the posterior surface of the bud. In the centre of the three inner lobes, in due time, appears a thickish oblong body, which is in reality the undeveloped stem, and eventually elongates, puts out small leaflets, and becomes a plant.

These buds are capable of growth either while attached to their parent stem, or when detached and in contact with the soil; and they appear to be the chief means of propagation possessed by this species; for the statements which have been made respecting the germination of the spores of the Fir Club-moss are open to much doubt. Probably it was these buds which were caused to germinate.

There is no doubt this plant possesses some medicinal properties, though it is not now used in regular practice. It is powerfully irritant, and is used by country people, in the form of an ointment, as a counter-irritant in parts near the eye, for diseases of that organ; it appears to be also sometimes employed as an emetic and cathartic, but not without danger. A decoction is, on the authority of

Linnæus, used in Sweden to destroy vermin on cattle. It is also employed for dyeing, and to fix the colour of woollen cloths.

Lycopodium annotinum, *Linnæus.*

Interrupted Club-moss.

A very distinct plant, easily recognized by the interrupted leafing of its stems, the leaves being at intervals much diminished in size and less spreading in their direction, indicating at these points where the annual growths have commenced and terminated. It is also known by its narrow leaves spreading out from the stem on all sides, and arranged in five indistinct rows. It is a large-growing species, often a foot high, with irregularly-branched stems, which, after they have produced fruit-spikes, or have reached an equivalent age, become depressed, rooting at intervals, and producing another series of upright branches. The annual increase of the stems is well marked by the closer-pressed and shorter leaves which occur at the upper part of each growth, and this is what gives the interrupted appearance to the stems. The leaves, which do not decay for several years, are linear-lanceolate in form, and have their margins minutely serrulate, and their apex drawn

out and terminating in a rigid point ; they are attached directly to the stems without stalks, and are arranged in an indistinctly spiral or somewhat five-ranked order. The lower leaves, that is to say, those remaining on the older portions of the stem, are more spreading than those on the younger growth, and indeed on the oldest portions often become somewhat deflexed : they have a yellowish-green colour, and are of a hard, rigid texture ; they have, moreover, a stout midrib, prominent at the back.

The spike of fructification is in this species perfectly stalkless, being seated directly on the termination of the leafy branch. It is about an inch long, of an oblong form, and consists of closely-overlapping bracts, of a roundish-ovate form, having a long narrow point and jagged membranous margins. In the axil of the bracts is produced a large reniform capsule, containing numerous minute pale-yellowish spores. The bracts become reflexed when these spores have escaped from the burst capsule.

This is a rare species, confined to wild mountainous localities, occurring in the Scottish Highlands and the Northern Isles, and in Carnarvonshire and the Lake district. It is plentiful in the pine-forests of the North of Europe, and in some parts of North America.

Lycopodium clavatum, *Linnæus*

Common Club-moss. (Plate XX. fig. 6.)

This Club-moss is of procumbent habit, having vigorous creeping stems often many feet in length, much branched, and attached to the soil here and there by means of tough pale-coloured wiry-looking roots. The young branches, which are very thickly clothed with leaves, grow rather upwards at first, but soon all become prostrate, and cross and interlace, forming a close-matted tuft, whence comes, in fact, the name it bears in Sweden—*Matte-grass*, or mat-grass. The stems are densely clothed with small, narrow, lanceolate, flattish leaves, which remain fresh through the winter; they are smooth on the margin, or very slightly toothed, and terminate in a long white filamentous point, which gives the branches a somewhat hoary appearance. The upright stalks supporting the spikes are bare of leaves, but have at intervals whorls of smaller bodies closely pressed to the stalk, and tipped with shorter but broader membranous chaffy processes; they are also of a pale yellowish-green colour.

The spikes of fructification are usually over an inch in length, and are supported by a stalk of about twice their

own length. They are commonly produced in pairs, though sometimes singly, and occasionally three together on the same stalk. These spikes are cylindrical, and supported on a short pedicel at the top of the common stalk; they are erect, but afterwards become more or less curved; and consist of crowded triangular-ovate acuminate bracts, of a pale-yellow colour, having membranous serrated margins. In the axils of these bracts the spore-cases are produced, and these are subreniform, two-valved, and filled with innumerable sulphur-coloured powdery spores. The bracts become reflexed after the spore-cases have shed their contents.

This is a common species, growing in moors and heathy places, in mountainous and hilly tracts of country throughout England, Wales, and Scotland; and frequent, though less abundant, in Ireland.

The leafy stems of this species are used for dyeing purposes, as well as to fix colours in the stead of alum. The long slender stems, used under the name of Stags-horn Moss, are formed into pretty ornaments for the houses of rustics, and for decorating their fireplaces during summer. Linnæus relates that in Lapland the boys have their heads decorated with chaplets formed of it, which—the twin

spikes projecting on all sides—have the effect of calling up the idea of groups of fauns and satyrs. Indeed, the long flexible stems are not badly adapted for various decorative purposes.

Lycopodium inundatum, *Linnæus.*

Marsh Club-moss. (Plate XX. fig. 4.)

This is a diminutive and common plant, very frequent on moist heaths and commons in the southern parts of England, less common northwards, comparatively rare in Wales and Scotland, and not found in Ireland. It prefers to grow on spots from which the turf has been pared.

It is of prostrate habit, with simple stems, two or three inches long, growing close to the surface of the ground, to which they are firmly attached by a few short stout roots. They are thickly clothed with narrow linear-lanceolate leaves, which have an acute point, and are entire on the margin ; those on the barren horizontal stems being curved upwards. The plant extends itself at the point, throughout the growing season, the other end meanwhile undergoing a process of decay ; so that in winter, when the growth is arrested, the decay still going on, the living stem is much

reduced, and a small portion only remains over to produce new foliage the following season. The direction of the older portions may often be traced by means of a black line, caused by the decayed matter left on the surface of the soil where the stem has perished.

The spike of fructification, which is produced towards autumn, is seated at the top of an erect branch-like peduncle, clothed throughout with leaves of the same shape as those on the horizontal stems; the peduncle and spike are nearly of equal thickness throughout, the spike about an inch long, the peduncle rather more. The spike is green, and is formed of narrow linear-lanceolate bracts, rather dilated at the base, and sometimes having one or two shallow teeth on each side. The spore-cases are in the axils of these bracts, and are nearly spherical, of a pale yellowish-green, containing numerous minute pale-yellow spores.

Lycopodium alpinum, *Linnæus.*

Savin-leaved Club-moss.

This Club-moss gets its trivial name from the resemblance between its branches clothed with the closely-pressed leaves, and those of the Savin, *Juniperus Sabina.* It is a pretty little evergreen plant, forming thick wide-spreading patches

of round, tough, creeping, sparingly leafy stems, bearing numerous other erect stems, which are repeatedly branched in a dichotomous manner, growing erect, from three to six inches high. The colour of the plant is a bright pleasant green. The smaller branches are set more or less closely with the small smooth sessile leaves, whose form is lance-shaped, ending in a point; they are of a thickish texture, and are rounded off at the back and hollowed out in front where they fit against the stem. On the dichotomous branches, just mentioned, the leaves are closely placed, the lower ones lying over the bases of those next above them, but they are arranged in four tolerably regular lines, so as to give a squarish form to the branches. The little fascicles of branches are for the most part level-topped, those which bear spikes of fructification being longer than the barren ones and twice dichotomous; the fruit-spikes, which exceed half an inch in length, are rather thicker than the branch.

The fructification consists of the little spikes just mentioned, which terminate a portion of the branches, and are erect, close, cylindrical, of a yellowish-green colour, and sessile on the branches, that is, joined to the leafy portion below, without any intermediate stalk-like con-

tracted part. The spike consists of a number of bracts closely packed together, each having in its axil a capsule, containing numerous minute pale-yellowish spores. The bracts are ovate, dilated at the base, drawn out into a longish point at the apex, and having the margins toothed. The capsules themselves, seated quite at the base of the bracts and close to the axis of the spike, are roundish kidney-shaped, and of a yellow colour. The bracts become reflexed after the spores have been dispersed. The plants are firmly fixed to the soil, by means of tough, strong, wiry-branched roots, produced at intervals along the prostrate stems.

The head-quarters of this species is in elevated mountainous tracts. It occurs very abundantly in Scotland and Wales; in the northern isles; on the hills of the North, and extending into the south-west of England. It is less common in Ireland. It also occurs throughout the alpine districts of Europe and Northern Asia.

The Savin-leaved Club-moss is a bitter plant, with a somewhat aromatic flavour, and possesses emetic properties; it is, however, seldom applied to any use. According to Sir W. J. Hooker, it is used in Iceland as a dye for woollen cloths, to which it gives a pale and pleasant but not brilliant

yellow. The process is simply that of boiling the cloth in water, along with a quantity of the *Lycopodium*, and some leaves of the Bog Whortleberry.

Genus XXI. SELAGINELLA.

The *Selaginellas* differ from the *Lycopodiums* in producing two kinds of spores, which have been already alluded to. The name is a diminutive of *Selago*, the specific appellation of one of the commoner *Lycopods*.

Selaginella spinosa, *Palisot de Beauvais.*

Prickly Mountain Moss.

This plant is perhaps generally known by the name of *Lycopodium selaginoides*, which it formerly bore. It has a slender, procumbent, often branched stem, the barren branches short and sinuous, the fertile ones ascending or erect, and from two to three inches high. They are clothed with lance-shaped leaves, of a delicate texture, jagged along the margins with spiny teeth; those on the decumbent stems being shorter, as well as more distant and spreading, than those of the fertile branches.

The inflorescence, as in the other species, is a terminal spike of about an inch in length, consisting of lance-shaped jagged-edged bracts, larger and more closely pressed than the leaves of the stem. These bracts produce from their axils two kinds of fructification. The lower bracts bear in their axils large three-celled spore-cases containing three globular oophoridia, or four-celled cases containing four of these bodies. The upper bracts bear subreniform spore-cases, containing the minute pulverulent pollen-like spores. This is the only native *Lycopod* which produces the two separate kinds of spores.

Though hardly to be considered a rare species, this is one of the less common ; it is found in the north of England, Wales, and Scotland, in which latter country it is pretty generally distributed. In Ireland it is rather common. The localities which it prefers are wet boggy places by the side of mountain rills.

The *Lycopodiums* are not frequently seen in cultivation, but they nevertheless, equally with the Ferns, would become a source of much interest if brought constantly under the eye in a living state ; and in an equal degree the study of them in this condition—the watching of their progress

and development day by day—would contribute to a thorough knowledge of them and their differences. We offer a few suggestions and hints as to their cultivation.

A small Wardian case, a northern aspect, a few blocks of sandstone, and some peat soil, are the materials that would be required. The Wardian case, while protecting them in some degree from the changes of temperature incidental to a lowland climate, would secure to them a constantly moist atmosphere, which they all prefer. The interior should be fitted up with an artificial mound of "rockwork," made of lumps of soft sandstone, in the disposal of which there will be an opportunity for the display of much taste. At the base of the "rockwork" there should be a little pond of water, in which *Isoëtes* and *Pilularia* might be cultivated. A portion of the peaty soil should be introduced into the interstices of the rockwork, and about its base on the margins of the water. In the former situations the smaller and alpine species, such as *alpinum*, *annotinum*, and *selaginoides*, should be planted; while on the lower and damper parts should be placed such as *inundatum* and *clavatum*.

The soil employed should be peat earth intermediate in texture between the spongy and the unctuous kinds; that

used among the rockwork may have in addition a portion of the sandstone pounded and intermixed with it. That used for *inundatum* in the lower part of the case will not require this intermixture, and, in fact, will be the better as it approaches the unctuous texture just referred to, which the presence of a good supply of water will soon give to it.

All parts of the soil should be kept rather moist than otherwise, by the application of fresh water occasionally; but as the confinement of the atmosphere in the damp state, in a close case, might tend to produce decay in some parts of the vegetable tissues, the little door or hinged sash may from time to time be left open for a few hours, in order that the stagnant moisture may be carried off, when a fresh supply will be doubly grateful to the plants.

It must be recollected, that the soil will be exposed to very slight drying influences, and can, therefore, never require to be very copiously supplied at any one time; the proper course being, rather to ventilate frequently, say once a week, in order to carry off the accumulated dampness, and then by a moderate fresh supply to produce a continued change of the watery element. For the same reason, and to prevent the souring of the soil, which always

takes place more or less when it is in contact with stagnant water, an outlet at the bottom of the case should be carefully provided, by which all the free water at least, which drains through after the soil has been irrigated, may be removed at it accumulates.

As to aspect, the northern is decidedly the best, principally for the reason that in such a situation the sun has less influence on the temperature of the interior of the case; and an extreme degree of confined heat would be anything but favourable to these plants.

The appearance of the case, would, no doubt, be improved by covering the soil entirely with living Sphagnum moss, which, if neatly packed on the surface, with the tops of its stems uppermost, would continue to grow. Most of the species of Club-moss would prefer to grow amongst the Sphagnum, which, to prevent its being drawn up and smothering the plants, should be neatly clipped down occasionally with a pair of scissors.

The interest of such a collection, so far as their appearance is concerned, would depend of course upon the taste with which the rockwork was designed and executed, and the plants distributed about it; but whatever the result as a matter of taste, the study of the living plant might be

prosecuted without inconvenience, and—which could never happen in their wild localities—all the species might be brought under the eye at one time, for the purpose of contrasting them, and studying their differences.

THE BRITISH PEPPERWORTS.

The group of plants to which the name of Pepperworts has been given, is technically called *Marsileaceæ*, and contains but a few genera, these being of very curious structure. It has only two representatives in the British flora. These two plants belong to different genera, and are both submerged aquatic plants of small size, agreeing in having grassy or quill-like foliage, but differing materially in habit, the one being of creeping habit and the other tufted. The fructification also presents some material differences, on which account *Isoëtes* is sometimes classed with the Club-mosses, instead of the Pepperworts.

Genus XXII. ISOËTES, or QUILLWORT.

Isoëtes, which takes its name from the Greek words *isos*, equal, and *etos*, the year, on account of its retaining its

leaves throughout the year, is commonly called Quillwort. The genus differs from *Pilularia*, its nearest ally, and with which it is associated in the order of Pepperworts, in having its spore-cases enveloped by the dilated bases of its hollow leaves; some of the spore-cases containing large, and some much smaller pollen-like spores. It may also be known by its hollow leaves being composed of four rows of elongated cells, which give it a bluntly quadrangular section; but this peculiar construction of the stems is not always to be observed, except in fresh specimens, the pressure to which they are subjected in the process of drying breaking up the partitions of the cells, so that the stem appears to be composed of one series of large elongated cells. There is but one species, the *I. lacustris*, a stemless quill-leaved submerged plant, which gives the appearance of a green turf to the bottom of the water where it occurs.

Isoëtes lacustris, *Linnæus.*

The European Quillwort, or Merlin's Grass.

(Plate XIX. fig. 1.)

This is a very curious plant, growing at the bottom of our mountain lakes, and having so much the appearance of

submerged grass, that the inexperienced eye would probably pass it by unnoticed. It has a fleshy tuber, of a nearly globular form, white, and of compact texture internally, but spongy and of a dark-brown colour externally. In the centre is a small nearly pellucid part, which appears to be the growing-point, since it is from this point that the leaves have their origin. From these tubers are produced the long semipellucid tubular roots, which strike downwards almost perpendicularly. The leaves spring from the crown of the tuber, and grow erect to the height of four or six inches, or more. They are persistent, and of an olive-green colour, and their general form is awl-shaped. The basal portion is dilated and furnished with membranous margins; above this dilated base they are bluntly quadrangular, being formed of four parallel hollow tubes, which tubes are subdivided at irregular distances by transverse partitions, while towards the apex they taper off and terminate in a sharp point. The transverse partitions above mentioned, being visible through the texture of the leaf, give it a jointed appearance. Owing to their brittleness, they not unfrequently break off at one of these joint-like points, their basal parts and the decaying remains of the older leaves continuing to encircle

the base of the young vigorous leaves springing from the centre.

The fructification is contained within a hollow at the dilated base of the leaves, and varies with the position it occupies. The spore-cases at the base of the outer leaves contain roundish spores, marked on the top by three elevated radiating ridges; these, which are externally opaque, whitish, and rough with minute prominent points, separate at the ridges into three triangular valves, exposing an interior subglobose semi-gelatinous substance. The spore-cases found at the base of the inner leaves, contain more numerous minute angular spores, of a pale-yellow colour.

Two distinct-looking forms of the Quillwort have been observed, the one having thicker, shorter, and more spreading leaves than the other; in the latter they are more slender and erect. These have been thought distinct varieties, or even distinct species, by some botanists, but are more probably mere changes of the plants brought about by external circumstances, such as a sudden rising of the water in which they grow, which may account for the taller and more slender growth; or the larger number of the spores, not becoming liberated from their parent

cell may be compelled to germinate in close contiguity, and are thus made to produce dense tufts of slender leaves. The latter explanation would be at once recognized by horticulturists as quite sufficient to account for the observed differences in habit among the plants.

It is said that fish feed on the *Isoëtes;* and that, when brought within the reach of cattle, it is greedily eaten by them, and proves fattening.

The cultivation of the Quillwort presents few difficulties; in fact, water and a little soil are the only requisites. In such a miniature lake as has been recommended to be introduced in a Wardian case fitted up for Club-mosses, this plant and the *Pilularia* might be made to thrive; but the most interesting way in which it could be grown would be in an aquatic-plant case, with transparent sides, or in any substitute for such a structure, such as a glass jar of sufficient depth. Planted in this way, its growth could be watched, and many interesting points of its economy could not fail to reward a careful observer.

The aquatic-plant case admits of much variety of detail. The most useful form is probably that of a rectangular glass cistern of the requisite size, held together by a light

metal frame, and closed in by a glass lid or cover. This would require to be supported on a stand. On the bottom of the interior, or projecting from the sides, proportionate-sized masses of coral or other rocks should be introduced, among which a little soil introduced would serve to fix and nourish the plants. Thus the smaller aquatic plants might, though in their proper element, be examined without difficulty, and at all times.

The proper situation for such a case would be the inside of any convenient window, provided it were not too much exposed to the heat of the sun; for if placed where the sun would have much influence on the temperature of the water, the plants would probably suffer. On this account, we believe, the best aspect would be the north; and in such a situation, by carrying a ledge of rock just above the water-surface, inside the case, a situation would be provided which would of all others best suit the beautiful and delicate Bristle Fern and the Film Ferns. Some of the very small kinds of fish and the *small* aquatic molluscs might be introduced with advantage, and they would impart something like animation to the water. A miniature aquarium of this kind, planted with the *Vallisneria* and other aquatics, and the *Trichomanes* and other Ferns,

and stocked with miniature fish, is an object of intense interest.

Genus XXIII. PILULARIA, or PILLWORT.

The *Pilularia globulifera*, Pillwort, or Pepper-grass, is a creeping-stemmed species, having filiform grass-like leaves, which grow in clusters at intervals along the thread-like stems, and bear the almost sessile fructification at their base. The parts of fructification differ considerably in position from those of *Isoëtes*, in which the spore-cases are within the thickened bases of the leaves, while those of the *Pilularia* are quite free, and attached directly to the stem, though seated at the base of a small tuft of leaves; they also differ in structure, that of *Isoëtes* consisting of granular and pulverulent spores, occupying separate spore-cases, while in that of *Pilularia* the two kinds of spores are produced within each spore-case, the larger bodies occupying principally the lower, and the smaller ones the upper parts.

The name comes from *pilula*, a little ball or pill, the spore-cases having a nearly globular form.

Pilularia globulifera, *Linnæus.*

The Pillwort or Pepper-grass. (Plate XVII. fig. 2.)

Pepper-grass is a small creeping plant with grassy leaves growing usually in the shallow margins of lakes and pools, where it is occasionally overflowed ; but sometimes occurring entirely submerged. The stem, or rhizome, is thread-like, composed of several longitudinal rows of hollow cells, rough externally on the younger portions with hair-like scales, but otherwise smooth, occasionally branched, and producing on the lower side, at intervals, small tufts of fibrous roots, which descend almost perpendicularly into the muddy soil in which they become fixed. On the upper part of the stem, at the same points, occur tufts of erect leaves, which are curled up in the incipient state, like those of a Fern, but on unrolling assume the erect position. These leaves are bristle-shaped, from one to four inches long, bright green, smooth externally, hollow within, but, unlike those of *Isoëtes*, which are composed of four lines of cylindrical tubes, the leaves of the Pillwort are divided longitudinally into various cells, separated by partitions radiating from the centre ; they are from one to four inches long.

The fructifications consist of small globular spore-cases, attached by a very short stalk to the stem at the points whence the leaves and roots proceed, being in fact seated at the base, or in the axils of the leaves. They are densely covered externally with pale-brown jointed hairs, and are about the size of a small pea or pepper-corn. These spore-cases are four-celled, and when mature, split into quarters, the four parts remaining attached to the footstalk by their base. The spores are attached to the interior of these valves along their centre, forming four lines; the lower part of the spore-case being occupied by the large spores, which are of a greyish colour, and have a roundish-oblong form, with a contraction in the middle, and a terminal nipple-like point, and the upper part being occupied by the small spores, which are oblong pale-yellow bodies, resembling pollen; both are contained in transparent membranous bags. The larger bodies are probably to be considered as the perfect spores, while the smaller ones are merely abortive spores; at least this is the most reasonable explanation which has been offered. There is, indeed, no doubt of the larger bodies being spores, since they have been caused to germinate by different persons.

The Pillwort is widely distributed throughout the United

Kingdom, but is apparently more abundant in England and Wales than in Scotland and Ireland. It usually grows on the margins of lakes or pools, where it is covered by the water in winter, and more or less exposed during the summer ; but it is also sometimes, though rarely, met with entirely submerged.

THE BRITISH HORSETAILS.

This race of plants bears an aspect altogether different from that of the groups in whose company they are placed in books; and indeed they have no very obvious affinity to any existing order of plants. In their mode of growth they have a certain resemblance to two small groups of plants, the *Ephedras* and *Casuarinas*, but this resemblance is confined to their general aspect, and is in great measure owing to the peculiar jointing of the stems and branches. With Ferns and Club-mosses they have little in common, though so frequently associated with them in books. Their most direct relationship is probably with a small group called Liverworts (*Marchantiaceæ*), and the aquatic group *Characeæ*.

The Horsetails are distinguished from other plants by the following characteristics. They are leafless, branching plants, with fistular jointed stems, separable at the joints, where they are solid, and at these points surrounded by

membranous toothed sheaths : each joint, in fact, terminates above in one of these sheaths, into which the base of the next joint fits. The sheaths seem to represent abortive leaves. The fructification consists of terminal cone-like heads, made up of peltate, usually hexagonal scales, to the lower face of which the spore-cases are attached in a series around the margin.

The stems consist chiefly of cellular matter, coated externally by a layer of hard woody tubes, from which plates of a similar nature project towards the central cavity. Between the outer and inner cuticle of this hollow cylinder-like stem, occur one or more circles of tubes, or air-cavities, differing in size and position ; these afford, by their comparative size, number, and arrangement, excellent auxiliary marks for the recognition of the species. Numerous stomates exist in the hollows of the fluted surface of the stems, the depressed part of each channel having two longitudinal series of these minute openings. The cuticle abounds in siliceous particles secreted in the form of little warts, which impart to the surface a greater or less degree of roughness in proportion to their prominence. In some species this deposit of siliceous matter is so great, that it is said the whole of the vegetable substance may be destroyed

by maceration, the form of the plant being preserved entire in the flinty coating. It has been found that the ashes contain half their weight of silica. We quote some very interesting observations of Dr. Brewster, on the microscopic structure of this siliceous coating in *E. hyemale*, first published by Dr. Greville—

"On subjecting a portion of the cuticle to the analysis of polarized light under a high magnifying power, Dr. Brewster detected a beautiful arrangement of the siliceous particles, which are distributed in two lines parallel to the axis of the stem, and extending over the whole surface. The greater number of the particles form simple straight lines, but the rest are grouped into oval forms, connected together like the jewels of a necklace by a chain of particles forming a sort of curvilinear quadrangle; these rows of oval combinations being arranged in pairs. Many of those particles which form the straight lines do not exceed the five-hundredth part of an inch in diameter. Dr. Brewster also observed the remarkable fact, that each particle has a regular axis of double refraction. In the straw and chaff of wheat, barley, oats, and rye, he noticed analogous phenomena; but the particles were arranged in a different manner, and displayed figures of singular

beauty. From these data Dr. Brewster concludes that the crystalline portions of silex and other earths which are found in vegetable films are not foreign substances of accidental occurrence, but are integral parts of the plant itself, and probably perform some important function in the processes of vegetable life."

Beyond their employment in the arts, the *Equisetums* are of little importance in an economical point of view. They are useless as fodder, and exploded as physic, though they have had some reputed astringent virtues. The under-ground stems, however, contain in winter, when the plants are inactive, a considerable quantity of starch, and they may be occasionally eaten by animals. In the cells of these underground stems, during the month of October, the particles of starch may be seen in active motion, passing up one side and down the other, as is observed in the stems of *Chara*. Dr. Lindley mentions having often noticed this phenomenon in the stems of the great Water Horsetail.

The Horsetails consist of the one genus *Equisetum*, of which some nine or ten species are recognized as British.

Genus XXIV. EQUISETUM, or HORSETAIL.

The jointed tubular siliceous stems, and the terminal cones of fructification consisting of spore-cases attached to peltate scales,- are marks by which the *Equisetums* may always be readily distinguished from other plants. The species are, however, not so easily recognized among themselves, owing to the great sameness which occurs in certain groups of them. The chief features relied on for their discrimination, are the similarity or otherwise of the fertile and barren stems, the number of ridges or striæ which occur on the exterior surface of these stems, and the structure of the sheaths which surround the joints. By means of the peculiarities which these parts present, the species may be certainly identified, and after a little experience has been had, several of them may be at once known by means of those *primâ-facie* appearances, which become associated with the plants in the mind of the attentive student. One peculiarity of the *Equisetums* is, that they have no leaves, these organs being represented by the tubular sheaths which are produced at every joint.

The name *Equisetum* is compounded from *equus*, a horse, and *seta*, a hair or bristle; whence comes the English name of Horsetail,—a not inapt comparison with the barren stems of some of the species.

Equisetum Telmateia, *Ehrhart.*

The Great Horsetail; or Great Water Horsetail.

(Plate XX. fig. 2.)

This is one of those species in which the ordinary fertile and the barren stems are perfectly dissimilar, the former being short and quite simple, the latter tall and compoundly branched. Occasionally a third sort of stem a kind of compromise between the two, is produced late in the season, reaching maturity about August, and bearing a very small proportion to the exclusively barren or fertile stems. They are smaller, though with longer joints; have shorter, less spreading sheaths; and bear catkins which are smaller than usual. This state of the plant has been attributed to drought; and seems to be one of those occasional and inconstant variations to which plants are liable, as they are influenced by the external circumstances of soil or climate, or the peculiarities of the seasons.

The barren stems of this species are very stately objects

when in a luxuariant condition of growth. They grow erect, and are from six to seven feet or more in height, clothed nearly to the bottom with spreading proximate whorls, those on the stouter parts consisting of thirty to forty branches, which are sometimes again branched. The upper whorls have a less number of branches. The whorls are most crowded towards the top of the stem, and there also the branches are about the full length—six or eight inches; lower down the stem the branches become shorter, and the whorls more distant. The stems measure about an inch and a half in diameter at the stoutest part, and from this point decrease upwards, becoming very slender at the point. The surface is smooth, with mere indications of about thirty faint lines extending into the sheaths, and there becoming more apparent. The sheaths set close to the stem, or nearly so, and are half an inch long, green below, with a dark brown ring at top, and divided at the margin into slender bristly teeth, about half an inch long, dark brown, with paler membranous edges; the teeth frequently adhere together in twos and threes. The branches have eight or ten ribs united in pairs, and their sheaths terminate in four or five teeth, each extended into a slender black bristle, and having two denticulated ribs. The

branches very frequently produce a series of two to five secondary branches at their second joints. The colour of the main stem is a very pale, that of the branches a delicate green. The sheaths of the branches, in this and some other species, furnish excellent marks for discrimination.

The fertile stem is erect, simple, from nine inches to a foot or more high, succulent, pale brown, and smooth. From each of the numerous joints arises a large loose funnel-shaped sheath, the upper ones being largest; they are distinctly striated, and terminate in thirty to forty long, slender, and, according to Hooker, two-ribbed, teeth. The sheaths are pale greenish brown below, darker brown above. The catkins are large, between two and three inches long; the scales, often numbering four hundred, are arranged in whorls, of which the lower ones are usually very distinct. The scales and spore-cases resemble those of the allied kinds.

A section of the barren stem of this species shows an outer surface without ridges and furrows, and in the very narrow cylinder of the stem occur two circles of cavities, the outer one consisting of larger openings, while those of the inner are more minute, and alternating with the larger.

The central cavity is very large, the tissue of the stem being reduced to a very narrow ring.

This is a widely-dispersed and rather common plant, occurring on moist banks and in muddy places, by the sides of streams and the margins of muddy pools. The nature of the soil would seem to be of small importance provided it has its necessary degree of moisture, for it is recorded as occurring both in sandy and in clayey soils, as well as in muddy pools. It is frequent in Ireland; and is found both in Scotland and Wales.

Equisetum pratense, *Ehrhart.*

The Shade Horsetail.

This species of Horsetail was formerly named *E. Drummondii*, after Mr. Drummond, who first discovered it as a native of Britain; and has subsequently passed under the name *E. umbrosum*. It is a very interesting and distinct plant, intermediate in its general characteristics between *E. arvense* and *E. sylvaticum*, but perfectly distinct from both.

From its long, dark-coloured, creeping, underground stem are produced, at the joints, whorls of slender fibrous roots, and from buds organized at the same points arise the aerial

stems. These are quite dissimilar in their appearance, some being short, quite simple, and terminating in a cone-like head of spore-cases ; others being without fructification, taller, and producing several whorls of long, crowded, slender branches ; whilst a third kind, of 'common though not constant occurrence,' produce whorls of branches and cones also. In the production of these three kinds of stems it serves to connect, through *E. sylvaticum*, that group in which the fertile and barren stems are successive and altogether unlike, with that in which any of the stems indifferently—at least as to external appearances—bear the fructification, all being of similar habit.

The fertile stems grow about six inches high, and are quite branchless ; they are of a pale yellowish-green, having numerous joints, the large loose funnel-shaped sheaths produced at these points almost covering the stem, as usually described and figured ; but in our specimens they are much less crowded, a space of from half an inch to an inch occurring between the adjoining sheaths. These sheaths are still paler-coloured than the stem, often almost white, with a dark ring below the teeth, which are awl-shaped, pale-brown, with pale-coloured membranous margins ; the teeth are about twenty—from twelve to twenty—

in number, equalling the ribs on the sheath. These fertile stems are very slightly striated.

The barren stems grow erect to the height of eighteen inches or more, and have their surface disposed in about twenty sharp ridges, with corresponding furrows, the ridges being coated with prominent siliceous warty particles, so that the stems become very rough. The few lower joints are without branches, but in all the upper part of the stem they produce whorls of from ten to sixteen branches, which are simple, and at first drooping, but eventually take a spreading or slightly ascending direction. The sheaths of these barren stems are much smaller than those of the fertile, less funnel-shaped, and more closely set to the stem, and their teeth are also fewer, shorter and blunter; but in respect of colour they do not materially differ. The branches, which are slender, and about four inches long, are three or four-ribbed, and have loose sheaths, which terminate in three or four short, acute, membranous-edged, faintly brown-tipped teeth; the ribs of the stem extend upwards into the teeth, one entering each, but they do not quite reach the apex.

The fructification forms a moderate-sized, terminal, oval, cone-like head; at first sessile in the uppermost sheath, but

becoming elevated on a short stalk. The scales are from forty to fifty in number, and are of a pale-brown colour, bearing numerous whitish spore-cases.

The branched fertile stems have their sheaths smaller than the simple fertile ones, but larger than the barren ones. Several of the uppermost joints produce whorls of branches, and the stem is terminated by a cone of fructification. In these cases, however, the number of branches is less than that produced by the ordinary barren stems, and the cone is smaller than those produced by the ordinary fertile stems.

The section of the stem of this species is very different from that of any other, though having most resemblance to those of *E. arvense* and *E. sylvaticum*. The exterior shows a series of sharp ridges with angular furrows; the central cavity rather exceeds a third of the whole diameter; the cylinder of the stem is then pierced by three circles of cavities—one of longish oblong openings opposite the furrows, one of minute pores exterior to these and opposite the ridges, and another of minute pores on their inner side also opposite the ridges.

Probably this species is tolerably plentiful in moist shady woods, which are the situations it affects; but it has as yet

been meet with only in a limited number of localities in Ireland, Scotland, and the north of England.

Equisetum arvense, *Linnæus.*

The Corn-field Horsetail.

This is the most common of the species, and in many places is an injurious weed, very difficult to eradicate. It occurs here and there, almost everywhere, in fields and waste places, especially where the soil is inclined to be sandy, and more abundant in moist than in dry places. It has long, creeping, underground stems, which are a good deal branched, and are cylindrical and jointed in the same way as the stems which rise above-ground. At the joints they throw out whorls of tough, branching, fibrous roots. The aerial stems are of two kinds, the one simple and bearing the fructification only, the other branched and perfectly barren.

The fertile stems are quite without branches, and grow up early in spring, arriving at maturity and perishing long before the barren ones have completed their growth. They reach maturity in April and May. The stems vary from three to eight or ten inches in height. They are hollow, succulent when fresh, and of a light brown colour,

nearly smooth, and apparently without the siliceous coating common to the stems of this race of plants. They are divided at intervals into joints of variable length, the number of joints being also variable—from six, on stems of about four inches in length, to eight, on those which measure eight inches, though sometimes specimens of equal length have but five or six joints. They are thus much more distant in certain cases than in others, a space of three-fourths of an inch being sometimes interposed between the top of one sheath and the base of the next, while, on the other hand, they are sometimes so close as nearly to touch. The base of a sheath is, however, not covered by the sheath below it, except at the very lowest part of the stem, where they become much reduced in size, and are sometimes crowded. It is usual for each succeeding joint upwards to be somewhat more distant than the one beneath it. The sheaths are large and loose, widening upwards; they are pale-coloured, somewhat yellowish at the base, and are divided above into about ten dark-brown teeth, which often adhere together in twos and threes. The teeth are very narrowly lance-shaped and sharp-pointed, and are the terminations of the ribs, about ten in number, by which the sheaths are marked These stems are ter-

minated an inch or two above the upper sheath, by cone-like heads, rather more than an inch long, tapering somewhat above and below, and terminating in a blunt point. The peltate thecæ-bearing scales, which are very numerous, often exceeding a couple of hundred, are arranged in whorls around the axis of the cone, as is the case generally in this family. At a right angle with their margin are ranged the spore-cases, four to seven in number; they are oblong, membranous, parallel, white cells, bursting finally into two longitudinal valves, and discharging an abundance of very minute globular spores, of a beautiful blue-green colour.

The barren stems are either erect or decumbent, and from one to two feet or more in height; they are often branched from the bottom to the top, but sometimes only the central and upper parts are branched. They spring up after the fertile stems have withered, and are of a pale-green colour; at first crowded with short appressed branches, which, by degrees, become elongated, and assume a spreading or somewhat drooping position, sometimes becoming again branched. The main stem has from ten to sixteen distinct shallow furrows, with corresponding ridges, and is, as well as the branches, studded over with

minute siliceous warty particles. The sheaths, which fit somewhat closely to the stem, are furrowed like it, and terminate in an equal number of acute wedge-shaped dark-coloured teeth, which are often margined by a narrow brown membrane. Immediately below these sheaths spring out, from other short sheaths with obtuse brown segments, the whorls of branches, which are of variable number and length; they are four-ribbed, and their sheaths are four-toothed, the teeth being long and acute, of one colour, with a single rib extending to the extreme point of each tooth. The branches are four-angled.

The section of the stem often affords a good mark of recognition among the species of *Equisetum*. In that of *E. arvense* it is seen that the interior cavity occupies only about one-third of the diameter. The exterior surface is varied by about a dozen blunt ridges, having corresponding shallow depressions; within this, occupying about the centre of the ring, and alternating with the ridges, are a series of large roundish-oblong or obovate cavities, the narrow end of which is turned inwards; alternating again with them, and consequently opposite to the external ridges, occurs an annular series of small circular cavities, which are placed near the inner surface of the tube.

This plant is not, as far as we are aware, applied to any use; and the harshness of its stems renders it by no means agreeable to cattle, although it often occurs abundantly among their pasturage; and in cultivated ground becomes a troublesome weed.

Equisetum sylvaticum, *Linnæus.*

The Wood Horsetail. (*Plate* XX. fig. 3.)

Perhaps this may be called the most beautiful of the *Equisetums;* certainly it is extremely elegant in almost all stages of its growth, and perhaps never more so than shortly after the fertile stems, with their fructification still perfect, have begun to develop their lateral branches. Later in the season, these branches, which have from the first a pendent tendency, droop around with exquisite grace on all sides.

The creeping underground stem of the Wood Horsetail is, like that of the others, dark-coloured and branched, and produces from its joints the slender fibrous roots which draw up nourishment to the plant. The aboveground stems are erect, and, in a certain sense, those of them which produce fructification, and those which are barren, are similar, except as regards this one point. Their

resemblance consists in both growing up at the same time, and both putting out whorls of deflexed branches, less numerous certainly on the fertile stems; but in other respects they differ, as, for instance, in the growth of the apices of the fronds. The fertile ones, terminating in a catkin which soon perishes, become blunt-topped, while the barren ones continue to elongate at the point, and so become somewhat pyramidal. The barren stems are also more slender than the fertile ones, and have less inflated sheaths. It will thus appear, that this species, in its habit of growth, holds a middle rank between that group in which the fertile and barren stems are successive and quite dissimilar, and that group in which they are simultaneous and present no appreciable difference of structure. Something of the same kind occurs in *E. umbrosum*.

The fertile stems, when they first shoot up, are almost quite simple, and a few of them remain so, perfecting their cone-like head, and then perishing. More usually, by the time the catkin has become fully grown, the whorls of branches from the upper joints will be seen protruded to the length of from half an inch to an inch or rather more. Two, three, or four, rarely more, whorls of branches are thus produced from the uppermost joints of the stem, and

above these the oblong-ovate blunt cone is seated on a bare stalk-like portion of the stem, one to two inches long. The stems are round, succulent, pale-coloured, with about twelve slender ridges and corresponding shallow furrows, nearly smooth, the siliceous particles which coat the surface being too minute to impart much roughness. The sheaths are large and loose, and are divided at the margin into three or four bluntish lobes; their lower half or tubular portion is pale-green, their upper half or lobes bright-russet; they have an equal number of ribs with the stem. The slender branches, which are deflexed, grow to about a couple of inches in length, and produce from their joints a series of secondary branches, which grow from about half an inch to an inch in length. The average height of the fertile stems is about one foot.

The barren stems are more slender and less succulent than the others: they also produce more numerous whorls of branches. These grow from fifteen to eighteen inches high, and are ribbed like the others, only somewhat more prominently. The sheaths fit closer than those of the fertile stems, but in colour and in the division of their margin they resemble them exactly. The whorls of branches are very dense, being compoundly branched.

The side branches, which measure about four inches in length, are constantly branched at every joint with a whorl of branchlets averaging two inches in length, and sometimes these branchlets put out another series of short branches. The outline would be nearly pyramidal, were it not that the extreme point becomes so slender as to be unable to retain itself erect; the lateral branches are all drooping or deflexed, and hence the elegant appearance of the full-grown plants. The ultimate branches are three-ribbed, which gives them a triangular form; their joints terminate in three long-pointed teeth, one of the ribs extending undivided to the apex of each tooth. The teeth are of the same colour as the branch.

The section of the stem shows a series of shallow ridges and furrows; opposite the latter a ring of largish cavities; and alternating with these on the inner side, another ring of very minute cavities, these latter again alternating with a circle of angular cavities close to the inner margin of the tube. The central cavity measures about half the diameter.

The fructification is an oblong-ovate cone-like head, consisting of eighty or more pale brown peltate scales ranged in whorls, and to which the white spore-cases

are attached. These, on bursting, disperse a great number of greenish spores.

This species grows naturally in moist shady woods ; and though local, owing apparently to the conditions necessary to its growth, namely, shade and moisture combined in a peculiar way, it is, nevertheless, a widely-distributed plant; and can hardly be considered as uncommon throughout the United Kingdom. Its fertile stems are in perfection about the middle of April, and its barren stems in June.

Equisetum limosum, *Linnæus.*

The Water Horsetail, or Smooth Naked Horsetail.

This is a common species and generally distributed, occurring principally in pools, ditches, and marshy places, though occasionally in running streams. It is rather a tall-growing plant, the stems rising from two to three feet or more in height, springing from the joints of the dark-brown underground stems, which also produce whorls of black fibrous roots. The stems are, though finely ribbed, very smooth to the touch, the furrows being very shallow ; their smoothness no doubt arising from the presence of a very slight coating of the siliceous particles, which, when more abundant, give their peculiar harshness to some of

the species ; probably, also, the particles themselves are in this species much finer and less prominent. Sometimes the stems are quite unbranched, sometimes furnished with irregular whorls of branches along all their central portion ; and between these two extremes there occurs also every conceivable degree of branching, from the single shoot produced here and there, through every gradation of imperfect whorls up to whorls of short branches almost complete. The branches, which are simple, nearly erect, and never acquire much length, are smooth like the stem. There is no material difference between the barren and fertile stems, except the presence of the fructification in the one case and not in the other ; they are therefore said to be similar in structure.

The surface of the stem is marked with from sixteen to twenty very slight ridges, and the sheaths, which are short, rather closely fitted to the stem, and of the same colour in the lower part, terminate in an equal number of dark-coloured awl-shaped teeth, which sometimes have a pale membranous margin. The branches are four to eight-angled.

Owing to the shallowness of the ridges and furrows, the section of the stem shows a nearly smooth exterior outline,

and the cylinder of the stem is furnished only with a row of minute cavities near the inner margin; this cylinder is very thin compared with the diameter of the stem, the central cavity being unusually large. The present plant, therefore, though it has been considered a variety of *E. palustre*, is most strikingly distinct from that species in the structure of its stem.

The fructification is produced only by a portion of the branches. The cones are ovate, obtuse, and very frequently sessile in the uppermost sheath. The scales are black, exceeding a hundred in number; the spore-cases are pale-coloured. Usually only the termination of the central stem bears fructification, but it sometimes happens, though rarely, that some of the uppermost branches are also fertile.

This plant is the most fodder-like of any of the *Equisetums*, owing to its less flinty cuticle, but in this point of view it is, at least in this country, of very small importance. It is, however, stated to be used in Sweden as food for cattle, "in order that the cows may give more milk;" and in Lapland, it is, even when dry, eaten with avidity by the reindeer, though they will not touch common hay. Linnæus censures the improvidence of the Laplanders in

not providing during summer a supply of this plant and of the Reindeer Moss, for winter use; thus making some provision for their herds at a time when the ground is covered with frost-bound snow, so as not to risk the loss of their most valuable or entire possessions. An instance is related by Mr. Knapp, in which a colony of the short-tailed water-rats made this plant their food, and in the evening might be heard champing it at many yards' distance.

Equisetum palustre, *Linnæus.*

The Marsh Horsetail.

A common species in boggy places, and by the sides of ditches and watercourses. It has a creeping underground stem, which is black and shining, and from the joints of this are produced whorls of slender roots. The part of the stem which rises aboveground is erect, growing from a foot to a foot and a half in height. The presence of fructification alone distinguishes the fertile stems from those which are unfruitful; both being erect, and bearing whorls of numerous branches.

The stems are somewhat rough on the surface, but less so than in many of the other kinds. They are marked on the exterior by prominent ribs, with intervening broad

deep furrows, the number being variable, from six to eight. The joints are invested with nearly cylindrical sheaths, which are quite loose, being almost twice the diameter of the stem in the upper parts of the plant ; the lower sheaths are smaller and rather more funnel-shaped. The sheaths terminate in as many acute wedge-shaped teeth as there are ridges on the stem ; they are pale-coloured, tipped with black or dark brown, and have membranous edges.

The stems are usually, except at the base, furnished with whorls of numerous simple branches, the number of the branches generally corresponding with the furrows of the stem. These are slender, four or five-ribbed, and their sheaths set nearly close, and terminate in pale-brown lance-shaped teeth, having a membranous border.

In this species, when a section of the stem is examined, it shows a series of prominent ridges on the outer face ; just within these, and over against the furrows, occurs a circle of moderate-sized cavities ; and alternating with these, and near the inner margin, is a series of much smaller circular cavities. The central cavity of the stem is comparatively very small, not very much larger than the series of openings near the outer surface. The resemblance is considerable between its section and that of *E. arvense*.

The fructification is a blunt oblong cone, more than an inch long, terminating the main stem, and supported on a stalk about equal to its own length above the uppermost sheath. The whorls of scales in the mature cone are quite separated, and expose the white spore-cases attached to the margin. The scales in this species exceed a hundred in number. The fructification is mature about June.

Besides the more usual form just described, there are some curious variations to which this plant is liable. One of the most remarkable has been called **polystachyon.** Its peculiarity consists in its having more or less of the branches of the two upper whorls terminating in cones of fructification; the usual habit of the plant being to produce only one cone, and that on the central stem. The cones produced by the branches are, we believe, always much smaller than the ordinary cone of fructification produced by the main stem, and they are darker-coloured and more compact. It has been suggested, that the production of these lateral fructifications is accidental, owing to the destruction of the top of the main stem, but this explanation is quite insufficient, since they are sometimes produced along with the central head, which, moreover, varies when accompanied by them, being sometimes of the

usual size, and sometimes reduced in size like the lateral heads. The lateral heads are usually later in their appearance than the central ones. Occasionally we have seen some of the branches of the lowest whorl become elongated, and terminate in one of these small cones.

Another form is called nudum, and a very similar variety is sometimes called alpinum. There appears to be no advantage in attempting to distinguish these, both being depauperated forms, depending no doubt on the circumstances of their growth. They differ from the ordinary plant in being altogether smaller, the height ranging from two to four or five inches, the lower part of the stems being decumbent, and the whole stem almost devoid of branches; a few being developed only at their very base. In some states, this form has much resemblance to the prostrate *E. variegatum*, but is distinguishable by means of its sheaths and fructification.

The variety, or form, called *polystachyon*, is probably rather accidental than constant, and is to be regarded as the result of peculiar and changeable circumstances which may influence its growth. The variety *nudum*, or *alpinum*, seems clearly a depauperization of the plant, either through elevation or lack of food, both producing the result of a

dwarf stunted growth. We have had no opportunity of testing their constancy in cultivation, neither are we aware of any experiments having been made on this point, but we should expect they would both revert to the common form under the influences of domestication.

Equisetum ramosum, *Schleicher.*

Long Rough Horsetail.

This plant, on its discovery in the United Kingdom being first made known, was named *E. elongatum* by Sir W. J. Hooker, and it has since been called *E. Mackayi* by Mr. Newman, and identified as the *E. trachyodon* of A. Braun by Mr. Babington. Mr. Bentham and others refer it to *E. ramosum.*

It is one of those species in which the stems that produce the fructification, and those which are barren, do not differ in any other respect, and are therefore said to be similar; and in which, also, the stems are almost branchless, the branching being mostly confined to the production of one or two erect lateral stems from near the base, and this lateral branching is by no means common. Sometimes, indeed, the upper part of the stem is also sparingly branched, but the branches are produced singly from the

whorls; in very luxuriant plants, the branches are now and then themselves branched upon a similar plan.

Like the other species, this has a branching underground creeping stem, which is black, and produces whorls of branched fibrous roots from its joints. The above-ground stems are slender, and erect in their mode of growth; from two to three or four feet high; deeply furrowed, with a double row of elevated points along the ridges, which are usually from eight to twelve, but sometimes fourteen in number. The sheaths are close, cylindrical, and striated like the stem, terminating in a number of teeth equalling the striæ; these teeth are long, slender, awl-shaped, black with pale membranous margins, and usually, but not always, persistent. The sheaths are, for the most part, entirely black, but here and there they occur with a narrow greyish ring, variable in position, being sometimes central, and at other times near the base or near the margin; it is, however, we believe always, much less decided and clearly defined than the pale-coloured band on the sheaths of *E. hyemale*.

The section of the stem differs from that of *E. hyemale*, to which it presents a general resemblance, in being smaller, showing fewer ridges, and having the cavities

placed rather nearer the inner margin; the central cavity is also proportionally smaller. It has, consequently, on the exterior, a series of ridges formed of twin projections representing the double row of siliceous particles which extends along each ridge; and a series of cavities rather nearer the inner than the exterior surface of the ring.

The fructification consists of small black cone-like heads, of an oblong form, terminating in an apiculus. In our specimens they appear sessile in the upper sheath, but they are said to become elevated on a short pedicel. The scales in one of these cones number about thirty.

Equisetum ramosum is found on the moist banks of the mountain glens of Scotland and the north of Ireland. It was first found in Ireland, and apparently by two botanists in company, Dr. Mackay and Mr. Whitla; this was in 1833. It has subsequently been met with in other parts of Ireland, as well as in Scotland.

Equisetum hyemale, *Linnæus.*

The Great Rough Horsetail. (Plate XX. fig. 1.)

The underground stems of this plant are branched, and creep to a considerable extent; they are black, and furnished with whorls of branched, black, fibrous roots. The

aerial stems are of a deep glaucous green, and all alike in structure, those which bear fructification, differing in no other particular from those which do not. They grow upright, from two to three feet high, and are scarcely ever branched: when this does occur, a solitary branch is produced, and this protrudes from below the base of one of the sheaths of the stem; they are cylindrical, tapering off at the apex, and marked on the thicker parts with from fourteen to twenty ridges, formed of a double row of elevated points, consisting of crystallized siliceous particles; hence the stems are very rough. In this species the sheaths fit closely around the stems, so that they are nearly cylindrical; they are marked by the same number of ridges as the stem, but they are less prominent, and terminate in a series of black, membranous, bristle-shaped teeth, which soon fall off, and leave the margin crenated. The sheath immediately below the cone of fructification has, however, its teeth persistent, and it is somewhat funnel-shaped. The sheaths are at first pale green, with a black margin; from this they change to be entirely black; and finally they become whitish in the middle, leaving a narrow ring of black at the base and margin.

In this species a section of the stem shows on the

exterior a series of distinct ridges, formed of twin projections, and varying in number, as already explained; opposite to the furrows between these, and occupying about the centre of the solid cylinder, is a ring of moderate-sized cavities. The central cavity is comparatively large.

The cones of the fructification are rather small, and are seated on the apices of a number of the stems; they are at first ovate and apiculate, subsequently becoming elliptical; when young, sessile in the sheath, but afterwards acquiring a short footstalk. They are dark-coloured, consisting of about forty to fifty scales, and abounding in light-coloured powdery spores. Each of the scales is impressed with two or three vertical lines.

This plant grows naturally in boggy shady places, and is much more abundant northwards than southwards, where it is rarely met with. Though distributed sparingly over the United Kingdom, its occurrence is strictly local.

The stems of this *Equisetum* are employed in the arts as a material for polishing, and are imported under the names of Dutch Rush and Shave-grass. They are obtained from Holland, where this species is planted to support the embankments, which it does by means of its branching

underground stems. It has been suggested that our own sandy sea-coasts might be profitably planted with it. The peculiarity which gives it its commercial value, is the presence of a very hard coating of silex, which is deposited in the form of little crystals, rendering the surface rough like a rasp or file, and hence not only woods, but metals and stones may be polished by it. This siliceous coating is so entire, and of such density, that it is stated the whole of the vegetable matter may be removed by maceration, or, according to others, by burning, without destroying the form of the plant. The minute crystals of silex, of which the flinty coating consists, are arranged with a degree of regularity which, under a microscope, has a very beautiful appearance; they form a series of longitudinal elevated points, and in the furrows between them are cup-shaped depressions, at the bottom of each of which is placed a stomate or pore.

All the species of *Equisetum* have a flinty coating to their stems, and may be, and are, more or less employed in polishing; but the stems of the *E. hyemale* are much preferable to those of the other kinds, in consequence of their rougher and more hardened surface.

Equisetum Moorei, *Newman.*

Mr. Moore's Rough Horsetail.

This plant differs from the other native unbranched Horsetails in the nature of its stems, which are not persistent through the winter, or evergreen as they are, but die down in autumn, and are renewed in spring; they are therefore annual. They grow from a foot to two feet and a half high, and are unbranched, except where the apex has been destroyed, in which case branches are sparingly produced. They are rough, and are channelled with about twelve deep well-marked furrows. The sheaths which are loose, and have the same number of ridges as the stem, are whitish, with a black ring at the base, and tipped by about twelve blackish teeth, which are rigid, bluntish, and terminated by elongated membranous paler awns. The fructification consists of a cone, formed of about three dozen black roundish scales, and terminated by a conical acuminate apex.

This plant was found in the year 1851, by Mr. D. Moore, the indefatigable Curator of the Royal Botanic Gardens at Glasnevin, Dublin. It was growing on banks facing the sea at Rockfield, in the county of Wicklow.

Equisetum variegatum, *Weber and Mohr.*

The Variegated Rough Horsetail.

This species is found on the banks of rivers and lakes, and in sandy places near the sea. There is considerable variation among the plants classed under this name, and met with in these different localities, the differences appearing to be permanent under cultivation, but we have not yet sufficient evidence to treat them as distinct species. We therefore include as varieties or forms of *variegatum*, the dwarf procumbent plant sometimes called *E. arenarium*, and the tall stout erect form which has been named *E. Wilsoni*.

This is one of the species whose stems are all similar, and almost quite unbranched. It extends by means of a widely-creeping underground stem, rooting in whorls like the other species, and producing numerous aboveground stems, often springing from joints in such close proximity, that they appear in dense tufts. Though so numerously branched just beneath or at the surface of the soil, it is not usual that any branches are produced on the exposed part of the stems; but this sometimes does occur, such

branches not growing in whorls, but springing singly from the joints, and having much similarity to the stem itself: it is the erect form of the species, chiefly, which thus becomes branched. The stems grow about a foot high, and, in what is taken as the typical plant, their surface is very rough, and impressed with from four to ten furrows, with alternating, rather prominent ridges, each ridge margined on both sides with a line of minute siliceous points, which give it the appearance of being grooved, and impart to it its peculiar roughness. The sheaths are slightly enlarged towards their margin, ribbed like the stem, green in the lower part, black above, and terminate in a fringe of black teeth, equalling the ribs in number, with a broad white membranous border, in form ovate, and tipped by a deciduous bristle. Sometimes the contrast between the black ring and teeth, and the white border to the latter, is very conspicuous.

A certain number of the stems, usually the most vigorous, terminate in a cone of fructification. This is small, elliptic, crowned by a prominent point or apiculus. It is usually black, and sessile in the uppermost sheath, but sometimes elevated on a short stalk. All the stalked cones we have seen have been much paler in colour than the sessile ones.

The scales are about twenty in number, and the spore-cases are whitish.

The section of the stem shows a small central cavity, an exterior surface of rather prominent ridges, each channelled so as to form two projecting angles, and a circle of moderate-sized cavities occurring about the centre of the tissues.

Insensibly merging into the form just described appears to be another, called **arenarium,** which in its extreme state is smaller and more slender, its stems always procumbent, and not having more than six furrows ; in this form the teeth of the sheaths are said to be wedge-shaped, but we do not detect any differences in respect to the teeth between specimens having the erect and the prostrate habit of growth.

The variety, **Wilsoni,** *Equisetum Wilsoni* of Newman, which is allied to *E. variegatum,* is at least a permanent variety, and may be still more distinct. It is a stouter and taller plant, three feet high, and growing smoother than the larger form of *E. variegatum.* The section of its stem also differs ; the central cavity and the ring of cavities occurring in the cylinder of the stem being much larger, and the latter differing in form from those in *E. variegatum.* This plant grows in water at Mucruss, in the immediate

vicinity of the Lakes of Killarney. The stems are tufted, generally simple, but sometimes sparingly branched; they have about ten furrows, with broad intermediate ridges, on which the siliceous particles are less prominent, so that the stems are not nearly so rough as in the allied *E. variegatum, ramosum,* &c. The sheaths are scarcely larger than the stem, and are entirely green, except a narrow, black, sinuous ring at the margin; the teeth are short, generally blunt, and have obscure membranous margins, and deciduous awns. The cone is small, black, terminal, and apiculate, and, as occurs in the allied kinds, its sheath is larger and looser than the rest, the teeth also longer, and their membranous edges more dilated and conspicuous.

The present species is rather a local plant, but is widely dispersed in the three kingdoms, the larger forms growing on the margins of lakes, canals, rivers, ditches, &c., the smaller prostrate examples occurring on the sandy sea-coasts.

The *Equisetums* appear to submit readily to cultivation; at least we have found no difficulty in inducing those of which we have from time to time procured the subterranean stems, to grow with freedom. The plan we have adopted has been to pot them in loamy soil, and simply to place the pots in a cold frame, among a collection of hardy

Ferns; or, in the case of some of the aquatic species, to sink the pots just beneath the surface of a tank of water.

There are, it should be remarked, two sets of *Equisetums*, which may be called the evergreen and the deciduous groups; and this is a distinction of some importance in reference to their cultivation. Under the head of evergreen should be classed the "rough" group, consisting of *E. hyemale*, *Mackayi*, and *variegatum*. All the remaining species come under the head of deciduous, by which is meant that the fronds die down annually in autumn, and are renewed from the underground stems in spring.

The evergreen species are desirable plants for damp, shady rockwork, requiring no peculiar care or culture; and though they cannot lay claim to any considerable elegance of growth or habit, yet, from their peculiar form and character, they must be looked upon as interesting plants, no less for their own sakes, than for the mere pictorial effect which their distinct appearance may help to bring out in such situations.

Of the deciduous kinds most desirable for a similar purpose, we should select *E. sylvaticum* and *E. umbrosum;* these being among the most elegant of the race, and of moderate size. Both of them would require shade, but

nothing else beyond what well constructed rockwork would supply.

Perhaps the most interesting way of cultivating these plants would be as a group on a shady border, or in a separate bed. In damp cool soil they would be certain to succeed. The smaller delicate sorts, such as the procumbent *E. variegatum*, should be rather elevated between three or four rough stones, over which it would hang; and for the aquatic species, earthenware pans might be sunk, and these, half-filled with mud, and the remainder with water, would provide all that would be necessary for their well-being. All the other species would grow in the ordinary soil, provided it were sufficiently moist and cool in summer; but the rambling propensities of the underground stems should be checked by planting them in pots sunk in the ground.

The raising of the *Equisetums* from the spores, too, would be very interesting employment, and withal very instructive. The spores are very curious bodies, of roundish or somewhat oval form, having four elastic filaments, thickened at the ends, coiled around them. These, when the spore has become ripe, unroll; and their elasticity, no doubt, contributes to burst the case in which the spores

are contained, as well as to assist in the dispersion of these minute reproductive bodies. They are, indeed, so irritable that a change of temperature or moisture, such as that produced by breathing on the spores, is sufficient to produce this forcible uncoiling. The spores themselves are very interesting microscopic objects; indeed, it is only under a high magnifying power that their nature can be examined.

The germination of the spores has been made the subject of experiment by several inquirers, whose observations have been published. Agardh states, that from three to fourteen days after the spores are sown, they send down a thread-like transparent root somewhat thickened at the end, and protrude a confervoid, cylindrical, obtuse, articulated, torulose thread, which is either two-lobed or simple at the apex. Some days after this, several branches are produced, and become agglutinated together, forming a body resembling a bundle of confervoid threads, each of which pushes out its own root. Bischoff finds these confervoid threads go on growing and combining until a considerable cellular mass is formed. Then this mode of development ceases, and a young bud is formed, which produces the stem of an *Equisetum*, at once completely organized, with its air-cells,

its central cavity, and its sheaths, the first of which are formed before the elongation of the stem, out of the original cellular matter.

To watch the minute atoms thus springing into life, developing by degrees their tiny stems, and gaining strength and bulk day by day until they reach maturity, could hardly fail, one would think, to lead a sensitive mind to pure and wholesome thought,—calling up, on the one hand, the contemplation of the wise and beneficent plans and the all-sufficient power of the Creator, by whose ordaining providence life interminably renewable had thus been made to spring from the dust-like spore; and at the same time producing, on the other, a just appreciation of the uncertainty and insufficiency of human agency. For, though man may plant and water, yet it is God alone that giveth the increase.

DISTRIBUTION OF THE BRITISH FERNS, &c.

The limits of this volume neither allow of a very complete nor very detailed record of the situations in which the plants we have been describing have been found; nor is it necessary that their habitats should be fully and minutely stated. The facts selected for record will, however, be so arranged as to afford some insight into the geographical range of the species in the British Isles.

Mr. Watson, who is our best authority on the question of the distribution of plants in the United Kingdom, has well remarked that the county divisions are too numerous, and the ancient political divisions too few, to express, with both completeness and precision, the actual distribution of species—the first, because our information is imperfect, the second, because the areas are too extensive. He has, therefore, proposed another set of divisions, which he calls provinces. These provinces are thus formed. From the south coast of England to the Highlands of Scotland, a medial line

is traced, corresponding with the county boundaries, and following that course which best divides the counties whose rivers flow to the east coast, from those whose waters flow to the west. These two longitudinal divisions are subdivided transversely into groups of counties, which together constitute the basin of a principal river, or have some other physical peculiarity in common. The medial line is not continued northward of Inverness, where Scotland becomes very narrow. A portion of Inverness, eastward of Loch Erricht, is united with the contiguous East Highland province; and the extreme north of Lancashire is united with the Lake province. Ireland, which Mr. Watson has omitted, is added to our list, and the Western severed from the Northern Isles, to form a connecting link with that country. This gives the following arrangement:—

1. Peninsula.—Cornwall, Devon, Somerset.
2. Channel.—Hants, Sussex, Dorset, Wilts.
3. Thames.—Herts, Middlesex, Kent, Surrey, Berks, Oxford, Bucks, Essex.
4. Ouse.—Huntingdon, Bedford, Suffolk, Norfolk, Cambridge, Northampton.

5. Severn.—Warwick, Gloucester, Monmouth, Hereford, Worcester, Stafford, Salop.
6. South Wales.—Radnor, Brecon, Glamorgan, Carmarthen, Pembroke, Cardigan.
7. North Wales.—Anglesea, Denbigh, Flint, Montgomery, Merioneth, Carnarvon.
8. Trent.—Leicester, Rutland, Lincoln, Notts, Derby.
9. Mersey.—Cheshire, Lancashire (excluding the northern portion, which is included in 12).
10. Humber.—York.
11. Tyne.—Durham, Northumberland.
12. Lakes.—Westmoreland, Cumberland, and N. of Lancashire. Isle of Man.
13. West Lowlands.—Dumfries, Kirkcudbright, Wigton, Ayr, Renfrew, Lanark.
14. East Lowlands.—Peebles, Selkirk, Roxburgh, Berwick, Haddington, Edinburgh, Linlithgow.
15. East Highlands.—Stirling, Clackmannan, Kinross, Fife, Perth, Forfar, Kincardine, Aberdeen, Banff, Nairn, Elgin or Moray including the N.E. of Inverness, or that part E. of Loch Erricht.
16. West Highlands.—Inverness west of Loch Erricht,

Argyle, Dumbarton, and the Isles adjacent from Bute and Arran to Skye.

17. North Highlands.—Ross, Cromarty, Sutherland, Caithness.
18. North Isles.—Orkney, Shetland.
19. West Isles.—The Outer Hebrides.
20. Ulster. (N.)—Antrim, Londonderry, Donegal, Tyrone, Down, Armagh, Monaghan, Fermanagh, Cavan.
21. Connaught. (W.)—Leitrim, Sligo, Galway, Roscommon, Mayo.
22. Leinster. (E.) — Longford, Westmeath, Meath, Louth, Dublin, Kildare, King's, Queen's, Wicklow, Wexford, Carlow, Kilkenny.
23. Munster. (S.)—Waterford, Tipperary, Clare, Limerick, Cork, Kerry.
24. Channel Isles.—Guernsey, Jersey, &c.

The records embodied in the following pages are derived from the principal published lists of localities, and from various notes, and other lists privately communicated. The use of the signs [ ] implies some doubt as to the correctness of the enclosed statements.

HABITATS OF BRITISH FERNS, &c.

Adiantum Capillus-veneris, *Linnæus.*

PENINSULA.—Carclew; Penzance; Carrick Gladden, and elsewhere, between St. Ives and Hayle, in low dripping sea-caves and on coast rocks, Cornwall. Ilfracombe; Watermouth; Brixham; Mewstone Bay, Devonshire. [Clevedon;] stone quarry at Combedown, *E. J. Lowe;* Cheddar Cliffs, *Rev. W. H. Hawker*, Somersetshire.

SEVERN.—[Staffordshire.] [Shropshire.]

S. WALES.—Dunraven; East Aberthaw, *F. Brent;* [Swansea, *J. Riley, B.S.E.*] Port Kirig; Barry Island, Glamorganshire.

TRENT.—[Derbyshire.]

HUMBER.—[Yorkshire.]

LAKES.—Isle of Man.

E. HIGHLANDS.—[Banks of the Carron, Kincardineshire.]

W. HIGHLANDS.—[Argyleshire. Arran.]

CONNAUGHT.—Lough Bulard, near Urrisbeg; Roundstone, Connemara, Galway; Arran Isles.

MUNSTER.—Cahir Conree, near Tralee, Kerry. Ballyvaughan, Clare.

CHANNEL ISLES.—Jersey, rare, *Rev. W. Greenwell.*

Allosorus crispus, *Bernhardi.*

Peninsula.—Exmoor near Challicombe, Devonshire, *N. Ward, B.S.E.* Simmonsbath, Somersetshire. (Perhaps these descriptions refer to one locality.)

Severn.—Titterstone Clee Hill, Shropshire. Malvern Hills, Worcestershire. [Stowe (? Staffordshire), *B.S.E.*]

S. Wales.—Glamorganshire. Cardiganshire.

N. Wales.—Cerig-y-Druidion; Ruthin, *T. Pritchard*, Denbighshire. Dolgelly; Cader Idris, Merionethshire. Breiddin Hills, Montgomeryshire. Cwm-Idwal; Clogwyn-du-Yrarddu, Snowdon; Glyder Vawr; Mynidd-Mawr; Llanbaba, *W. Pamplin;* Llanberis; Aber; and elsewhere in Carnarvonshire.

Trent.—Fairfield; Chinley Hills, Derbyshire. [Rutland.]

Mersey.—Tag's Ness, near Macclesfield, Cheshire. Lancaster; Cliviger near Todmorden; Fo-edge near Bury, Lancashire.

Humber.—Settle; Saddleworth; Fountain's Fell; Halifax; Wensley Dale; Cronkley Scar; Ingleborough, &c., Yorkshire.

Tyne.—Falcon Clints, Teesdale, Durham. Cheviots above Langley Ford; Crag Lake; Haltwhistle, Northumberland.

Lakes.—Ambleside; Casterton; Morland; and the hill-sides of Westmoreland, very abundant. Borrowdale; Winlatta *W. Christy, B.S.E.;* Keswick; Skiddaw; Helvellyn;

Grasmere; Scawfell; Martindale, &c., Cumberland. Conistone, Lancashire. Isle of Man, *Dr. Allchin.*

W. Lowlands.—Dumfries; Jardine Hall; George Town; Queensberry Hill; Rae hill; Hills above Loch Skew; Morton Hills; Moffat-dale, *P. Gray;* Dumfries-shire. Sandy Hills and Douglass Hall, Colvend; Carsethorne, *P. Gray;* Criffel, Kirkcudbrightshire. Cuff Hill and Beith, Ayrshire. Neilston Pad, *W. L. Lindsay*, Renfrewshire.

E. Lowlands.—Eildon Hills; Winchope, *Walter Scott, B.S.E.*, Roxburghshire. South bank of the Whiteadder, Berwickshire. [Edinburghshire.]

E. Highlands.—West Lomond Hill; Saline Hill, Fifeshire. Ben Lawers; Killin; Dunkeld, *A. Tait;* Glen Tilt; Blair Athol, &c., Perthshire. Sidlaw Hills, *G. Lawson, B.S.E.;* Glen Isla, *W. Brand, B.S.E.;* Clova Mountains, Forfarshire. Glen Callater, *W. Christy, B.S.E.;* Castleton; Loch-na-gar; *H. M. Balfour*, Aberdeenshire. Kingussie, *A. Rutherford, B.S.E.;* stone walls near Dalwhinnie, and on the neighbouring mountains, Inverness-shire. Morayshire.

W. Highlands.—Ben Nevis; Gnarrow; Ben Aulder, Western Inverness-shire. Argyleshire. Loch Lomond, Dumbartonshire. Goat Fell, Arran, *J. R. Cobb.* Ben-na-Caillich, Skye. Isle of Mull.

N. Highlands.—Ross-shire. Sutherlandshire.

W. Isles.—Roddal, Harris.

Ulster.—Carrickfergus, Antrim. Sleive Bignian; Mourne Mountains, Down.

Leinster.—Carlingford Mountain, Louth.

Munster.—Black Head, Clare, *E. T. Bennett.*

Asplenium acutum, *Bory.*

Ulster.—[Sherard's plant from Mourne Mountain, Down *Asplenium Adiantum-nigrum* β of Sir J. E. Smith, and identified with *A. acutum*, by Mr. Newman, is not referrible here, but to *Athyrium Filix-fœmina.*]

Leinster.—Dublin mountains.

Munster.—Mucruss, Killarney, Kerry, *Dr. Mackay.* Cahir Conree, near Tralee, Cork.

Channel Isles.—[Jersey, *J. Piquet.*]

Asplenium Adiantum-nigrum, *Linnæus.*

Peninsula.—Cornwall. Devonshire. Somersetshire.

Channel.—Hampshire, and the Isle of Wight. Dorsetshire. Wiltshire. Sussex.

Thames.—Hertfordshire. Middlesex. Kent. Guildford (with an attenuated form), and elsewhere, Surrey. Berkshire. Buckinghamshire. Oxfordshire. Essex.

Ouse.—Bedfordshire. Suffolk. Norfolk. Cambridgeshire. Northamptonshire.

Severn.—Warwickshire. Gloucestershire. Monmouthshire, *T.*

H. Thomas. Herefordshire. Worcestershire. Staffordshire. Haughmond Hill (with caudate pinnæ), *Rev. W. A. Leighton;* and elsewhere, Shropshire.

S. Wales.—Glamorganshire. Carmarthenshire. Pembrokeshire. Cardiganshire.

N. Wales.—Anglesea. Denbighshire. Merionethshire. Flintshire. Carnarvonshire.

Trent.—Leicestershire. Rutland. Nottinghamshire. Derbyshire.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire.

Tyne.—Durham. Northumberland.

Lakes.—Westmoreland. Cumberland. North Lancashire.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Ayrshire. Lanarkshire. Renfrewshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Clackmannanshire. Kinross-shire. Fifeshire. Perthshire. Forfarshire. Kincardineshire. Aberdeenshire. Banffshire. Morayshire. Nairnshire.

W. Highlands.—Inverness-shire. Argyleshire. Dumbartonshire. Isles of Arran; Bute, *T. M.;* Islay; Cantyre; and Iona. Ailsa Craig.

N. Highlands.—Cromarty. Sutherlandshire. Caithness.

N. Isles.—Orkney.

W. Isles.—Tarbet, Harris.

Ulster.—Antrim (an attenuated form), *D. Moore.* Down, (an attenuated form).

Connaught.—Gort; Connemara, Galway. Arran Isles.

Leinster.—Meath. Louth. Dublin. King's. Wicklow. Kilkenny.

Munster.—Kerry. Cork. Ardmore (dichotomous), *J. R. Kinahan.* Waterford. Tipperary (an attenuated form). Clare. Limerick. Cork.

Channel Isles.—Jersey. Guernsey (with an attenuated form) *C. Jackson.*

Asplenium fontanum, *R. Brown.*

Channel.—Near Petersfield, Hants, *Rev. W. H. Hawker.* Swanage Cave, Isle of Purbeck, Dorsetshire, *Dr. Power* (*Phytol.*)

Thames.—Recently on an old garden-wall at Tooting, Surrey, *D. Haigh.* (The wall has been cleaned, and the plants destroyed.)

N. Wales.—Between Tan-y-Bwlch and Tremadoc, Carnarvonshire, *Dr. Power* (*Phytol.*)

Trent.—Matlock, Derbyshire, *H. Shepherd.*

Humber.—York.

Lakes.—[Formerly at Wybourn, Westmoreland; or Wiborn, Cumberland.]

E. Highlands.—Shady rocks near Stonehaven, Kincardineshire, *D. Hutcheson.*

Asplenium germanicum, *Weiss.*

Peninsula.—Near Culbone, Somersetshire, *Miss Payne.*

N. Wales.—Rocks near Llanrwst (Bwlch-y-Rhyn), Denbighshire, *H. Wilson.* "Between Llanrwst and Capel Curig," *Cyb. Brit.* Moel Lechog, Llanberis, Carnarvonshire.

Lakes.—Helvellyn, *Rev. W. H. Hawker;* Borrowdale, *H. E. Smith*, and *Miss Wright*, Cumberland.

Tyne.—Kyloe rocks, Northumberland, *G. R. Tate.*

E. Lowlands.—Rocks near Kelso on the Tweed; Minto Crags near Hassendean, *W. Nichol*, Roxburghshire.

E. Highlands.—Dunfermline, Fifeshire, *Dr. Dewar.* Stenton rock near Dunkeld, Perthshire (nearly if not quite exterminated).

Asplenium lanceolatum, *Hudson.*

Peninsula.—St. Michael's Mount, and other places about Penzance, abundant; Logan Rock; rocks at Hot Point, and other stations near the Land's End; St. Ives, Cornwall. Morwell rocks, on the Tamar; banks of the Tavy, and of the Plym near Cann Quarry; Shaugh, *R. J. Gray;* near the Tors, Tynemouth, *R. J. Gray;* Buckland Monachorum; Tavistock; Salcombe; Torquay; Bickleigh Vale, *W. S. Hore, B. S. E.;* Devonshire. Selworthy, *Mrs. A. Thompson*, and elsewhere, Somersetshire.

Channel.—High Rocks, Tunbridge Wells, Sussex.

Thames.—Tunbridge Wells, Kent. [Oxfordshire.]

Severn.—River Frome, near Frenchay, *T. H. Thomas;* Beechly; Oldbury Court Woods, and Pennant Rocks, near Stapleton, Gloucestershire. [Shropshire.]

S. Wales.—Ramsay Island, Pembrokeshire. Glamorganshire.

N. Wales.—About Barmouth, Merionethshire. Tremadoc; Pwllheli; Beddgelert; about Aberglaslyn, Carnarvonshire. Near Llanrwst, Denbighshire.

Humber.—[Yorkshire.]

Munster.—Kinsale, Cork, *J. Woods.*

Channel Isles.—Guernsey. Jersey. Sark, *Miss C. E. Nixon.*

Asplenium marinum, *Linnæus.*

Peninsula.—Cornish coast generally; St. Ives; Lamorran. Plymouth Hoe (acute var.) *J. Bauker:* Dawlish; Ilfracombe; Salcombe; Torquay; Babbicombe; Teignmouth; Lynton, *N. B. Ward;* Exmouth; Valley of Rocks, and Lee Abbey, near Lynmouth, *T. Clark;* and other parts of Devonshire. Clevedon; Portishead. Selworthy, *Mrs. A. Thompson;* Weston-super-Mare, Somersetshire.

Channel.—Isle of Portland; Purbeck; Lyme Regis, Dorsetshire. Isle of Wight, beyond Knowle, towards Blackgang. Castle Rock at Hastings, Sussex.

Severn.—Gloucestershire, *Fl. Brit.*

S. Wales.—Rocks by the Mumbles Lighthouse, Swansea;

Dunraven; Neath; Oystermouth; Barry Island, &c., Glamorganshire. Cliffs between Tenby and Saundersfoot; Fishguard; St. David's; St. Catherine's Island, &c., Pembrokeshire. Aberystwith and elsewhere, Cardiganshire.

N. Wales.—Llanddwyn; Traeth Loch, *J. E. Bowman;* South Stack Lighthouse, Holyhead, &c., Anglesea. Towyn, Merionethshire. Carnarvon Castle; Orme's Head; Bangor, Carnarvonshire.

Mersey.—Red Noses Rocks, New Brighton, at the mouth of the Mersey; Hilbre Island, mouth of the Dee, Cheshire. Winwick stone-quarry, near Warrington; Hulme quarry, *T. G. Rylands;* Newton; Black Rock, near Liverpool; rocks near Heysham, Lancashire.

Humber.—Cloughton Bay, *A. Clapham;* cliffs north of Scarborough, Yorkshire.

Tyne.—Marsden Rocks; Black-hall Dean, west of Hartlepool; Teesdale, Durham. Holy Island, *B.S.E.* N. Durham. Howick, *T. Wilcke.* Rocks near Craster, *Rev. R. Taylor.* Northumberland.

Lakes.—Sea-cave near Silverdale, Westmoreland. Whitehaven; St. Bee's Head, Cumberland. Head of Morecambe Bay. North Lancashire. Isle of Man.

W. Lowlands.—Southwick Cliffs and Colvend Cliffs, by the Solway, Kirkcudbrightshire, *P. Gray.* Port Patrick, Wigtonshire. Ayrshire.

E. Lowlands.—Near Eyemouth; Rammel Cove; rocks by the

Tweed, below Lady-Kirk House; and elsewhere, Berwickshire. Near Queensferry, Edinburghshire.

E. Highlands.—Wemyss, and elsewhere on the coast of Fifeshire. Red Head, *A. Croall, B.S.E.;* east of Auchmithie, *G. Lawson;* Montrose; Dysart, Forfarshire. Cove, Kincardineshire; or Aberdeenshire. Morayshire.

W. Highlands.—Oban, Argyleshire, *E. Newman.* Isles of Bute, Arran, Islay, Mull, Cantyre, Jura, Staffa, Iona, and Skye; Ailsa Craig.

N. Highlands.—Nigg, Ross-shire. Farr, Sutherlandshire, *B.S.E.* Rocks near Wick; near Thurso, Caithness, *T. Anderson.*

N. Isles.—Hoy and Mainland, Orkney, *T. Anderson* (who found it growing on the inside of St. Magnus' Cathedral, from whence it is now eradicated by repairs).

W. Isles.—Little Barve, Harris; Shiant Isles.

Ulster.—Newcastle, Down. Isle of Rathlin. Mullaghmore, Cavan.

Connaught.—Abundant along the coast. Connemara, Galway.

Leinster.—Howth; Killiney Bay, *G. Lloyd, B.S.L.*, Dublin co.

Munster.—Killarney; Derrynane, &c., Kerry. Rocks on south coast, Clonmel, Cork, *J. Sibbald.* Abundant along the coast.

Channel Isles.—Petit Bot Bay; Torteral; and north and east coast of Guernsey; occurring also on an inland church two miles from the sea; also an acute var., *C. Jackson.* Jersey (with acute var.), *J. Piquet.*

Asplenium Ruta-muraria, *Linnæus.*

Peninsula.—Cornwall. Devonshire. Somersetshire.

Channel.—Dorsetshire. Wiltshire. Isle of Wight. Hampshire. Sussex.

Thames.—Hertfordshire. Middlesex. Kent; also var. with wedge-shaped pinnules, Town Malling, *Dr. Allchin.* Surrey. Berkshire. Buckinghamshire. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Northamptonshire.

Severn.—Warwickshire. Gloucestershire. Monmouthshire, *T. H. Thomas.* Herefordshire. Shropshire. Worcestershire. Staffordshire.

S. Wales.—Glamorganshire. Talgarth, Breconshire, *E. Williams.* Carmarthenshire. Pembrokeshire.

N. Wales.—Anglesea, and Priestholme Island, *Rev. W. A. Leighton.* Denbighshire. Merionethshire. Carnarvonshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire. Rutland.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire.

Tyne.—Durham. Northumberland.

Lakes.—Cumberland; various forms at Keswick, *Miss Wright.* Westmoreland.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Berwickshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Fifeshire. Dunkeld (with var. having wedge-shaped pinnules, approaching *A. germanicum*, and various other forms, *A. Tait*); and elsewhere, Perthshire. Forfarshire. Kincardineshire. Aberdeenshire. Banffshire. Morayshire. Nairnshire.

W. Highlands.—Argyleshire. Dumbartonshire. Ailsa Craig· Isles of Iona, Islay, and Cantyre.

N. Highlands.—Cromarty. Sutherlandshire. Caithness.

N. Isles.—Orkney.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Rostrevor, Down, *A. Crawford.*

Connaught.—Arran Isles. Connemara, Galway.

Leinster.—Louth, *C. L. Darby.* Dublin. King's. Wicklow. Kilkenny.

Munster.—Cork. Waterford. Tipperary. Limerick. Mucruss, Killarney, Kerry (furcate var.), *Dr. Allchin,* Clare, on limestone boulders; also with narrow pinnules at Ennis, *Dr. Allchin.*

Channel Isles.—Jersey.

Asplenium septentrionale, *Hull.*

Peninsula.—Near Culbone, *N. Ward;* near Oare church, *Rev. W. S. Hore,* Somersetshire. Wall on Exmoor, four miles from Porlock, *R. J. Gray.*

Thames.—[Bocton Hill, Kent.]

N. Wales.—Llan Dethyla, near Llanrwst, Denbighshire. Craig Dhu, pass of Llanberis; Llyn-y-cwm; Moel Lechog; Bettwys-y-Coed; Pont-y-Pair; Capel Curig; Carnedd Llewellyn, &c., Carnarvonshire.

Humber.—Ingleborough, Yorkshire.

Tyne.—Kyloe Crags, Northumberland.

Lakes.—Honister Crags; Scawfell; Patterdale; Keswick; ravine near Wastwater; Borrowdale, *Miss Wright;* Vale of Newlands; Helvellyn, *Rev. W. H. Hawker*, Cumberland. Ambleside, Westmoreland.

E. Lowlands.—Minto Crags; Jedburgh, Roxburghshire. Arthur's Seat, Blackford Hill, and other places in the neighbourhood of Edinburgh.

E. Highlands.—Stenton Rocks, near Dunkeld, Perthshire. [Forfarshire.] Pass of Ballater, Aberdeenshire, *A. Tait.*

N. Isles.—[Orkney.]

Asplenium Trichomanes, *Linnæus.*

Peninsula.—Cornwall; very fine in Raven's Hugo, *C. A. Johns.* Devonshire; Totnes (dichotomous form), *C. Scott;* the incised form is also found. Somersetshire.

Channel.—Isle of Wight. Hampshire. Wiltshire. Dorsetshire. Sussex.

Thames.—Hertfordshire. Kent. Isle of Sheppey. Surrey. Buckinghamshire. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire.

Severn.—Warwickshire. Gloucestershire. Monmouthshire, *T. H. Thomas.* Herefordshire. Worcestershire. Staffordshire. Shropshire.

S. Wales.—Glamorganshire. Talgarth, Breconshire, *E. Williams; J. R. Cobb.* Carmarthenshire. Pembroke.

N. Wales.—Anglesea. Denbighshire. Montgomeryshire. Merionethshire. Carnarvonshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire. Rutland.

Mersey.—Cheshire. Lancashire. The var. *incisum* is found at Kant Clough, near Burnley.

Humber.—Yorkshire. The var. *incisum* is found at Smeerset, near Settle, *J. Tatham; A. Clapham.*

Tyne.—Durham. Northumberland.

Lakes.—Westmoreland. Cumberland; also Keswick (var. *ramosum*), *Miss Wright*, and Borrowdale (var. *incisum*), *Miss Wright.* Isle of Man.

W. Lowlands.—Dumfries-shire, *P. Gray.* Kirkcudbrightshire, *P. Gray;* also var. *multifidum*, at St. Mary's Isle, *D. Dick.* Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Fifeshire. Perthshire. Forfarshire. Kincardineshire. Aberdeenshire. Morayshire. Nairnshire.

W. Highlands.— Argyleshire. Dumbartonshire. Isles of Arran, *T.M.;* Bute, *T.M.;* Islay; and Cantyre.

N. Highlands.—Ross-shire. Cromarty. Sutherlandshire.
N. Isles.—Orkney, *T. Anderson.*
W. Isles.—Tarbet, Harris.
Ulster.—Antrim. Rostrevor, Down, *A. Crawford.*
Connaught.—Arran Isles. Connemara, Galway.
Leinster.—Louth, *C. L. Darby.* Dublin. King's. Wicklow. Kilkenny.
Munster.—Cork. Kerry. Waterford. Tipperary. Limerick. Clare (var. *incisum*), *J. R. Kinahan;* Quin Abbey (dichotomous form), *J. R. Kinahan.*
Channel Isles.—Jersey.

Asplenium viride, *Hudson.*

Channel.—In the parapet wall of an old cellar window at Danny, ten miles from Brighton, Sussex, *Rev. T. Rooper.* Old wall at Mickleham, Surrey, *W. Borrer.*
Severn.—Ham Bridge, Worcestershire. Dovedale, Staffordshire.
S. Wales.—Brecon Beacon and Trecastle Beacon, near Brecon; Chapel-y-Fin; rocks near Capel Colbren, Brecknockshire. Merthyr-Tydvil; Cilhepste Waterfall, near Pont Nedd Vechn; Darran-yr-Ogof near Ystradgunlais, Glamorganshire.
N. Wales.—Cader Idris, Merionethshire. Cwm Idwl; Twll-du; Llyn-y-cwm; Glyder-Vawr; Clogwyn-du-Yrarddu; Clogwyn-y-Garnedd, *T. Butler;* Carnarvonshire.

Trent.—Buxton; Cavedale, Castleton, Dovedale, Derbyshire. Charley forest, Beacon Hill, Leicestershire.

Mersey.—Carr-edge, Cheshire. Dulesgate; Staley, Lancashire.

Humber.—Settle (forked), *T. Wilcke*; Craven (ramose form), *J. S. Henslow;* Ingleborough; Gordale; Widdal Fell, Wensley Dale; Ogden Clough, near Halifax; Reeth Moor, Swaledale; and other parts of Yorkshire.

Tyne.—Falcon Clints, Teesdale; Weardale, *W. C. Trevelyan*, Durham. Banks of the Irthing, Northumberland.

Lakes.—Rocks above Patterdale; Kendal Fell, *W. Christy, B.S.E.;* Hutton Roof; Farlton; Arnside; Casterton Fell; Mazebeck Scar; Ambleside, Westmoreland. Ashness Gill; Borrow Force; Brandy Gill, Carrick Fell; Borrowdale, *Miss Wright;* Gillsland, Cumberland.

W. Lowlands.—Bold Craig, near Moffat, *Rev. W. A. Little;* Grey Mare's Tail, *W. Stevens*, Dumfries-shire. Falls of the Clyde, Lanarkshire.

E. Highlands.—Stirlingshire. Blair Athol; Ben Lawers; Drummond hill, *C. M'Intosh;* Ben Chonzie, near Crieff; Ben Voirlich, Perthshire. Canlochen, Clova, Forfarshire, *A. Croall, B.S.E.* Cawdor Woods, Nairnshire. Aberdeenshire.

W. Highlands.—Inverness-shire. Dunoon, and other parts of Argyleshire. Ben More, Isle of Mull.

N. Highlands.—Assynt, Sutherlandshire. Ross-shire.

N. Isles.—Shetland, *Herb. S. F. Gray.*

Ulster.—Near Lough Eask, Donegal.
Connaught.—Ben Bulben, Sligo.
Munster.—Bandon, Cork. Turk Mountain, Killarney, Kerry.

Athyrium Filix-fœmina, *Roth.*

A common species, the distribution of the many variations of which is very imperfectly recorded.

Peninsula.—Travenna (var. *rhœticum*), &c., Cornwall. Devonshire (various forms, including vars. *stenodon*, and multifid var. of the *molle* type), *Rev. J. M. Chanter;* also Salterton (a monstrous state, approaching *latifolium*), *H. B. M. Harris, B.S.E.* Somersetshire; also Bristol (var. *molle*); and Nettlecombe (vars. *polydactylum* and *laciniatum*), *C. Elworthy.*

Channel.—Isle of Wight. Hampshire. Dorsetshire. Wiltshire. Tunbridge Wells (var. *rhœticum*), *Miss Bower;* Tilgate Forest, and elsewhere, Sussex.

Thames.—Hertfordshire. Kent. Portnall Park, Virginia Water, and Shirley (var. *rhœticum*); Mayford (vars. *molle* and *trifidum*); Gomshall (var. *stenodon*), *E. Morse;* Bagshot (var. *molle*); and other parts of Surrey. Windsor (var. *pruinosum*), *Dr. Allchin*, Berkshire. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire.

Severn.—Arbury Park (with the vars. *rhœticum* and *molle*) and other parts of Warwickshire. Gloucestershire. Penyard

Park Wood, near Ross, Herefordshire (var. *rhæticum*), *W. H. Purchas.* Newport, Monmouthshire. Worcestershire; also Malvern (var. *trifidum*), *E. Lees.* Staffordshire; also var. *multifidum*, D. Doody, according to *Plukenet.* Shrewsbury, &c., Shropshire (var. *rhæticum*); also Bickley, near Shrewsbury (deeply incised); Titterstone Clee (incised form).

S. Wales.—Brecknockshire. Glamorganshire. Carmarthenshire. Pembrokeshire.

N. Wales.—Anglesea; also Cickle (var. *trifidum*), *Rev. W. A. Leighton.* Denbighshire; also Ruthin (var. *rhæticum*), and Voil Famma (dwarf form of *molle*), *T. Pritchard.* Flintshire. Craig Breidden, Montgomeryshire (var. *molle*), *Rev. W. A. Leighton.* Aber (var. *rhæticum*), &c., Carnarvonshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire; also near Chatsworth (var. *multifidum*), *J. Bain*, according to *Prof. Kinahan.* Rutland.

Mersey.—Cheshire. Lancashire; also Boghart Hole Clough, near Manchester (var. *trifidum*), *Rev. W. A. Leighton;* Chaigeley (dwarf form of *molle*), *E. J. Lowe;* Todmorden (var. *crispum*), *A. Huddart.*

Humber.—Yorkshire; also Mickley Barrows (var. *rhæticum*); Hebden Bridge, near Halifax (dwarf form? *molle*), *S. Gibson;* Sheffield (var. *trifidum*), *Rev. W. A. Leighton.*

Tyne.—Northumberland. Durham.

Lakes.—Keswick, Cumberland, with vars. *trifidum* and *latifolium*, which latter "only grew in one locality," *Miss Wright;* and various other forms, abundant. Westmoreland. Conistone, N. Lancashire (various forms, *Miss Beever*).

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Edinburghshire. Jedburgh, Roxburghshire (var. *rhæticum*). Berwickshire.

E. Highlands.—Clackmannanshire. Fifeshire. Ben Lomond, Stirlingshire. Sidlaw hills, and other parts of Forfarshire. Dunkeld, *A. Tait* (with vars. *molle*, *rhæticum*, and *confluens*); Callender (var. *rhæticum*), *T. M.;* near Dalnacardoch (var. *rhæticum*), *Dr. Graham*, *B.S.E.*, &c., Perthshire. Corymulzie Linn, Braemar (var. *crispum*), *W. C. Trevelyan;* sea-cave near Aberdeen (var. *marinum*), *Dr. Dickie;* and elsewhere, Aberdeenshire. Banffshire. Morayshire.

W. Highlands.—Ben Nevis (var. *rhæticum*), *Hb. S. F. Gray*, Inverness-shire. Hell's Glen, Lochgoilhead (var. *rhæticum*), *T.M.*, Argyleshire. Tarbet (var. *pruinosum*) *T. M.*, Dumbartonshire. Isles of Islay, Cantyre; Arran (with var. *rhæticum*), and also at Brodick (vars. *molle* and *trifidum*).

N. Highlands.—Cromarty. Sutherlandshire. Caithness.

N. Isles.—Orkney, common, *T. Anderson.*

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—The hill "Orah," Antrim (var. *crispum*), *A. Smith.*

Sherard's plant, from the Mourne Mountains, is *Athyrium Filix-fœmina* blanched, not a variety of *Asplenium Adiantum-nigrum*, as supposed by some, or *Asplenium acutum*, as stated by others.

Connaught.—Connemara ; Gort (on limestone), Galway, *J. R. Kinahan.*

Leinster.—Wicklow (var. *multifidum*), *D. Moore.* Louth. Dublin (on granite). King's. Kilkenny, *J. R. Kinahan.*

Munster.—Cork. Kerry ; also Mucruss, Killarney (vars. *multifidum* and *rhœticum*). Clare (var. *multifidum*), *J. R. Kinahan.* Carthy's Cove, Waterford. Keeper Hill, Tipperary. Limerick, *J. R. Kinahan.*

The species is very common in Ireland.

Channel Isles.—Jersey (var. *multifidum* and others). Guernsey (var. *rhœticum* and other forms), *C. Jackson.*

Blechnum Spicant, *Roth.*

Peninsula.—Cornwall. Devonshire. Somersetshire.

Channel.—Hampshire. Isle of Wight. Dorsetshire. Wiltshire. Sussex.

Thames.—Hertfordshire. Kent, Tunbridge (var. *heterophyllum*, and other forms), *G. B. Wollaston.* Surrey. Middlesex. Berkshire. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Northamptonshire.

Severn.—Warwickshire. Gloucestershire ; Nailsworth (fronds

partially fertile), *G. F. Playne.* Monmouthshire; also Newbridge (stipes bifid), *T. H. Thomas.* Herefordshire. Worcestershire. Staffordshire. Shropshire.

S. Wales.—Brecknockshire. Glamorganshire. Carmarthenshire. Pembrokeshire.

N. Wales.—Anglesea. Denbighshire. Flintshire. Merionethshire. Carnarvonshire; also Beddgelert (dwarf var.), *F. C. Wilson.*

Trent.—Leicestershire. Rutland. Lincolnshire. Nottinghamshire. Derbyshire.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire; also segments bifid, *A. Clapham.*

Tyne.—Tanfield Dean (segments of barren frond cut), *T. Wilcke.* Blaydon Burn (segments bifid), *T. Wilcke,* Durham. Northumberland.

Lakes.—Westmoreland. Cumberland. Conistone, Lancashire (fronds partially fertile), *Miss Beever.*

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire.

E. Highlands.—Clackmannanshire. Fifeshire. Kinross-shire. Perthshire. Forfarshire. Kincardineshire. Aberdeenshire. Banffshire. Morayshire. Inverness-shire.

W. Highlands.—W. Inverness-shire. Argyleshire. Dumbartonshire. Isles of Arran, Islay, and Cantyre.

N. Highlands. — Ross-shire. Cromarty. Sutherlandshire. Caithness.

N. Isles.—Orkney. Shetland.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Cloughmore Wood, Rostrevor, Down, *A. Crawford.* Colin Glen, Belfast, Antrim, *A. Crawford.*

Connaught.—Connemara, Galway. Arran Isles. Near Eriffe, Mayo (fronds dichotomous multifid and crisped—var. *ramosum*), *Captain Eden.*

Leinster.—Dublin (fertile and barren fronds bifid), *J. R. Kinahan.* King's. Wicklow (1. fronds bifid; 2. fronds crisped; 3. fronds bifid and multifid-crisped at summit), *J. R. Kinahan.*

Munster.—Waterford (fronds bifid), *J. R. Kinahan.* Tipperary. Quin Abbey, Clare (fronds dichotomous); also (1. segments cut, 2. segments bifid, 3. fronds bifid), *J. R. Kinahan.* Limerick. Cork.

Channel Isles.—Jersey. Guernsey.

Botrychium Lunaria, *Linnæus.*

Peninsula.—Cardynham, Cornwall. Near Barnstaple; by the Dart; Haldon Hill, Devonshire. Bath; King's Weston; Hampton Cliffs, &c., Somersetshire.

Channel. — Titchborne; New Alresford; Petersfield; Somborne, near Winton; Hinton, &c., Hampshire. Luccomb, Shanklin, &c., Isle of Wight. Patching; Storrington;

Croboro' Warren, &c., Sussex. Alderbury Common; near Bath, within Wiltshire. Sturminster Newton, Dorsetshire.

Thames.—Dartford; Chislehurst; Foot's Cray, and the south part of Kent. Reigate; Shere; Albury; Dorking; Shirley; Highdown Heath near Godalming; Farnham Park, Surrey. Shotover Hill; Winchwood Forest, Oxfordshire.

Ouse.—Oakley Westfield, Bedfordshire. Bury, Suffolk. Heveringham Heath; Stratton Heath; Seething, Norfolk. Little Linton; Balsham; Chippenham, Cambridgeshire. Halston Heath; Wold Field, &c., Northamptonshire.

Severn.—Moxhall; near Coleshill Pool, Warwickshire. Gloucestershire. Twyn-gwyn, Monmouthshire, rare, *T. H. Thomas.* Duncumb and elsewhere, Herefordshire. Abberly Hill; Oversley Hill, near Ancester; Stourbridge, Worcestershire. Cheadle; Farley, Staffordshire. Stollerton; Titterstone Clee Hill; Ludlow; Whitchurch, Shropshire.

S. Wales.—Glamorganshire.

N. Wales. — Anglesea. Wrexham; Ruthin, *T. Pritchard,* Denbighshire. Near Rodney's Pillar, Montgomeryshire. Barmouth, Merionethshire. Penmaen Mawr, Carnarvonshire.

Trent.—Rutland. Loughborough; Market Harborough; Ashby de la Zouch; Twycross, &c., Leicestershire. Weelsby, Lincolnshire. Sutton-on-Trent; Newstead; Clifton; Paplewick; Norton; Sherwood Forest, Nottingham. Buxton; Masson, near Matlock, Derbyshire.

MERSEY.—Near Over; between Egremont and New Brighton; Macclesfield, &c., Cheshire. Chilburn, near Todmorden; Manchester; Newton; Oldham; Bootle, &c., Lancashire.

HUMBER.—Teesdale; Cronckley Fell; Hambleton Hills; Halifax; Richmond; Settle; Sheffield, and various other parts of Yorkshire.

TYNE.—Near Shewing Shields; Hexham; Horsley, *J. Bigge;* Tynemouth; Newcastle Town Moor, Northumberland. Near Marsden Rocks; Beamish, Durham.

LAKES.—Braystones; Muncaster Fell; Keswick; Castle Sowerby; Daleton; Flimby; Aspatria, &c., Cumberland. Rigmaden, and elsewhere, Westmoreland; with var. "*rutaceum.*"

W. LOWLANDS.—About Dumfries; Drumlanrig; Barhill, Tinwald, *P. Gray,* Dumfries-shire. Dalscarith; Glen of Terregles; Douglas Hall, Colvend; and elsewhere, Kirkcudbrightshire, *P. Gray.* Portpatrick, Wigtonshire. Ayrshire. Cathkin Hills, Lanarkshire. Gourock, Renfrewshire.

E. LOWLANDS.—Bemerside Hill; Blackburnrigg Dean; Coldingham Moor, Berwickshire. Pentland Hills and elsewhere, Edinburghshire. Linlithgowshire.

E. HIGHLANDS.—Clackmannanshire. Kinross-shire. Fifeshire. Fort at Taymouth Castle, *C. M'Intosh;* South side of Loch Tay; Craig Challiach; Ben Lawers; Blair Athol; Roman Camp at Ardoch, *C. M'Intosh,* Perthshire. Kingoldrum,

G. Lawson; Clova Mountains; Sands of Barry (var. "*rutaceum*"); Montrose; Strickathrow, *A. Croall;* Arbroath, &c., Forfarshire. Kincardineshire. Belhelvie Links; Corsehill, &c., Aberdeenshire. Mortlock, Banffshire, *B.S.E.* Morayshire. Auldean, Nairnshire.

W. Highlands.—Ardrishiag, *W. Brown;* Glen Croe, *B.S.L.;* Argyleshire. Mugdock, Dumbartonshire. Rothesay, Bute. Breeze Hill, Skye. Staffa, *T. B. Bell.*

N. Highlands.—Ross-shire. Wick, Caithness, rare, *T. Anderson.*

N. Isles.—Orkney. Shetland.

Ulster.—Roughfort; Belfast; Altmore Glen, near Cushendall; Knockagh, near Carrickfergus; Black Mountain, Antrim. Benyvena Mountains, near Magelligan, Londonderry. Scrabo, Down.

Leinster.—Luggelaw, Wicklow.

Munster.—Clonmel, Cork, *J. Sibbald.*

Connaught.—Connemara, near Galway, *Lady S. De la Poer Trench.*

Ceterach officinarum, *Willdenow.*

Peninsula.—Trevenna; Truro; Newlyn; Calstock; Pentillie Castle, Cornwall. Topsham; Totnes, *C. Scott;* Torquay; Babbicombe; Plymouth; Chudleigh, *R. J. Gray,* &c., Devonshire. Forscote, near Bath, abundant, as in the county generally, *Rev. E. Bosanquet;* Bristol; Bream

down; Selworthy; Clevedon; Cheddar; Weston-super-Mare, &c., Somersetshire.

Channel.—Winchester Cathedral; near Winchester, epiphytal, *R. W. Smith;* Netley Abbey; Selborne; Titherly, *E. T. Bennett;* Botley, &c., Hampshire. Brading; Carisbrooke Castle, &c., Isle of Wight. Sherborne, Dorsetshire. Corsham, *B.S.E.*, and other parts of Wiltshire. Pulborough; Enfield; Hurstpierpoint; Danny, near Brighton, *Rev. T. Rooper;* Stopham; Marden; Chailey, &c., Sussex.

Thames.—Hertfordshire. [Middlesex.] Riverhead; Maidstone, and various parts of Kent. Westbrook and Catteshall near Godalming; Haslemere; Farnham, Surrey. [Berkshire.] Cowley, Oxfordshire. Essex.

Ouse.—Heveringham Church; Heydon Church, Norfolk. Northamptonshire.

Severn.—Tachebrook; Coventry, Warwickshire. Stapleton; Chepstow; Cheltenham; Cirencester, &c., Gloucestershire. Tintern Abbey; Pont-y-pool, &c., Monmouthshire. Hereford; about Ross; Leominster, &c., Herefordshire. Malvern; Badsey, near Evesham; Wychwood Forest, Worcestershire. Wetton; Berresford; Beeston Tor, &c., Staffordshire. Ludlow, Shropshire.

S. Wales.—Brecon; Talgarth; Crickhowel (crenated var.), *J. R. Cobb,* Brecknockshire. Aberdare; Cardiff, *F. Brent;* Swansea; Gower; Pennard Castle, &c., Glamorganshire.

Carmarthenshire. Tenby; Pembroke and Manorbeer Castles; Haverfordwest Priory, Pembrokeshire.

N. Wales.—Holyhead, Anglesea. Denbighshire. Barmouth, Merionethshire. Trebroth; Bangor; near Carnarvon, Carnarvonshire.

Trent.—Colwick Park; Paplewick, Nottinghamshire. Dovedale; Newton, near Melbourne; Lath-kill Dale, Derbyshire.

Mersey.—Carr-edge, Cheshire. Lancaster; Club-moor, near Liverpool; West Houghton; Kellet, north of Manchester, Lancashire.

Humber.—Rocks behind Malham; Kirklees Park near Halifax; about Settle, Yorkshire.

Tyne.—Northumberland.

Lakes.—Arnside Knot (crenated var.); Milnthorpe; Kendal; Castleton; Ambleside (crenated var.), *Miss S. Beever*, &c., Westmoreland. Gosforth, *J. Robson;* Keswick (crenated var.), *Miss Wright;* Sandwith; St. Bees; Gowbarrow Park, Ulswater, Cumberland. Silverdale, N. Lancashire, *T. Simpson, B.S.E.*

W. Lowlands.—Drumlanrig, Dumfries-shire. Orchardton Buit, Kirkcudbrightshire, *J. Fraser.* Paisley, Renfrewshire. Glasgow, Lanarkshire.

E. Highlands.—Kinnoul Hill; near Annat Cottage, *G. Lawson;* Dens of Balthayock and Pitroddie, Perthshire.

W. Highlands.—Kilfinnan, Argyleshire.

Ulster.—Galgorm ; Cave-hill, Antrim. Bryansford ; Rostrevor, *A. Crawford ;* Down. Florence Court, Fermanagh.

Connaught.—Drumahore, Friarstown Abbey, near Sligo, *J. T. Syme, B.S.E.* Round Tower of Roscommon, between Galway and Oughterard ; Oughterard ; near Mohir ; and many other parts of Galway. Arran Isles.

Leinster.—Townley Hall, Louth, *C. L. Darby.* Marlay, co. Dublin (on granite), *S. Foot, B.S.E.* Glendalough, Wicklow. Marble quarries at Kilkenny.

Munster.—Between Clonmel and Waterford, and many parts of Waterford. Tipperary. Castle-Connel and elsewhere, Clare ; also crenated var. (*Dr. Allchin*). Cork ; Clonmel ; Youghal (on clay slate), *J. R. Kinahan*, &c., Cork. Limerick. About Killarney, Kerry.

Channel Isles.—Jersey.

Cystopteris regia, *Presl.*

Thames.—Wall at Low Layton, Essex.

Trent.—Derbyshire, *H. Shepherd,* } who has sent specimens
Humber.—Yorkshire, *H. Shepherd,* } thus located.

Lakes.—Saddleback, Cumberland, *S. F. Gray*, 1820.

Cystopteris fragilis, *Bernhardi.*

Peninsula.—Exwick, near Exeter, Devonshire. Cheddar Cliffs

(with var. *dentata*); Hampton Cliffs, Bath, *R. Withers*, &c., Somersetshire.

Channel.—Dorsetshire Box, Wiltshire, *Dr. Alexander*, *B.S.E.* (var. *dentata*). Tunbridge Wells, Sussex, *Miss Bower* (var. *dentata*).

Thames.—Albury, Surrey.

Ouse.—Yoxford; Bungay, Suffolk. Norfolk. Northamptonshire.

Severn.—Near Arbury Hall (var. *dentata*); Compton Verney, Warwickshire. Near Bristol, &c., Gloucestershire. Pen-y-garn, near Pont-y-pool, *T. H. Thomas*; Skirrid Vawr, near Abergavenny (with var. *dentata*); Wyndcliff woods, *W. H. Purchas*, Monmouthshire. Downton (var. *angustata*); The Dowards on the Wye (var. *dentata*), Herefordshire. Breedon hill; Bromsgrove, Worcestershire. Ecton Tor, *Rev. A. Bloxham*, Staffordshire (also var. *dentata*). Blodwell rocks; Whitcliff near Ludlow; banks of the Teme, near Downton Castle, *E. Lees*, Shropshire.

S. Wales.—Radnorshire. Brecknockshire. Pont-nedd-Vechn, &c., Glamorganshire (with var. *dentata*). Cardiganshire.

N. Wales.—Anglesea (var. *dentata*). Llangollen (var. *dentata*); near Wrexham (with var. *dentata*), Ruthin (with var. *dentata*), *T. Pritchard*, Denbighshire. Castle Dinas, Flintshire (var. *dentata*). Craig Breiddin, Montgomeryshire (var. *dentata*), *Rev. W. A. Leighton*, *B.S.E.* Barmouth, Merionethshire. Llanberis (vars. *dentata* and *angustata*); Cwm-

Idwal, Clogwyn-y-Garnedd, Penmaen Mawr (var. *dentata*), and elsewhere, in the Snowdon district (form near *alpina*), Carnarvonshire.

Trent.—Leicestershire. Oxton and Bulwell Churches; Worksop, Nottinghamshire. Fairfield (with var. *dentata*); Dovedale (var. *dentata*); Matlock Baths (with vars. *dentata* and *angustata*); Castleton; Lover's Leap near Buxton, Derbyshire.

Mersey.—Rostherne Church, Cheshire. Lancashire. (Var. *dentata* in both counties.)

Humber.—About Settle (with vars. *dentata* and *angustata*); Reivaulx Abbey; Helmsley; Egglestone bridge on the Greta; Dropping Well, Knaresborough; Anston rocks near Sheffield; Castle Howard Park; Halifax; Ayrsgarth Bridge, Wensley Dale (var. *angustata*), and many other parts of Yorkshire.

Tyne.—Cauldron Snout (var. *dentata*), &c., Durham. Haltwhistle; Mitford Church near Morpeth (with var. *dentata*), *B.S.E.;* Lintrope, Cheviots (with var. *dentata*), *Rev. R. Taylor*, Northumberland.

Lakes.—Lamplugh, *J. Dickenson*, *B.S.E.;* Borrowdale (var. *dentata*), *Miss Wright;* Holm Rock; Mickledore; Braithwaite Brow, Egremont (var. *dentata*), *J. Robson;* and elsewhere, Cumberland. Kendal (with var. *dentata*); Windermere (var. *interrupta*), *F. Clowes*, and other parts of Westmoreland. Silverdale, N. Lancashire (var. *dentata*).

W. Lowlands.—Near Hobb's Linn, Moffat Dale, Dumfries-shire (var. *dentata*), *P. Gray*. [Formerly on Cluden Hills, Kirkcudbrightshire (var. *dentata*), *P. Gray*.] Calderwood, Lanarkshire, *T. B. Bell, B.S.E.*

E. Lowlands.—Coldstream ; near Mains, Berwickshire. Pentland Hills (var. *angustata*), and elsewhere, Edinburghshire. Woodcock Dale Wood, Linlithgowshire (with var. *dentata*), *Dr. Balfour*.

E. Highlands.—Banks of Loch Lomond, Stirlingshire (var. *dentata*). Castle Campbell, near Dollar, Clackmannanshire. Silver Cove, near Wemyss Castle, Fifeshire (var. *decurrens*), *A. Tait*. Den of Balthayoch ; Glen Queich in the Ochils ; Pass of Killiecrankie ; Killin ; Ben Lawers (with var. *dentata*), Perthshire. Glen Clova and Glen Isla, Forfarshire. Kincardineshire coast. Sea-cave near Aberdeen (var. *Dickieana*) ; Braemar, and elsewhere, Aberdeenshire. Cawdor Castle, Nairnshire. Kingussie (var. *dentata*), Inverness-shire. Morayshire.

W. Highlands.—Ben Nevis, Inverness-shire (var. *dentata*). Glen Croe, *T.M.* ; Oban and Dalmally, *Miss Brownlow* ; Dunoon, Argyleshire. Dumbartonshire.

N. Highlands.—Coul, Ross-shire, *J. Fraser, B.S.E.* Sutherlandshire. Morven, Caithness (var. *dentata*), *T. Anderson*.

N. Isles.—Hoy, Orkney (with var. *dentata*), *T. Anderson*.

W. Isles.—Langa, Harris, *Dr. Balfour*.

Ulster.—Near Belfast; Woodburn Glen; Rocks at Carrickfergus (var. *dentata*), Antrim. Black Mountain, Down.

Connaught.—Leitrim. Connemara, Galway. Sligo, near the town.

Munster.—Brandon Hill; cliffs above Mangerton, Kerry.

Cystopteris montana, *Link.*

N. Wales.—Reputed to have been found in this province on Mount Glyder (*Lloyd: Ray: Plukenet*).

E. Highlands.—Ben Lawers, *W. Wilson*, and subsequently *Dr. Balfour;* Corrach Dh' Oufillach, or Corrach Uachdar in the Meal Oufillach Mountains, between Glen Dochart and Glen Lochy, *W. Gourlie*, Perthshire. Clova, Forfarshire, 1855, *J. Backhouse.*

Gymnogramma leptophylla, *Desvaux.*

E. Highlands.—[In a stone dyke by the road from Braemar to Ballater, nearly opposite Invercauld House, Aberdeenshire, *Miss Veitch.* Probably an error, arising from the accidental intermixture of Scottish and Maderia specimens.]

Channel Isles.—Jersey, on moist banks, among *Marchantia;* near St. Aubyn's; St. Laurence and St. Haule.

Hymenophyllum tunbridgense, *Smith.*

Peninsula.—Rough Tor near Camelford; near Penryn, Corn-

wall. Bickleigh Vale; Vixen Tor, Staple Tor, and Shaugh, Dartmoor; Becky Fall near Moreton, *R. J. Gray*, Devonshire. Shepton Mallet, Somersetshire.

CHANNEL.—Tunbridge Wells, Kent. Cockbush near Chichester; West Hoathly; Ardingly; Handcross; Balcombe, *J. Lloyd;* Tilgate Forest, *J. A. Brewer*, Sussex.

SEVERN—[Staffordshire.]

S. WALES.—Melincourt and Cilhepste Waterfalls; Pont-nedd-Vechu, Glamorganshire. Brecknockshire.

N. WALES.—Crofnant near Harlech; Dolgelly; Cwm Bychan, near Barmouth, *Rev. T. Salway;* Vale of Festiniog; Cader Idris, *J. E. Bowman;* Rhaiadr Du, near Maentwrog, *E. Newman*, Merionethshire. [Anglesea.] [Carnarvonshire.]

MERSEY.—Near Croydon brook; hills from Macclesfield to Buxton, Cheshire. Cliviger; Greenfield, near Saddleworth; Rake Hey Common, near Todmorden, Lancashire.

HUMBER.—Esk Dale, near Whitby; near Halifax, &c., Yorkshire.

LAKES.—Hawl Gill, Wastwater, *J. Robson;* Ennerdale, Cumberland, *J. Dickinson, B. S. E.* Westmoreland. Conistone, North Lancashire.

W. LOWLANDS.—Drumlanrig, Dumfries-shire. Banks of the Clyde,. Lanarkshire.

E. LOWLANDS.—Peebles-shire.

E. HIGHLANDS.—[Stirlingshire.] [Perthshire.]

W. HIGHLANDS. Bullwood; Dunoon; Glen Gilp, *C. M'Intosh,*

Argyleshire. Banks of Loch Lomond, Dumbartonshire. Isle of Mull, *J. T. Syme.* Isle of Bute, *Dr. Balfour.*

N. Highlands.—[Ross-shire.]

Connaught.—Connemara, *Dr. Graham;* Ballynahinch, *Dr. Balfour*, Galway.

Leinster.—Dublin co., rare, *B.S.E.;* [Powerscourt;] Glencree, and elsewhere, Wicklow.

Munster.—Feacle, *J. R. Kinahan*, Clare. Morgan's Glen, *E. H. Sargint;* Clonmel, *J. Sibbald;* Glengariff, Bantry, *C. C. Babington, B.S.E.;* Glenbower, Killeagh, *Dr. Power;* Dunbullogue Glen; Ballenhassig Waterfall, Cork. Glen Carnn, *W. Andrews, B.S.E.;* about Killarney, and elsewhere in the co. of Kerry.

Hymenophyllum unilaterale, *Willdenow.*

Peninsula.—Bodmin; Carn Brea near Redruth; Rough Tor near Camelford; Granite Tor, Cornwall. Moreton, *R. J. Gray;* West Lynn, *N. B. Ward;* Westman's Wood, Shaugh Bridge, Vixen Tor, Great Mist Tor, White Tor, Longaford Tor, and Sheep's Tor, Dartmoor, *R. J. Gray;* Tynemouth; Bickleigh Wood, Devonshire.

Severn.—Gradbitch, near Flash, Staffordshire. Treflach Wood, near Oswestry, Shropshire.

S. Wales.—Mountains of Brecknockshire. Below Melincourt Waterfall; rocks near Scud-einon Gam, *E. Young*, Glamor-

ganshire. Pont Bren; Devil's Bridge; Hafod, Cardiganshire. Carmarthenshire.

N. Wales.—Dolgelly; Rhaiadr Du, near Maentwrog; Rhaidr-y-Mawddach, near Llanetyd; Festiniog, Merionethshire. Cwm Idwal, and throughout the Snowdon district: Rhaidr-y-Wenol, Falls of the Llugwy, Capel Curig; Rhaiadr Mawr, near Llanberis, &c., Carnarvonshire.

Mersey.—Near Bury; near Lancaster; Caves at Greenfield; Thevilly, near Burnley, Lancashire.

Humber.—Turner's Clough, Rishworth; Hawl Gill, near Mickleton; Lower Harrowgate, Yorkshire.

Tyne.—Jurionside, Northumberland, *B.S.E.*

Lakes.—Patterdale; Stock Gill Force; Langdale Pikes, Ambleside, &c., Westmoreland. Keswick; Bow Fell; Scaw Fell; Borrowdale; Ennerdale, *J. Dickinson;* Scale Force, near Buttermere; Honister Crag; Lodore Fall, *Miss Wright;* High Still; Gatesgarth Dale; Dalegarth, *J. Robson*, &c., Cumberland. Near Hawkeshead, *Miss S. Cowburn;* near Conistone, *Miss Beever;* Old Man Mountain, Silverdale, N. Lancashire.

W. Lowlands.—Delvine Pass; Nithside; near Penpont; Grey Mare's Tail, Moffat Dale, *P. Gray;* Girpel Lane, Kirkpatrick-juxta, Dumfriesshire. Kircudbrightshire. Glen Ness, W. Dalmellington, Ayrshire, *Dr. M'Nab, B.S.E.* Rocks above Gourock, Renfrewshire.

E. Lowlands.—Peebles-shire.

E. Highlands.—By the Reeky Linn, on the Isla, Forfarshire. Castle Campbell, Dollar, Clackmannanshire. Glen Queich in the Ochils; Ben Lawers; Pass of Leny, *B.S.E.*; Finlarig Burn, near Killin; rocks in the Trosachs; shores of Loch Katrine, Perthshire.

W. Highlands.—Crinnan; Glen Moray; Dunoon; Glen Gilp, *C. M'Intosh;* Glen Finnart, Argyleshire. Banks of Loch Lomond; Bowling Hills, Dumbartonshire. Ben More; Loch Spelire; Tobermorey, Isle of Mull. Isles of Islay and Arran.

N. Highlands.—Sutherlandshire.

N. Isles.—Hoy, Orkney, *R. Heddell.* Near Ska, Unst, Shetland.

W. Isles.—Langa, Harris.

Ulster.—By the Glenarve River, near Cushendall; Colin Glen, Belfast, Antrim. Londonderry. Ennishowen Mountains. Donegal. Tullaghmore Park; Mourne Mountains, Down. Florence Court, Fermanagh.

Connaught.—Connemara, Oughterard, &c., Galway. Mountains of Mayo, *J. Ball, B.S.L.*

Leinster.—Dublin. *S. Foot, B.S.E.* Glendalough; Hermitage Glen; Powerscourt Waterfall, and other parts of Wicklow.

Munster.—Morgan's Glen, Clonmel, *E. H. Sargint;* Glens near Youghal, Cork. Great Blanket Island, Killarney, and among the mountains of Kerry. Tipperary.

Lastrea cristata, *Presl.*

Peninsula.—[Devonshire.]

Thames.—[Epping, Essex (var. *uliginosa*), *E. Newman:* we have only seen *spinulosa* from this station.] [Oxfordshire.]

Ouse.—Westleton; Bexley Decoy, near Ipswich, *H. Bidwell*, Suffolk. Bawsey Heath, near Lynn (with var. *uliginosa*); Dersingham; Edgefield, near Holt; Fritton, near Yarmouth; Surlingham Broad, near Norwich (apparently with var. *uliginosa*), *W. S. Hore;* Wymondham (var. *uliginosa*), Norfolk. [Huntingdonshire.] [Bedfordshire.]

Severn.—Near Madeley; Bog near Newcastle-under-Lyne (? with var. *uliginosa*), *J. Hardy*, *Hb. Leighton.* Staffordshire. [Worcestershire.]

Trent.—Oxton Bogs (with var. *uliginosa*); Bullwell Marshes, Nottinghamshire.

Mersey.—Wybunbury Bog, Cheshire (with *uliginosa*).

Humber.—Plumpton Rocks, near Knaresborough, Yorkshire, *Baines's Flora of Yorkshire.*

E. Highlands.—[Aberdeenshire.]

Munster.—[Mucruss, Killarney, Kerry (var. *uliginosa*). The plant from Rathronan, near Clonmel, seems to be rather a state of *L. Filix-mas.*]

Lastrea dilatata, *Presl.*

Peninsula.—Cornwall. Lynmouth; Torquay; Walkhampton; Hartland (with var. *Chanteriæ*), *Rev. J. M. and Mrs. Chan-*

ter ; Ilfracombe (various forms, including *nana*), *Rev. J. M. Chanter*, &c., Devonshire. Inglishcombe Wood ; Selworthy, Somersetshire.

Channel.—Hampshire. Ninham, near Ryde, Isle of Wight. Dorsetshire. Spye Park, Wiltshire. Tilgate Forest ; Hastings ; Tunbridge Wells (with a dwarf var.), Sussex.

Thames.—Hertford Heath ; Broxbourne ; Aldenham ; Hitchin, &c., Hertfordshire. Eridge Rocks, Kent. Chertsey ; Bagshot ; Virginia Water, and other parts of Surrey. Hampstead (with a glandular, a dwarf, and an obtuse-pinnuled var.), Middlesex. Epping (with var. *glandulosa*, *H. Doubleday*), Essex. Chipping Norton, Oxfordshire, *H. Buckley*.

Ouse.—Norwich, Norfolk. Cambridgeshire. Northamptonshire.

Severn.—Stoke Heath ; Stinchall ; Whitley, and other parts of Warwickshire. Dean Forest (var. *glandulosa*), *Messrs. Bennett and Purchas*, Gloucestershire. Pen-y-garn and Trevddun, Monmouthshire, *T. H. Thomas*. Howle Hill, Ross ; Colwall, Herefordshire. Worcestershire. Staffordshire. Titterstone Clee (with a glandular form) ; Sandford Heath ; Hawkestone ; Bomere ; Sutton Spa, and Shomere, near Shrewbury ; Pimhill ; Shawbury Heath, *Rev. W. A. Leighton ;* Whitchurch, *R. W. Rawson*, Shropshire.

S. Wales.—Brecknock Beacon ; Drygarn (dwarf form), *J. R. Cobb*, Brecknockshire. Gamrhin, above Rhayader (var. *dumetorum*), *J. R. Cobb*, Radnorshire. Glamorganshire. Cardiganshire. Pembrokeshire.

N. Wales.—Cickle, Anglesea, *Rev. W. A. Leighton.* Ruthin, Denbighshire. Flintshire. Festiniog (var. *dumetorum*), Merionethshire, *Dr. Allchin.* Aber (with a dwarf var.), *Rev. W. A. Leighton*; Tre'r Ceiri (supposed var. *collina*), *C. C. Babington*, Carnarvonshire.

Trent.—Leicestershire, Black Rock, Cromford Moor, near Matlock, Derbyshire (var. *dumetorum*), *Sm. Eng. Fl.* Lincolnshire. Nottinghamshire.

Mersey.—Lindon Moss, near Mobberley, Cheshire. Risley Moss, near Warrington; Clough, near Manchester; and elsewhere on the hills (vars. *collina* and *dumetorum*) of Lancashire.

Humber.—Leckby Carr; Heckfall Wood; Sheffield Moor; Settle (with var. *nana*), *J. Tatham;* Halifax; Thirsk; Ingleborough (var. *collina*), and elsewhere, Yorkshire.

Tyne.—Morpeth, Northumberland. Sunderland, Durham.

Lakes.—Near Elter Water (var. *collina*), *Rev G. Pinder;* Langdale (var *collina*); Silverthwaite; Old Man; and the rocky Fells, probably throughout the district (var. *dumetorum*), *Miss Beever*, Westmoreland. Red House, Cumberland. Torver, near Conistone (var. *collina*), *Mr. T. Eccleston*, N. Lancashire. Isle of Man (var. *dumetorum*), *Dr. Allchin.*

W. Lowlands.—Dumfries-shire. Maybole, Ayrshire, *W. Dickson.* Lanarkshire.

E. Lowlands.—Roxburghshire. Berwickshire. Habbie's How, *E. Hall*, Edinburghshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Kinrossshire. Fifeshire. Dunkeld; Ben Lawers (var. *alpina*); mountains near Crieff (as var. *montana*), *Dr. Balfour*, &c., Perthshire. Ingelmady; Dundee, Forfarshire. Kingcausie, Kincardineshire, *J. T. Syme*. Ben-na-Baird, Aberdeenshire. Banffshire. Morayshire. E. Inverness-shire.

W. Highlands.—Appin, *J. T. Syme;* near Loch Ballenoch (var. *dumetorum*), *T. M.;* Ardrishiag, *T. M.*, Argyleshire. Tarbet, Dumbartonshire (with var. *dumetorum*), *T. M.* W. Inverness-shire. Arran; also on Goat-fell (var. *collina* and *dumetorum — maculata*, *Dr. Deakin*). Isles of Islay and Cantyre. Ailsa Craig.

N. Highlands.—Ross-shire. Sutherlandshire. Caithness, *T. Anderson*.

N. Isles.—Hoy, and other islands of Orkney, *T. Anderson*.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Newton Breda, Down, *Dr. Mateer*.

Connaught.—Connemara, Galway.

Leinster.—Newtown, *Miss Tarbet;* Powerscourt Waterfall, Wicklow (gathered as *dumetorum*, perhaps *collina*), *C. C. Babington*. Dublin Mountains (? var. *collina*), *J. R. Kinahan*. Kilkenny. King's.

Munster.—Waterford. Clare. Limerick. Tipperary. Clonmel. Cork, *J. Sibbald*.

Channel Isles.—Jersey. Guernsey, *C. Jackson*.

Lastrea Filix-mas, *Presl.*

One of our most common Ferns, dispersed over the whole of England, Wales, Scotland, and Ireland, and found in the Northern and Western Isles, and in Jersey and Guernsey.

The var. *incisa.*—Teignmouth, *Miss A. Hoseason;* Combe Martin, *C. C. Babington*, Devonshire. Bridgewater, Somerset. Wiltshire. Bridport, Dorsetshire. Tunbridge, *M. T. Masters;* Sturry, Kent. Reigate; Albury; St. Martha's Hill, Guildford; Sutton Park; Mayford; Bagshot; Virginia Water, Surrey. Barnet, Hertfordshire. King's Cliffe, Northamptonshire. Ross, Herefordshire. Malvern, Worcestershire. Stapenhill, Derbyshire. Wollaton, Nottinghamshire. Cockermouth, Cumberland. Bedlington, Morpeth, Northumberland, *Rev. R. Taylor.* Cathcart Hills, near Glasgow, Lanarkshire. Dunkeld; Ben Chonzie, near Crieff, Perthshire. Kingcausie, Kincardineshire, *J. T. Syme.* Guernsey, *C. Jackson.* Kingstown, Dublin, *R. Barrington.* A fine modification of this form (var. *elongata*) was found in the Isle of Wight, by *Mr. A. G. More* and the *Rev. W. H. Hawker.* Another modification (var. *producta*) was found on the Wrekin, in Shropshire, by the *Rev. W. A. Leighton.* A third (var. *deorso-lobata*), at Sutton and Bomere, near Shrewsbury, *Rev. W. A. Leighton;* also found in Anglesea; Bedale, Yorkshire; Black Park, Buckinghamshire; Maidstone and Cobham, Kent; Albury, Surrey; Epping, Essex; Lynn, Norfolk; Ambleside, Lakes; Callender, Scotland; Ballyvaughan, Ireland; Jersey; Guernsey.

The var. *paleacea* seems very common in Scotland. We have observed it at Tarbet, Dumbartonshire, with a remarkable variation; Polmont, Stirlingshire; and in several parts of Argyleshire and Perthshire. *Mr. Backhouse* finds it in the Clova mountains, Forfarshire, and also in the English counties of Durham and York; and *Miss Beever* at Ambleside, in Westmoreland. We have seen it from Torquay and elsewhere in Devonshire; Hastings and other parts of Sussex, *Dr. Allchin;* Tunbridge Wells and other parts of Kent, *G. B. Wollaston;* Chobham and other parts of Surrey. *Mr. Newman* adds the counties of Worcester, Hereford, and Salop. In Wales it seems also plentiful; *Mr. Hankey* has sent it to us from Dolgelly, at the base of Cader Idris, in Merionethshire; *Mr. T. Prichard*, from Ruthin, in Denbighshire; *Mr. Newman* records it as occurring in profusion at Hafod, Cardiganshire; and it is, no doubt, widely dispersed both in North and South Wales. In Ireland *Dr. Allchin* informs us that he found it very abundant; and he has preserved specimens from near Dingle and Cahir Conree. *Mr. C. Jackson* sends it from Guernsey, as well as a multifid form of it; and it occurs in Jersey. A remarkable narrow elongate lanceolate form of it (var. *Pinderi*) was found near Elter Water, by the Rev. G. Pinder.

The var. *abbreviata* (including *pumila*).—Teesdale, Durham, *Mr. Backhouse;* Ingleborough, Yorkshire, *Rev. G. Pinder;* Conistone, Lancashire, *Miss Beever;* Westmoreland, *G. B. Wollaston:* Cumberland, *Rev. G. Pinder;* Wyck, Gloucestershire

Bab. Man.; Snowdon, *W. Pamplin*; near Llyn Ogwyn, Carnarvonshire, *S. O. Gray;* Scottish Highlands, *Mr. Backhouse.*

The var. *cristata.*—Charleston, near St. Austell, Cornwall; Devonshire, *G. B. Wollaston.* Also reported from Ireland.

The var. *polydactyla.*—Bromsgrove, Worcestershire, *B. Maund.* A "many-headed" variety, probably similar, is reported from Brecon, *J. R. Cobb*; another from Staffordshire, *S. Jervis.*

The var. *subintegra*, scarcely more than once pinnate, is reported from Ennis, Clare, Ireland. At Rathronan, near Clonmel, Cork, occurs a small variety, somewhat resembling *L. cristata.*

Lastrea æmula, *Brackenridge.*

Peninsula.—Penzance; St. Michael's Mount; Helston; Lostwithiel; Truro, and throughout Cornwall. Chambercombe; Ilfracombe; Linton; Hartland, *Rev. J. M. Chanter;* Parracombe Hill, *R. J. Gray;* Barnstaple; Clovelly; Helsworthy, *Rev. W. S. Hore;* Devil's Tor, Dartmouth; Bickleigh Vale; Shaugh Vale, *R. J. Gray*, &c., Devonshire. Selworthy, Somersetshire.

Channel.—Tunbridge Wells; Ardingly; Balcombe; West Hoathly, Sussex.

Severn.—Herefordshire.

S. Wales.—Melincourt Waterfall, Glamorganshire, *E. Young.*

N. Wales.—Holyhead, Anglesea, *G. Maw.* Merionethshire. Snowdon district, *Dr. Allchin.*

HUMBER.—Settle, *J. Tatham;* Scarborough, *F. Bean*, Yorkshire.

TYNE.—Embleton; Dirrington Law, *Dr. Johnston*, Northumberland.

LAKES.—St. Bee's Head, Cumberland. Conistone, North Lancashire. Isle of Man, *Dr. Allchin.*

E. HIGHLANDS.—[Baldovan, Kinnordy, Forfarshire. *W. Gardiner.*]

W. HIGHLANDS.—Banks of Loch Lomond, Dumbartonshire. Glen Gilp; Campbelton, *A. Tait;* Loch Swin, west coast of Argyleshire, *Mrs. Shaw.* Wooded rocks between Brodick and Corrie, and between Lamlash and Whiting Bay, Arran, *Dr. Balfour.* Tobermory, Isle of Mull, *W. Tanner.*

N. ISLES.—Hoy, Orkney, rather common, *T. Anderson.*

W. ISLES.—N. Uist, *Dr. Balfour.*

ULSTER.—Fairhead, Antrim. Near Coleraine; Rushbrook; near Londonderry; Garvagh, Londonderry. Banks of Lough Swilly; Milroy Bay; Arrigal Hill near Donegal; about Lough Derg, Donegal.

CONNAUGHT.—Between Sligo and Manorhamilton, *E. Newman*, Sligo. Foot of Nephin; Coraan, Achill; Newport; Westport, &c., *E. Newman*, Mayo. About Clifden; about Roundstone and Ballynahinch; near Oughterard; Connemara, Galway.

LEINSTER.—Seven Churches, abundant, *D. Moore, B.S.E.;*

Glendalough, abundant and luxuriant; Powerscourt, *J. Ball;* Great Sugar-loaf, *J. R. Kinahan*, Wicklow.

Munster.—Ballyquin, plentiful; Ardmore, on sea cliffs, sparingly; Foxe's Cove, &c., *J. R. Kinahan*, Waterford. Lough Graney; and near Feacle, *J. R. Kinahan;* near Loop-head, Clare. Near Cork; woods about Glengarriff; Clonmel, *J. Sibbald*, Cork. Kenmare; on the mountains and in the woods of Kerry, especially about Killarney, Dinis Island, Cromaglaun, and O'Sullivan's Cascade.

Channel Islands.—Guernsey, *J. James.*

Lastrea montana, *Moore.*

Peninsula.—Cornwall. Brendon Wood, and borders of W. Lyn, Lynmouth, *T. Clark*, Devonshire. Near Keynsham; Selworthy, *Mrs. A. Thompson*, &c., Somersetshire.

Channel.—New Forest, near Lyndhurst; near Southampton, Hampshire. Apse Castle, Isle of Wight. Dorsetshire. Wiltshire. Danny, near Brighton, *Rev. T. Rooper;* Tilgate Forest; Waterdown Forest; Eridge Woods, Tunbridge Wells, and elsewhere, Sussex.

Thames.—Bell Wood, Bayford; Tring; Broxbourne, &c., Hertfordshire. Hampstead, Middlesex. Bexley; Blackheath; Bailey's Hill between Brasted and Tunbridge, Kent. Witley; Hindhead; Cobham; Wimbledon, &c., Surrey. Shotover Hill, Oxfordshire. Hartwell, Buckinghamshire. High Beech; Little Baddow, *A. Wallis, B.S.L.*, Essex.

Ouse.—Bradwell, Suffolk. Near Crome, Norfolk, *R. Wigham, B.S.L.* Fulbourne, Teversham, &c., Cambridgeshire. Dallington Heath, Northamptonshire.

Severn.—Allesley; about Arbury Hall; Coleshill Heath; Corley, Warwickshire. Forest of Dean, Gloucestershire, *W. H. Purchas.* Glyn Ponds; Nantygollèn, near Pont-y-pool, Monmouthshire, *T. H. Thomas.* Herefordshire. Malvern Hills, Worcestershire, *E. Lees, B.S.L.* Ramshaw Rocks, near Warslow, Staffordshire. Whitcliffe; Ludlow; Shawbury Heath; Wyre Forest, Shropshire.

S. Wales.—Radnorshire. Brecknockshire. Swansea, Glamorganshire, *T. B. Flower, B.S.E.* Carmarthenshire. Cardiganshire.

N. Wales.—Anglesea. Wrexham; Llanymynech, *C. C. Babington,* Denbighshire. Flintshire. Dolgelly, Merionethshire, *B.S.L.* Near Llanberis; Aber, and other parts of Carnarvonshire.

Trent.—Near Twycross, Leicestershire. Rutland. Lincolnshire. Oxton and Eddingley Bogs, Nottinghamshire. Dethich Moor; Riley, Derbyshire.

Mersey.—Birkenhead and Oxton, Cheshire. Near Warrington; Rochdale; Rainhill; Gateacre, Lancashire.

Humber.—Sheffield; Valley of the Don, near Doncaster; Melton Wood, near Adwick; Escrick, near York; Whitby; Richmond; Halifax; Everley, near Scarborough, Yorkshire.

Tyne.—Chapel Weardale; Cawsey Dean, near Newcastle; by the Tees, Durham. Embleton; banks of the Irthing, *Rev. R. Taylor*, Northumberland.

Lakes.—Keswick; near Lodore Waterfall; Patterdale; Hawl Gill, Wastwater, Cumberland. Rydal Water; Langdale and other parts of Westmoreland.

W. Lowlands.—Moffat Dale, Dumfries-shire, *P. Gray*. Lanarkshire.

E. Lowlands.—Rubershaw, Roxburghshire. Pentland Hills, Edinburgh. Dye at Longformacus; Banks of Whiteadder, Berwickshire.

E. Highlands.—Ben Lomond, Stirlingshire. Clackmannanshire. Kinross-shire. Glen Isla; Clova Mountains; Sidlaw Hills, Forfarshire. Dunkeld; Craig Chailliach; Ben Lawers, and elsewhere abundant, Perthshire. Aberdeenshire. Morayshire.

W. Highlands.—Argyleshire, common. Dumbartonshire, plentiful. Isles of Arran, Islay, and Cantyre.

N. Highlands.—Sutherlandshire.

N. Isles.—Shetland, *Cyb. Brit.*

W. Isles.—N. Uist.

Ulster.—Milroy Bay, Donegal. Londonderry, *D. Moore.*

Connaught.—Lough Corril; Connemara; between Dooghty and Ma'am; ascent of Ma'am Turc Pass; Letterfrank, *E. T. Bennett*, Galway.

Leinster.—Glencree, *S. Foot, B.S.E.;* Seven Churches, *D.*

Moore, B.S.E.; Glendalough, and Powerscourt, Wicklow.

Munster.—Between Innistymon and Corrafin, *E. T. Bennett;* Feacle, *J. R. Kinahan*, Clare. Near Clonmel, Waterford. Mangerton, Killarney, *S. P. Woodward, B.S.L.*, Kerry.

Lastrea rigida, *Presl.*

Peninsula.—'Cornwall,' *Hb. Hooker.* Bath, Somersetshire; probably planted.

Mersey.—[Woolston Moss, near Warrington, Lancashire.]

Humber.—Ingleborough; Wharnside; White Scars, above Ingleton; Attermine Rocks, near Settle, Yorkshire.

Lakes.—Arnside Knot; Hutton Roof Crags; Farlton Knot, Westmoreland. Silverdale; by the Lancaster and Kendal Canal, N. Lancashire.

Leinster.—Clay-slate wall at Townley Hall, Louth, *C. L. Darby;* probably introduced.

Lastrea spinulosa, *Presl.*

The habitats of this species have not been noted sufficiently distinct from those of *L. dilatata*, to render the record a perfect one. We include the plant under *L. cristata* (see p. 112).

Peninsula.—About Penzance, Cornwall. Fingal Bridge; Exwick Wood, near Exeter, *R. J. Gray*, Devonshire. Selworthy and elsewhere, Somersetshire.

Channel.—Hampshire. Tinker's Hole, Apse Castle, and elsewhere in the Isle of Wight. Dorsetshire. Ardingly, *F. Evans;* Tilgate Forest, *J. Lloyd;* Tunbridge Wells, Sussex.

Thames.—Ball's Wood, Hertford; N. Mimms; Hatfield, &c., Herts. Chiselhurst; Canterbury, &c., Kent. Middlesex. Combe Wood; Wimbledon; Portnall Park, Virginia Water; Gomshall, &c., Surrey. Fulmer, Buckinghamshire. Epping; Danbury; Coggleshall; Pod's Wood, Tiptree, *E. Hall;* Kavanagh Wood, Brentwood, *S. F. Gray,* Essex.

Ouse.—Suffolk. Surlingham Broad, near Norwich; Scoulton Mere, *G. J. Chester;* Bawsey, near Lynn, *Dr. Allchin,* &c., Norfolk. Fulbourn, Cambridgeshire. Northamptonshire.

Severn.—North Wood, Arbury Hall; Binley; Rugby; Chesterton Wood; Rounsel-lane, *T. Kirk,* Warwickshire. Gloucestershire. The Horls, near Ross, Herefordshire. Worcestershire. Needwood; Wolverhampton, Staffordshire. Whitchurch, *R. W. Rawson*; Bomere Pool and Shomere Moss, near Shrewsbury, *Rev. W. A. Leighton;* Shirlet, near Broseley, *G. Maw,* Shropshire.

S. Wales.—Brecknockshire. Glamorganshire. Carmarthenshire.

N. Wales.—Carnarvonshire.

Trent.—Paplewick; Oxton Bogs; Wollaton, *E. J. Lowe,* Nottinghamshire. Netherscall, Leicestershire, *A. Bloxam, B.S.L.* Derbyshire.

Mersey.—Wybunbury Moss, near Nantwich, *R. W. Rawson;*

Delamere Forest, Cheshire. Chat Moss; Lowgill; Woolston Moss and Risley Moss, near Warrington; Levenshulme, *S. F. Gray*, Lancashire.

Humber.—Sheffield; Richmond; Ingleborough; Doncaster; Leckby Carr; Terrington Carr; York; Thirsk, Yorkshire.

Tyne.—Chivington Wood, Northumberland, *Rev. R. Taylor.*

Lakes.—Red-house, Cumberland. Westmoreland. Isle of Man.

W. Lowlands.—[Dumfries-shire, *P. Gray.*]

E. Lowlands.—[Edinburghshire.]

E. Highlands.—[Forfarshire.] Dunkeld, Perthshire, *A. Tait.*

W. Highlands.—[Argyleshire.] Tarbet, Dumbartonshire, *T.M.*

N. Highlands.—Dingwall, Ross-shire, *W. C. Trevelyan.*

W. Isles.—North Uist. Harris. Lewis.

Ulster.—Dastrey, Monaghan, *C. L. Darby.*

Connaught.—Connemara, Galway.

Leinster.—Wicklow, *D. Moore;* also (?) Newton, Mt. Kennedy, *R. Barrington.*

Munster.—Killarney, Kerry, *E. J. Lowe.*

Lastrea Thelypteris, *Presl.*

Peninsula.—Devonshire. Turf Moor, near Bridgewater, Somersetshire.

Channel.—Portsea; Winchester, Hampshire. West Medina; Wilderness; Freshwater Gate; Cridmore, &c., Isle of Wight. Tunbridge Wells; Albourne; Amberley; Waterdown Forest; Ore, near Hastings, Sussex.

THAMES.—North Cray ; Bexley ; Ham Ponds, near Sandwich, Kent. Leith Hill ; Hurtmore, near Godalming ; Wimbledon Common ; Pirbright Common, Surrey. Windsor Park and Sunninghill Wells, Berkshire. Epping ; Little Baddow, Essex.

OUSE.—Belton ; Bungay ; Hipton ; Bradwell Common, Suffolk. Horning ; St. Faith's ; Upton ; Filby ; Holt ; Edgefield, Felthorpe ; Wroxham ; Dereham ; Ormsby Broad ; Lound, near Yarmouth ; about Norwich, Norfolk. Wicken and Whittlesea Fens ; Teversham Moor ; Gamlingay ; Fulbourn, Cambridgeshire. Potten Marshes, Bedfordshire. Huntingdonshire.

SEVERN.—Bog near Allesley, Warwickshire. Herefordshire. Staffordshire. Whitchurch, *R. W. Rawson ;* Berrington Pool, *T. Westcombe,* Shropshire.

S. WALES.—Sketty Bogs ; Cwmbola, Glamorganshire. Tenby, Pembrokeshire, *Rev. W. A. Leighton.*

N. WALES.—Llwydiard Lake, Pentraeth ; Beaumaris, Anglesea. [Near Llanberis, Carnarvonshire.]

TRENT.—Oxton and Bulwell Bogs, Nottinghamshire. [Leicestershire.]

MERSEY.—Newchurch Bog ; Knutsford Moor ; Over ; Rostherne Moor ; Wybunbury Bog ; Harnicroft Wood, near Wernith, Cheshire.

HUMBER.—Pottery Carr ; Doncaster ; Askham Bog ; Terrington

Carr; Buttercrambe, near York; Heslington; Settle; Scarborough; Askam Fens, Yorkshire.

Tyne.—Learmouth Bogs, Northumberland.

Lakes.—Keswick; Ulleswater; Glencoin; Irton Woods, *J. Robson;* Blowike, Cumberland. Hammersham, Westmoreland.

E. Highlands.—Rescobie; Restenet, Forfarshire.

N. Isles.—[Shetland.]

Ulster.—Portmore Park by Lough Neagh, Antrim; Boggy wood at Portumna, Galway, *D. Moore.*

Connaught.—Near Lough Carra, Mayo, *J. Ball.*

Leinster.—[Marshes at Glencree, Wicklow.]

Munster.—Marsh near Mucruss, Killarney, Kerry, *Dr. Mackay.*

Ophioglossum lusitanicum, *Linnæus.*

Channel Isles.—Petit Bot Bay, Guernsey, *Mr. G. Wolsey.*

Ophioglossum vulgatum, *Linnæus.*

Peninsula.—Cornwall. Slateford; Barnstaple; near Exeter, *R. J. Gray,* Devonshire. Somersetshire.

Channel.—Strathfieldsaye; Stoke; Wanston, Hampshire. Bembridge Down; Blackgang Chine; West Cowes, &c., Isle of Wight. Box, Dorsetshire. Longleat, Wiltshire, Highlands, Framfield, &c., Sussex.

Thames.—Bury Woods, Hitchin; Elstree; Essenden, and other parts of Hertfordshire. Hackney Marshes; Sion-

lane, Isleworth ; Osterley Park, Brentford ; Acton, Middlesex. West Farleigh ; Greenhithe ; near Canterbury, &c., Kent. Compton ; Beddington ; Cobham ; Reigate ; Dorking, &c., Surrey. Banbury, Oxfordshire. Essex.

Ouse.—Suffolk. Upton Broad ; Ellingham Fen, &c., Norfolk. Wilburton ; Grantchester ; Whitwell ; Madingley, *Rev. W. A. Leighton*, Cambridgeshire. Bedfordshire. Huntingdonshire.

Severn.—Foleshill ; Wellesbourne, &c., Warwickshire. Gloucestershire. Howle Hill, Ross ; West Hope Hill (in a wood, *E. Newman*), Upton Bishop ; Whitbourne ; Berrington Park, &c., Herefordshire. Needwood, Staffordshire. West Felton ; Llandforda Park, near Oswestry, *Rev. T. Salwey ;* Bridgenorth, *Rev. W. A. Leighton*, Shropshire.

S. Wales.—Field near Roche Castle, Pembrokeshire, *S. O Gray.*

N. Wales.—Anglesea. Wrexham, Denbighshire.

Trent.—Near Braunston ; Thringston ; Humberstone, Leicestershire. Paplewick ; Colwick, Nottinghamshire. Heanor ; Breadsall, Derbyshire.

Mersey.—Alderley, Cheshire. Warrington ; Bidston Marsh ; Todmorden ; Manchester, &c., Lancashire.

Humber.—Richmond ; Settle ; Whitby ; Sheffield ; Huddersfield, &c., Yorkshire.

Tyne.—Middleton, Durham. Hexham ; Hawthorn Dene ; Haltwhistle, Northumberland.

Lakes.—Westmoreland. St. Bee's Meadows, plentiful, *J. Robson*, Cumberland.

W. Lowlands.—Kirkcudbrightshire. Lanarkshire.

E. Lowlands.—Coldstream, Berwickshire. Dalmeny and Arniston Woods, Edinburgh. Linlithgowshire.

E. Highlands.—Dunfermline, Fifeshire, *G. M'Nab, B.S.E.* Dunsinnane, Perthshire. Forfarshire. Burghead, Morayshire, *G. Wilson, B.S.E.*

W. Highlands—Argyleshire.

N. Isles.—Orkney; where, at Swanbister, Mr. Syme finds a small variety fructifying in autumn. Shetland.

Ulster.—Knockagh, Carrickfergus; Banks of the Logan, near Belfast, Antrim. Armagh, *J. R. Kinahan.*

Connaught.—Arran Isles, *J. Ball;* Ballinasloe, *Countess of Clancarty*, Galway.

Leinster.—Holly Park, Dublin, *S. Foot, B.S.E.;* Dunsinsk, Dublin.

Munster.—Clonmel, Cork, "found several years since by *Mr. R. Davis.*" Tipperary *R. Kinahan.*

Osmunda regalis, *Linnæus.*

Peninsula.—Common in the low boggy parts of Cornwall. Dawlish; between Budleigh and Exmouth; Watermouth, near Ilfracombe; Holme Chase, near Ashburton, Devonshire. Somersetshire.

Channel.—Frequent in the west of Hampshire. Isle of Wight.

Isle of Purbeck, Dorsetshire, *T. B. Salter, B.S.E.* Wiltshire. Tunbridge; Uckfield; Buxton Park; West Hoathly, Sussex.

Thames.—[Formerly on Hampstead Heath, Middlesex.] Thursley; Hindhead; Hambledon Heath; Cæsar's Camp, Farnham; Chobham; Bagshot; Frimley; Esher; Wimbledon; Merivale Wood, Leith Hill, *E. T. Bennett;* Dorking; Reigate, *H. M. Holmes, B.S.L.*, Surrey. Berkshire. Buckinghamshire. Kavanagh Wood, near Brentwood; Great Warley and Little Warley; Little Baddow; Epping, Essex.

Ouse.—Suffolk. Caistor, near Yarmouth, *D. Stock, B.S.L.;* Horning Ferry, *W. J. West, B.S.L.* [Gamlingay, Cambridgeshire.] Bedfordshire.

Severn.—Arbury; Birmingham, and elsewhere, Warwickshire. Cwm-bran, Monmouthshire, *T. H. Thomas.* Herefordshire, *E. Williams.* Kidderminster and elsewhere, Worcestershire. Staffordshire. Ellesmere Lakes; Whitchurch, *R. W. Rawson;* West Felton, Shropshire.

S. Wales.—Swansea, Glamorganshire, *G. Lawson.* Fishguard, Pembrokeshire, *E. Lees, B.S.L.* Carmarthenshire.

N. Wales.—Anglesea. Denbighshire. Barmouth; Falls of the Cynvael, near Festiniog, Merionethshire. Loughton Bog, Flintshire, *Dr. Bidwell, B.S.E.* Carnarvonshire.

Trent.—Leicestershire. Mansfield; Bullwell, Nottinghamshire.

Mersey.—Lindon Moss; near Mobberly, Cheshire. Speke,

near Liverpool; Chat Moss; Woolston Moss, and elsewhere, near Warrington; Poulton-le-Sand, Lancashire.

HUMBER.—Pottery Carr, near Doncaster; Leeds; Askham Bog; Whitby; York, and other parts of Yorkshire.

TYNE.—Durham. Chivington Woods, *Rev. R. Taylor*, Northumberland.

LAKES.—Windermere, *T. Rylands, B.S.L.;* Colwith, *H. Fordham, B.S.L.*, Westmoreland. Sea Scale, Gosforth, *J. Robson*, Cumberland. Isle of Man.

W. LOWLANDS.—Lochar Moss, Dumfries-shire, *W. G. Johnstone.* By the Manse, or White Loch, and below the Cliffs, Colvend, Kirkcudbrightshire, *P. Gray.* By the Clyde, Lanarkshire.

E. HIGHLANDS.—Stirlingshire. Fifeshire. Kincardineshire. Culross; by Loch Tay, *C. M'Intosh*, Perthshire. Arbroath, *G. Lawson;* Montrose; Kinnaird, &c., Forfarshire. Mill of Leys, *G. Dickie, B.S.E.*, and elsewhere, Aberdeenshire.

W. HIGHLANDS.—Glen Finnart; Dunoon; Loch Fine, N.E. of Inverary, Argyleshire. By Loch Lomond, Dumbartonshire. Isles of Arran, Bute, Mull, and Islay.

N. HIGHLANDS.—Inchnedamff, Sutherlandshire. Ross-shire.

N. ISLES.—Shetland.

W. ISLES.—N. Uist. Harris. Lewis.

CONNAUGHT.—Abundant in Connemara; Oughterard; Bog near Lough Coota, *J. R. Kinahan*, Galway. Achill Island. Castlebar; Mayo.

LEINSTER.—Kelly's Glen, co. Dublin.

Munster.—Bandon; Clonmel, frequent, *J. Sibbald*, Cork. Letterfrack, near Ballinaskellig's Bay; Mucruss Abbey, Killarney, Kerry. Glandine, and Carthy's Cove, near Ardmore, Waterford, *J. R. Kinahan*. Tipperary. Near Woodford, Clare, *J. R. Kinahan*.

Channel Isles.—Jersey.

Polypodium alpestre, *Sprengel.*

E. Highlands.—Killin; Ben Lawers, Perthshire. Glen Fiadh, Glen Prosen, Glen Dole, Canlochen, and other glens of the Clova Mountains, Forfarshire, abundant, *J. Backhouse*, and *G. Lawson*. Braemar; by the streams on Benawn, Ben-na-bourd, and Ben-macd'hui, and by the lake which forms the source of the Dee, Aberdeenshire, *A. Croall*. Abundant in the mountains of Aberdeen, Forfar, and Perth, at from 2,000 to 4,000 feet elevation, *G. Lawson*. Mountains near Dalwhinnie, E. Inverness-shire, 1841, *H. C. Watson*.

W. Highlands.—Great Corrie of Ben Aulder, W. Inverness-shire, 1841, *H. C. Watson*.

N. Highlands.—Ben Hope, Sutherlandshire.

Polypodium Dryopteris, *Linnæus.*

Peninsula.—Near Ilfracombe, Devon, *Rev. J. M. Chanter*. Challacombe, *H. F. Dempster*. Mendip Hills; near Bristol; near Bath, Somersetshire.

Channel.—[Petersfield, Hampshire, *Dr. Bromfield.*] Tilgate Forest, Sussex, *Rev. T. Rooper.*

Thames.—Cornbury Quarry, Oxfordshire. [Chingford Church, Essex.]

Severn.—Berkswell, Warwickshire. New Weir, Forest of Dean, Frocester Hill; Lea Bailey; Atterbury Hill, above Lydbrook, *E. T. Bennett*, Gloucestershire. Tintern Abbey, Monmouthshire. Penyard Park, near Ross; near Downton Castle, by the Teme; Aymestrey Quarry; Shobden-hill Woods, Herefordshire. Malvern Hills; Shrawley Wood, Worcestershire. Trentham Park; near Colton Hall and Oakamoor; Needwood, Staffordshire. Titterstone Clee Hill; Whitcliffe, near Ludlow; Froddesley Hill, Shropshire.

S. Wales.—Craig-Pwll-du, Radnorshire. Brecon; Trecastle; Pont Henryd, near Capel Colboen; Ystrad Felltree, Brecknockshire. Pont-nedd-Vechn; Scwd-y-Gladis; Merthyr-Tydvil, Glamorganshire. Ponterwyd; Devil's Bridge; Hafod, *J. Riley*, *B.S.E.*, &c., Cardiganshire.

N. Wales.—Anglesea. Llangollen; Ruthin, Denbighshire. Craig-Breidden; Plinlymmon, Montgomeryshire. Dolgelly, *A. Irvine*, Merionethshire. Near St. Asaph, Flintshire. Cwm-Idwal; Llanberis; Bangor; Rhaiadr-y-Wenol, Twll-du, Carnarvonshire.

Trent.—Chinley Hill, near Chapel-le-Frith; Pleasley Forges, Derbyshire. Lincolnshire.

Mersey.—Hill Cliff, Cheshire. Manchester; Warrington; Broadbank, near Colne; Dean-Church Clough; Mere Clough; Cotteril Clough; Chaigeley Manor, *E. J. Lowe;* Lancaster; Ashworth Wood, &c., Lancashire.

Humber.—Burley; Brimham Rocks; Thirsk; Ingleborough; Reivaulx Wood; Teesdale; Halifax; Whitby; Richmond; Settle, *J. Tatham, B.S.L.;* Brierley; Castle Howard Park, and many other parts of Yorkshire.

Tyne.—Walbottle Dene; foot of the Cheviots, near Langley Ford, Durham. Morpeth; Hexham; Shewing Shields; Scotswood Dene; banks of the Blythe, the Wansbeck, and Irthing, *Rev. R. Taylor*, Northumberland.

Lakes.—Lodore, near Keswick; Borrowdale; Calder Bridge; Wasdale; Scale Force; Dalegarth; Gillsland, Cumberland. Stockgill Force, Ambleside; Hutton Roof; Casterton, &c., Westmoreland. Conistone, N. Lancashire.

W. Lowlands.—Drumlanrig; Rae Hills; Maiden Bower Craigs, Dumfries-shire. Cluden Craigs; Hills above Dalscairth, Kirkcudbrightshire, *P. Gray.* Falls of the Clyde; Calderwood, *T. B. Bell, B.S.E.*, Lanarkshire. Gourock, Renfrewshire.

E. Lowlands.—Wanchope, Roxburghshire, *W. Scott, B.S.E.* Banks of the Whiteadder; Longformacus, Berwickshire. Rosslyn and Auchindenny Woods, and elsewhere about Edinburgh.

E. Highlands.—Clackmannanshire. Kinross-shire. Carden

Den, Fifeshire, *R. Maughan, B.S.E.* Culross; Ben Lawers; Killin; Dalnacardoch; Killicrankie, *H. B. M. Harris, B.S.E.;* Dunkeld, *A. Tait;* Pass of Trosachs, *T.M.;* Ben Voirlich, Perthshire. Sidlaw Hills; Clova Mountains; Clack of the Ballock, *L. Carnegie, B.S.E.* Forfarshire. Inglis Maldie, Kincardineshire, *A. Croall, B.S.E.* Castleton, Braemar, Aberdeenshire. Cawdor Woods, Nairnshire, *J. M'Nab, B.S.E.* Dalwhinnie, E. Inverness-shire.

W. Highlands.—Freuch Corrie, Strath Affarie; Glen Roy; Ben Aulder, W. Inverness-shire. By Loch Lomond, Dumbartonshire. Glen Gilp, Ardrishiag; between Lochs Awe and Etive; Dunoon, Argyleshire. Brodick, Isle of Arran. Tobermory, Isle of Mull, *W. Christy, B.S.E.*

N. Highlands.—Ross-shire. Ferry-house E. of Loch Erboll, Sutherlandshire.

Ulster.—Knockleyd, Antrim, very rare. Mourne Mountains, Down.

Connaught.—Ma'am Turc, Galway.

Munster.—Mucruss, Killarney, Kerry.

Polypodium Phegopteris, *Linnæus.*

Peninsula.—Near Tintagel, Cornwall. Exmoor, near Challacome, *R. J. Gray;* Cock's Tor, *Rev. W. S. Hore;* White Tor, Great Mist Tor, and Sheep's Tor, *R. J. Gray;* Dartmoor, *R. J. Gray;* [Ilfracombe;] Becky Falls, &c., Devonshire.

Channel.—Kidbrood Park, Forest Row; Balcome, *J. Lloyd;* Tilgate Forest, *S. O. Gray*, Sussex.

Thames.—[Near Brentford, Middlesex.] [Norwood, Surrey.]

Severn.—Forest of Dean; near Lydbrook, Gloucestershire. Shobden Hill Woods; Aymestrey Quarry, Herefordshire. Ridge Hill; Madeley, &c., Staffordshire. Titterstone Clee Hill; Craigforda, near Oswestry, *Rev. T. Salwey;* near Ludlow, Shropshire.

S. Wales.—Craig-Pwll-du; Rhayader, Radnorshire. Pont Henryd near Capel Colboen; Brecon Beacon, &c., Brecknockshire. Pont-nedd-Vechn; Scwd-y-Gladis; Cilhepste, Glamorganshire. Glynhir, near Llandebie, Carmarthenshire. Hafod, &c., Cardiganshire.

N. Wales.—Garthbeibio; Plinlymmon, Montgomeryshire. Falls of the Cynvael near Festiniog; Barmouth, &c., Merionethshire. Llanrwst; Ruthin, Denbighshire. Cwm-Idwal; Dolbadern; Llanberis; Aberglaslyn; Bangor, &c., Carnarvonshire.

Trent.—Buxton, Derbyshire.

Mersey.—Mow Cop; Wood near Staleybridge; Werneth, &c., Cheshire. Dean-Church Clough, near Bolton; near Todmorden; Philips Wood, near Prestwich; Blackhay, Clitheroe; Chaigeley Manor, *E. J. Lowe;* Longridge Fell; Mere Clough; woods near Manchester, &c., Lancashire.

Humber.—Halifax; Beckdale Helmsley; Buttercrambe Moor

near York; Settle; Sheffield; Ingleborough; and many other parts of Yorkshire.

Tyne.—By the Tees above Middleton; Rocks above Langley Ford; Cawsey Dene, &c., Durham. Moors near Wallington; Shewing Shields; Cheviot Hills; Hexham; Banks of the Irthing, *Rev. R. Taylor*, Northumberland.

Lakes.—Wardale; Borrowdale; Ennerdale; Scaw-Fell; Keswick; Tindal Fell; Laggat, on Cold Fell, *J. Robson*, &c., Cumberland. Stockgill Force; Ambleside; Grasmere; Casterton Fell; Hutton Roof, &c., Westmoreland. Conistone, N. Lancashire. Isle of Man.

W. Lowlands.—Drumlanrig; Rae Hills; Jardine Hall, Dumfries, Dumfries-shire. Dalscairth; Mabie, Kirkcudbrightshire, *P. Gray*. Gourock, Renfrewshire. Falls of the Clyde, near Corra Linn; Calderwood; Crutherland; Campsie, near Glasgow, &c., Lanarkshire.

E. Lowlands.—Berwickshire. Jedburgh; Ruberslaw, Roxburghshire. Pentland Hills; Arniston; Rosslyn, and Auchindenny Woods, near Edinburgh.

E. Highlands.—Ben Lomond, Stirlingshire, *J. S. Henslow*. Castle Campbell, near Dollar, Clackmannanshire, *J. T. Syme, B.S.E.* Dunfermline; Inverkeithing; Carden Den, Fifeshire. Kincardineshire. Glen Queich in the Ochils; Bridge of Bracklin, near Callender; Dunkeld, *A. Tait;* Ben Voirlich; Ben Lawers; Craig Chailliach; Killin; Tyndrum; Dalnacardoch, &c., Perthshire. Canlochen,

Clova, Forfarshire. Castleton, Braemar, Aberdeenshire. Dalwhinnie, E. Inverness-shire.

W. Highlands.—Aberarder; Ben Nevis; Red Caird Hill, &c., W. Inverness-shire. Glen Gilp, Ardrishiag; Dunoon; Crinnan; Inverary; Pass of Glencroe, &c., Argyleshire. Tarbet; Arroquhar, &c., Dumbartonshire. Isles of Mull, Islay, and Cantyre.

N. Highlands.—Kessock, Ross-shire. Ferry-house E. of Loch Erbol, Sutherland. Morven, Caithness, rare, *T. Anderson.*

N. Isles.—Hoy, Orkney, *T. Anderson.* North Marm, Shetland.

Ulster.—By the Glenarve, near Cushendall, and other parts of Antrim. Waterfall above Lough Eske, Donegal. Slieve Bignian; near Slieve Croob; Black Mountain, above Tollymore Park, Down. Glen Ness, Londonderry.

Connaught.—Garoom Mountain, Letterfrach, Connemara, Galway, *E. T. Bennett.*

Leinster.—Carlingford Mountain, Louth. Powerscourt Waterfall, Wicklow.

Munster.—Between Killarney and Kenmare; Mucruss, Kerry.

Polypodium Robertianum, *Hoffmann.*

Peninsula.—Bath; Cheddar Cliffs; Mendip Hills; Friary Wood; Hinton Abbey, Somersetshire.

Channel.—Box Quarries; Corsham, *Dr. Alexander, B.S.E.*, Wiltshire.

Thames.—Oxfordshire.

Severn.—Besborough Common, *W. H. Purchas;* Rocks by the Wye, near Symond's Yat, and Colwall, near Whitchurch; Lydbrook in the Forest of Dean; Cleeve Clouds; Windlass Hill, near Cheltenham; Postlip Hill, on the Cotswolds; Cirencester, *J. Buckman;* English Bicknor, *A. T. Willmot;* Leigh Wood, near Bristol, Gloucestershire. Herefordshire (planted). Worcestershire. Staffordshire.

N. Wales.—Llanferris, Denbighshire. [Cwm-Idwal, Carnarvonshire.]

S. Wales.—Merthyr-Tydvil, Glamorganshire. Near Llanelly, Brecknockshire, *T. H. Thomas.*

Trent.—Matlock; Wirksworth; Buxton; Bakewell, *T. Butler;* Dovedale, Derbyshire.

Mersey.—Lancaster; Sheddin Clough, near Burnley; Broadbank, Lancashire.

Humber.—Ingleborough; near Settle; Anster Rocks; Arncliff; Gordale; Ravenscar, Waldenhead, *J. Ward, B.S.E.;* near Sheffield, Yorkshire.

Tyne.—Falcon Clints, Durham, *T. Simpson.*

Lakes.—Newbiggin Wood; Gelt Quarries; Baron Heath; Scale Force, *J. Robson,* Cumberland. Arnside Knot; Hutton Roof; Farlton Knot; Caskill Kirk, Westmoreland.

Polypodium vulgare, *Linnæus.*

This is one of our most common Ferns, dispersed throughout the United Kingdom and Ireland, and found in Guernsey,

Jersey, and in the Western Isles, N. Uist, Harris, and Lewis. The varieties only—and of these only the most remarkable—are enumerated below; *semilacerum* is the Irish form, and *omnilacerum* the Goodrich Castle plant, both which appear distinct from the true *cambricum*.

The var. *cambricum*.—Found in various parts of N. Wales. Macclesfield, Cheshire, *E. J. Lowe*. Reported from Braid Hill, near Edinburgh. The var. *omnilacerum*, closely allied to this, is from Goodrich Castle, Ross, Herefordshire, *E. T. Bennett*.

The var. *semilacerum*.—Torquay, and Berry Pomeroy Castle, Devonshire. Cheddar Cliffs, Somersetshire. Bonchurch, Isle of Wight. Saltwood Castle, Kent, *S. F. Gray*. Postwich, Norfolk, *Hb. Hooker*. Tintern Abbey, and Chepstow Castle, Monmouthshire, *R. Heward*. Aberglaslyn, Carnarvonshire, *Dr. Allchin*. Arran Isles. Lough Coota, Galway, *J. R. Kinahan*. Wood near the Dargle, Wicklow. Ballinahinch, near Feacle, Clare, *J. R. Kinahan*. Blackwater, Waterford, *J. R. Kinahan*. Killarney, Kerry. ? Guernsey.

The var. *serratum*.—Cheddar, Somersetshire. Hastings, and Balcombe, Sussex. Sidcup, Kent. Surrey. Warwickshire. Gloucestershire. Chepstow, Monmouthshire. Whitchurch and Mordiford, Herefordshire. Malvern, Worcestershire. S. Wales. Ruthin, Denbighshire. Kirkcudbrightshire. Galway. Ballynahinch, Clare. Blackwater, Waterford. An allied form—*crenatum*—is found at Conway, *Dr. Allchin*; Saltwood Castle, *S. F. Gray*.

Polystichum aculeatum, *Roth.*

The records of the distribution of *P. aculeatum* and *P. angulare* are incomplete.

PENINSULA.—Cornwall. Lynmouth; between Totness and Ashburton, &c. (with *lobatum*), Devonshire. Portishead, &c. (with *lobatum*); Dundry Hill, near Bristol, *G. H. K. Thwaites*, Somersetshire.

CHANNEL.—Selbourne, *Miss Bower* (with *lobatum*, *T. B. Salter*); Alresford, &c., Hampshire. Isle of Wight (with *lobatum*), Dorsetshire. Box Quarries, Wiltshire (with *lobatum*, as *lonchitidoides*). Henfield; Cuckfield (with *lobatum*), *J. Lloyd;* Groombridge (*lobatum*), Sussex.

THAMES.—St. Alban's; Totteridge; Hitchin; Essendon; Cheshunt, &c., Hertfordshire. Norwood (with *lobatum*), *S. F. Gray*, Middlesex. Kent (with *lobatum*). Mayford and Dorking (*lobatum*), and elsewhere (with *lobatum*), Surrey. Chalfont (*lobatum*); Fulmer, Buckinghamshire. Berkshire (with *lobatum*). Oxfordshire (with *lobatum*). Near Ongar. Brentwood; Chingford, and Black Notley (*lobatum*), Essex.

OUSE.—Wingfield (*lobatum*); Spexhall (*lobatum*); Sudbury (with *lobatum*), &c., Suffolk. Yarmouth (*lobatum*); Edgefield, near Holt, Norfolk. Gamlingay, Cambridgeshire. Bedfordshire. Northamptonshire (*lobatum*).

SEVERN.—Stoneleigh; Allesley; Rugby, *Rev. A. Bloxam;* Hollyberry End and Wyken-lane (all with *lobatum*); Al-

cester (with tasselled fronds), *Hb. Hooker;* and elsewhere, Warwickshire. Mamhilad, Monmouthshire, *T. H. Thomas.* Herefordshire (*lobatum* as *lonchitidoides*). Near Bristol, Gloucestershire (with *lobatum*). Knightwick, Worcestershire, *E. Lees, B.S.L.* Staffordshire (*lobatum* as *lonchitidoides*). Bridgenorth (*lonchitidoides*); Mannington, near Cherbury (*lobatum* as *lonchitidoides*); Blodwell Rocks (*lonchitidoides*), *Rev. W.A. Leighton*, Shropshire.

S. Wales.—Tenby, Pembrokeshire, *E. Lees, B.S.L.* Carmarthenshire. Glamorganshire (*lobatum*). Talgarth (with *lobatum*), *E. Williams;* Llandrindod Wells (var. *lonchitidoides*), *Rev. T. Salwey;* common in Breconshire, *J. R. Cobb.*

N. Wales.—Anglesea (with *lobatum*). Wrexham; Ruthin (*lobatum*); Llanymyneck, Denbighshire (*lobatum*). Llyn-y-cwm, Carnarvonshire.

Trent.—Leicestershire (with *lobatum*). Beeston; Mansfield; Paplewick (with *lobatum*), Nottinghamshire. Matlock, Derbyshire (with *lobatum*). Lincolnshire (*lobatum*).

Mersey.—Chaigeley, near Clitheroe (with *lobatum*), *E. J. Lowe;* Walton (*lobatum*); Manchester (*lobatum*); Gateacre, near Liverpool; Hail Wood (with *lobatum*), &c., Lancashire. Preston, Cheshire (with *lobatum*).

Humber.—Halifax; Castle Howard Woods; Settle; Richmond; Studley; Roche Abbey, *J. F. Young, B.S.L.;* Fountain's Abbey (*lobatum*), *Mrs. Rutter;* Ripon; Doncaster; Shef-

field (*lobatum*), *J. Hardy;* York ; Ingleborough (in most instances with *lobatum*), Yorkshire.

Tyne.—Hexham and Scotswood Denes, Northumberland (*lobatum*). Cawsey Dene, &c. (with *lobatum*), Durham, *R. Bowman*, *B.S.L.*

Lakes.—Irton Wood, *J. Robson;* Airey Force, *H. Fordham*, *B.S.L.*, &c. (with *lobatum*), Cumberland. Ambleside, Westmoreland.

W. Lowlands.—Drumlanrig ; Nithsdale, snd other parts of Dumfries-shire (with *lobatum*), *P. Gray*. Kirkcudbrightshire (with *lobatum*), *P. Gray*. Renfrewshire. Lanarkshire (with *lobatum*).

E. Lowlands.—Edinburghshire (with *lobatum*). Pease Bridge, &c., Berwickshire (with *lobatum*).

E. Highlands.—Glen Fiadh, Clova Mountains, and other parts of Forfarshire (*lobatum*). St. David's, Fifeshire. Dunkeld (*lobatum*), *A. Tait;* Glenfarg, near Perth, Perthshire. Kincardineshire (*lobatum*). Aberdeenshire (*lobatum*). Cawdor Woods (*lobatum*), Nairn. Morayshire (*lobatum*).

W. Highlands.—Glen Gilp (with *lobatum*), Ardrishiag, Argyleshire, *T.M.* Isles of Islay (with *lobatum*), Cantyre (with *lobatum*), and Bute.

N. Highlands,—Ross-shire (*lobatum*).

Ulster.—Colin Glen (with *lobatum*) ; Malone (with *lobatum* as *lonchitidoides*), Belfast, Antrim.

Connaught.—Connemara ; Gort, Galway, *J. R. Kinahan.*

Leinster.—Newtown Mount Kennedy, Wicklow (*lobatum*), *R. Barrington*. Bohernabreena, Dublin, *J. R. Kinahan*.
Munster.—Foot of "Mononita," Clare (*lonchitidoides*).
Channel Isles.—Jersey.

Polystichum angulare, *Presl.*

Peninsula.—Penzance, Cornwall (var. *tripinnatum*), *E. J. Lowe*. Lynmouth; Ilfracombe, *Rev. J. M. Chanter;* Ottery St. Mary (var. *proliferum*), *G. B. Wollaston*; between Totness and Ashburton, Devonshire. Leigh Woods, near Bristol; near Bath; Nettlecombe (vars. *irregulare* and *imbricatum*), *C. Elworthy;* Selworthy (with var. *alatum*), *Mrs. A. Thompson*, Somersetshire.
Channel.—Stubbington; Uplands; Cattisfield, and elsewhere, Hampshire. Isle of Wight. Dorsetshire. Wiltshire. Cuckfield; Patching; Findon, &c., Sussex.
Thames.—Panshanger; Hatfield Woodside; Colney; Watford; Totteridge, Hertfordshire. Brentford (var. *biserratum*), *S. F. Gray*, Middlesex. Sturry; St. Mary Cray (var. *intermedium*), *G. B. Wollaston;* and elsewhere (including var. *dissimile*, *Mrs. Delves*), Kent. Mayford; St. Martha's, near Guildford, Surrey (with vars. *subtripinnatum* and *hastulatum*). Epping, *J. Ray*, *B.S.L.;* Springfield, Essex.
Ouse.—Norwich, *Hb. Hooker*, Norfolk. Huntingdonshire.
Severn.—Bristol; Forest of Dean, *E. Lees*, *B.S.L.*, Gloucestershire, *G. H. K. Thwaites*, *B.S.L.* Stoneleigh; Berkeswell;

Rugby; Hearsall, &c., Warwickshire. Ross, Herefordshire. Eartham; Malvern; Suckley, Worcestershire, *E. Lees*, *B.S.L.* Staffordshire. Blodwell Rocks; Wenlock, Shropshire.

S. Wales.—Tenby, Pembrokeshire, *E. Lees*, *B.S.L.* Gower, Glamorganshire, *C. Conway*, *B.S.L.* Talgarth, Brecknockshire, *E. Williams*. Cardiganshire. Radnorshire, common, *J. R. Cobb*.

N. Wales.—Beaumaris; Cickle, Anglesea, *Rev. W. A. Leighton*. Conway; Bangor, Carnarvonshire. Ruthin, Denbighshire, *T. Prichard*.

Trent.—Matlock, Derbyshire. Leicestershire.

Mersey.—Clitheroe, *E. J. Lowe;* Manchester (var. *subtripinnatum*, with very dark scales on stipes and lower part of rachis), *J. B. Wood;* Prescott; Hail Wood, Lancashire. Cheshire.

Humber.—Ingleborough, *W. J. Hooker;* Edlington Crags, near Adwick; Roche Abbey, *J. F. Young*, *B.S.L.;* Halifax, *R. Leyland*, *B.S.L.;* Richmond; Heckfell Woods; Elland, and other parts of Yorkshire.

Lakes.—Loughrigg Fell; Ambleside, Westmoreland. Isle of Man.

E. Lowlands.—Peasebridge, Berwickshire.

W. Highlands.—Ederline, Loch Gilphead, Argyleshire, *Mrs. A. Smith*.

Ulster.—Blackstaff Lane; Colin Glen, Belfast, Antrim.

Connaught.—Arran Isles. Connemara; Blackwater, near Gort, *J. R. Kinahan*, Galway.

Leinster.—Tinnahinch, Wicklow, *C. C. Babington*, *B.S.E.* Ballinteer, Dublin, *J. R. Kinahan*. Kilkenny, *J. R. Kinahan*.

Munster.—Clonmel, Cork, *J. Sibbald*. Waterford. Tipperary. Clare, *J. R. Kinahan*.

Channel Isles.—Jersey (with var. *biserratum*), *Dr. Allchin: C. Jackson*. Guernsey (several varieties), *C. Jackson*.

Polystichum Lonchitis, *Roth.*

Ouse.—[Cambridgeshire.] [Northamptonshire.]

S. Wales.—Glamorganshire.

N. Wales.—Clogwyn-y-Garnedd; Cwm-Idwal; Twll-du; Glyder-Vawr; above Llanberis, Carnarvonshire.

Humber.—Langcliffe, near Settle; Attermine Scar; Giggleswick; Ingleborough, Yorkshire.

Tyne.—Falcon Clints, Teesdale; Mazebeck Scar, Durham.

Lakes.—Fairfield, Helvellyn, Cumberland, *Rev. W. H. Hawker: Miss Wright*.

W. Lowlands.—[Lanarkshire.]

E. Highlands.—Ben Lomond, Stirlingshire, *F. Bossey*, *B.S.L.* Ben Lawers; Craig Challiach; Glen Lyon, *G. Lawson;* Ben Chonzie, near Crieff, *Dr. Balfour*, *B.S.E.*; Ben Voirlich, Perthshire. Canlochen, Glen Isla, Glen Fiadh, Glen

Dole, &c., in the Clova Mountains, Forfarshire. Aberdeenshire. Morayshire.

W. Highlands.—Mountains near Loch Erricht, Inverness-shire. Ben More, Isle of Mull.

N. Highlands.—Raven Rock, near Castle Leod, Ross-shire. Ben Hope, *B.S.E.;* Assynt, Sutherlandshire.

N. Isles.—Hoy-hill, Orkney (1,600 feet), very rare, *T. Anderson.*

Ulster.—Glen E. of Lough Eske; Rosses and Thanet Mountain passes, Donegal.

Connaught.—Glenade Mountains, Leitrim. Ben Bulben, Sligo.

Leinster.—Navan, Meath, *R. Kyle.*

Munster.—Brandon Hill, Kerry.

Pteris aquilina, *Linnæus.*

The most common of our Ferns, disposed over the whole of England, Wales, Scotland, and Ireland; ascending to an elevation of nearly 2,000 feet. It is also found in Shetland, in the Orkneys, in the Hebridean Islands of N. Uist, Harris, and Lewis, and in the Channel Isles.

A multifid variety is found near Chiselhurst, *G. B. Wollaston;* in Devonshire, *Rev. J. M. Chanter;* and in Guernsey, *C. Jackson.*

Scolopendrium vulgare, *Symons.*

Peninsula.—Cornwall. Bideford (lobate form), Devonshire. St. Decuman's (var. *fissum*), *Sir W. C. Trevelyan;* Nettle-

combe (vars. *marginatum*, *multifidum*, and *crispum*), *C. Elworthy*. Selworthy (var. *marginatum*), *Mrs. A. Thompson*; Frenchay, near Bristol (with var. *multifidum*), *T. H. Thomas*, &c., Somersetshire.

Channel.—Fareham (vars. *undulatum* and *polyschides*), Hampshire. Isle of Wight. Littlehampton (vars. *variegatum*, *truncatum*, *marginatum*, &c.), *G. B. Wollaston*, Sussex. Glanville's Wootton (vars. *crenato-lobatum* and *crista-gal.*), *G. B. Wollaston*, Dorsetshire. Wiltshire.

Thames.—Hertfordshire. Middlesex. Kent. Surrey. Berkshire. Buckinghamshire. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Huntingdonshire. Northamptonshire.

Severn.—Warwickshire. Stroud (reported as var. *marginatum*), *W. M. Cooper*, Gloucestershire. Trevddun (with *lobatum*); Twyn-gwyn (with *lobatum*), *T. H. Thomas*, Monmouthshire. Herefordshire. Worcestershire. Staffordshire. Shropshire.

S. Wales.—Brecon (var. *bimarginatum*), *J. R. Cobb*. Brecknockshire. Pembrokeshire. Glamorganshire. Carmarthenshire.

N. Wales.—Carreg Onan, and Mill Dingle, Beaumaris (lobate form), Anglesea. Ruthin (var. *crispum*), *T. Prichard*. Denbigh (var. *fissum*), *J. W. Griffith*, Denbighshire. Carnarvon Castle (lobate form), Carnarvonshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire (with var. *undulatum*); also Edlington, near Adwick (var. *polyschides*), *J. Hardy;* magnesian limestone rocks, Doncaster (var. *crispum*), *J. Hardy;* Coninbrough Cliffs (fronds ramose and multifid), *J. Hardy;* near Settle (many forms, including vars. *crispum*, *supralineatum*, and *ramosum majus*), *A. Clapham.*

Tyne.—Northumberland. Durham; also Sunderland (var. *multifidum*), *J. Fairbridge.*

Lakes.—Cumberland; also a forked var. at Whitehaven. Westmoreland. Isle of Man.

W. Lowlands.—Drumlanrig, *G. P. London;* banks of the Glen Water (with forked varieties), *Dr. Lindsay*, Dumfries-shire. Kirkcudbrightshire. Wigtonshire. Ayrshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Edinburghshire. Berwickshire.

E. Highlands.—Fifeshire. Forfarshire. Kincardineshire. Aberdeenshire. Nairnshire. Morayshire.

W. Highlands.—Poltalloch, *G. P. London*, Argyleshire. Isles of Islay, Cantyre, and Skye.

N. Highlands.—Sutherlandshire.

N. Isles.—Isle of Ronsay, Orkney, rare, *R. Heddell.* Shetland.

Ulster.—Colin Glen, Belfast, Antrim (with vars. *undulatum* and *multifidum*), *A. Crawford.*

Connaught.—Arran Isles. Connemara; Gort, Galway. Sligo.

Leinster.—Dublin. Townley Hall, Louth, *C. L. Darby.*

Wicklow. King's. Kilmoganny, Kilkenny (var. *multifidum*), *J. R. Kinahan.*

Munster. — Cork. Mucruss, Killarney, Kerry. Waterford (var. *multifidum*), *J. R. Kinahan.* Tipperary (var. *multifidum*), *J. R. Kinahan.* Clare (var. *multifidum*,), *J. R. Kinahan.* Limerick.

Channel Isles.—Jersey. Guernsey (many varieties, *C. Jackson*).

Trichomanes radicans, *Swartz.*

Humber.—[Supposed to have been formerly found at Belbank, near Bingley, Yorkshire.]

Leinster.—Hermitage Glen ; Powerscourt Waterfall, Wicklow.

Munster.—Glendine Wood, and Glenbour, Killeagh, both near Youghal ; Temple Michael Glen, and Ballinhasy Glen, near Cork. Bandon ; Fall of the Clashgariffe ; near Glandore ; near Bantry ; Carrigeena, Kildorrery (elev. 1,000—1,200 feet), *J. Carrol*, Cork. Turk Waterfall, Killarney ; ravine of Cromaglaun Mountain ; Mount Eagle, near Dingle ; Gortagaree ; Blackstones, Glouin Caragh ; Inveragh ; Curaan Lake, Waterville, *C. C. Babington*, *B.S.E.*, Kerry.

Woodsia alpina, *Gray.*

N. Wales.—Clogwyn-y-Garnedd, Snowdon ; Moel Sichog, Pass of Llanberis, *L. Clark*, Carnarvonshire.

E. Highlands.—Ben Chonzie, near Crieff, *Dr. Balfour ;* Ben

Lawers; Mael-dun-Crosk; Catjaghiamman; Craig Challiach, Perthshire. Glen Isla, *Dr. Balfour;* Glen Fiadh, Clova Mountains, *Dr. Balfour*, Forfarshire.

Woodsia ilvensis, *R. Brown.*

N. Wales.—Clogwyn-y-Garnedd; Llyn-y-cwm, on Glyder-Vawr; Pass of Llanberis, *L. Clark*, Carnarvonshire.

Humber.—[Yorkshire.]

Tyne.—Falcon Clints, and Cauldron Snout, Teesdale, Durham.

Lakes.—Westmoreland, "in three distant stations," *F. Clowes.* Cumberland, *F. Clowes.*

W. Lowlands.—Ravine, near Loch Skene; Devil's Beef-tub, and hills north of Moffat, Dumfries-shire, *P. Gray.* Hills dividing Dumfries and Peebles-shire, abundant, *W. Stevens.*

E. Highlands.—Ben Chonzie, near Crieff, *Dr. Balfour;* Ben Lawers, *J. Backhouse*, Perthshire. Glen Fiadh, Clova Mountains, Forfarshire, *J. Backhouse.* Forres, Morayshire, *Hb. S. F. Gray.*

THE FERN ALLIES.

Equisetum arvense, *Linnæus.*

Peninsula.—Cornwall. Devonshire. Somersetshire.

Channel.—Hampshire. Isle of Wight. Dorsetshire. Wiltshire. Sussex.

Thames.—Hertfordshire. Middlesex. Kent. Surrey. Oxfordshire. Berkshire. Essex.

Ouse. — Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Huntingdonshire. Northamptonshire.

Severn. — Warwickshire. Gloucestershire. Herefordshire. Worcestershire. Staffordshire. Shropshire.

S. Wales.—Glamorganshire. Pembrokeshire. Carmarthenshire.

N. Wales.—Anglesea. Denbighshire. Flintshire.

Trent.—Leicestershire. Rutland. Lincolnshire. Nottinghamshire. Derbyshire.

Mersey.—Lancashire. Cheshire.

Humber.—Yorkshire.

Tyne.—Durham. Northumberland. Isle of Man.

Lakes.—Gosforth, Cumberland, *J. Robson.*

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Lanarkshire.

E. Lowlands.—Berwickshire. Haddingtonshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Kinrossshire. Fifeshire. Perthshire. Forfarshire. Kincardineshire. Aberdeenshire. Morayshire.

W. Highlands.—Argyleshire. Dumbartonshire. Isles of Islay and Cantyre.

N. Highlands.—Ross-shire. Sutherlandshire. Caithness.

N. Isles.—Orkney, *T. Anderson.* Shetland.

W. Isles.—Roddal, Harris.

CONNAUGHT.—Connemara, Galway, *J. R. Kinahan.*

LEINSTER.—Dublin. King's. Wicklow. Kilkenny.

MUNSTER.—Waterford. Tipperary. Clare. Limerick. Cork, *J. R. Kinahan.*

CHANNEL ISLES.—Jersey.

Equisetum hyemale, *Linnæus.*

PENINSULA.—[Somersetshire.]

CHANNEL.—[Near Broadstich Abbey, Wiltshire.]

THAMES.—[Middlesex.] South Kent, *Rev. G. E. Smith,* Wanborough, near Guildford, Surrey, *J. D. Salmon.*

OUSE.—St. Faith's Newton; Arminghall Wood, near Norwich, Norfolk. Stretham Ferry, Gamlingay, Cambridgeshire. Potton Marshes; Ampthill Bogs, Bedfordshire.

SEVERN.—Near Middleton, Warwickshire. Pencoyed, Herefordshire. Mosely Bog, Worcestershire. Staffordshire. Dell at Bitterley, below the Clee Hills, Shropshire.

S. WALES.—Swansea, Glamorganshire, *J. W. G. Gutch, B.S.L.*

N. WALES.—Wrexham, Denbighshire. Flintshire.

TRENT.—Grace-Dieu Wood, Charnwood Forest; Measham, Leicestershire. Nettleworth Green, near Mansfield; Kirklington, Nottinghamshire.

MERSEY.—Near Arden Hall; Lally's Wood, near Over; Thurstaston, Cheshire. Mere Clough, near Manchester, Lancashire.

HUMBER.—Halifax; by the Derwent, near Castle Howard;

Goadland Dale, near Whitby; Hackness, near Scarborough; by the Skell, near Ripon; Conesthorpe; Bolton Woods, Wharfdale; Rigby Wood, near Pontefract, and many other parts of Yorkshire.

Tyne.—Hawthorn Dene; Castle Eden Dene, Durham. Scotswood Dene; Mill Green; Heaton Wood; Felton; Warkworth, Northumberland.

Lakes.—Sowgelt Bridge, Cumberland. Westmoreland.

W. Lowlands.—Barnbarrock, Colvend, Kirkcudbrightshire. Ayrshire. Corra Linn; Calderwood, Lanarkshire.

E. Lowlands.—Rosslyn; Lasswade; Dalkeith, and elsewhere about Edinburgh. Lamberton Moor, Berwickshire.

E. Highlands.—Kenmore, Perthshire. Den of Airlie, Forfarshire. Park; banks of the Dee, Kincardineshire. Aberdeenshire. Pittendriech; Forres, Morayshire.

N. Highlands.—Ross-shire.

Ulster.—Antrim. Tyrone.

Leinster.—Powerscourt, &c., Wicklow. Wood at Leislip Castle, and elsewhere about Dublin.

Equisetum limosum, *Linnæus.*

Peninsula.—Cornwall. Devonshire. Somersetshire.

Channel.—Hampshire. Isle of Wight. Dorsetshire. Wiltshire. Sussex.

THAMES.—Middlesex. Kent. Surrey. Hertfordshire. Oxfordshire. Essex.

OUSE. — Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Huntingdonshire. Northamptonshire.

SEVERN. — Warwickshire. Gloucestershire. Herefordshire. Worcestershire. Staffordshire. Shropshire.

S. WALES.—Glamorganshire. Carmarthenshire.

N. WALES.—Anglesea. Denbighshire.

TRENT.—Leicestershire. Rutland. Lincolnshire. Derbyshire. Nottinghamshire.

MERSEY.—Cheshire. Lancashire.

HUMBER.—Yorkshire.

TYNE.—Durham. Northumberland.

LAKES.—Cumberland. Westmoreland.

W. LOWLANDS.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. LOWLANDS.—Roxburghshire. Berwickshire. Edinburghshire.

E. HIGHLANDS.—Clackmannanshire. Kinross-shire. Fifeshire. Perthshire. Forfarshire. Aberdeenshire. Morayshire.

W. HIGHLANDS.—Dumbartonshire. Loch Skyros, Islay (with var. "*simplex*").

N. HIGHLANDS.—Ross-shire. Caithness-shire.

N. ISLES.—Kirkwall, Orkney, *J. T. Syme.* Shetland.

W. ISLES.—N. Uist. Harris. Lewis.

ULSTER.
CONNAUGHT.
LEINSTER.
MUNSTER.
} Common in Ireland.

CHANNEL ISLES.—Jersey.

Equisetum Moorei, *Newman.*

LEINSTER.—Wicklow, *D. Moore.*

Equisetum palustre, *Linnæus.*

PENINSULA.—Cornwall. Braunton Burroughs, Devonshire (var. *nudum*). Weston-super-Mare (var. *polystachyon*) ; sands at Bream (var. *nudum*), Somersetshire.

CHANNEL.—Hampshire. Shanklin Chine and Cockleton (with var. *polystachyon*) ; Moor Town, Brixton ; Freshwater Gate, Isle of Wight. Dorsetshire. Spye Park (var. *polystachyon*) ; Purton, Wiltshire. Sussex.

THAMES.—Hertford ; Stortford ; Hitchin ; St. Alban's, Hertfordshire. Middlesex. Kent. Stoke ; Woodbridge, near Guildford, and Richmond Park (var. *polystachyon*), &c., Surrey. Stratford, Essex (var. *polystachyon*). Oxfordshire.

OUSE.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Northamptonshire.

SEVERN.—Hart's-hill (var. *polystachyon*), &c., Warwickshire.

Gloucestershire. Herefordshire. Staffordshire. Worcestershire. Shropshire.

S. Wales.—Glamorganshire. Carmarthenshire. Pembrokeshire.

N. Wales.—Anglesea. Denbighshire. Conway Sands, Carnarvonshire (var. *polystachyon*).

Trent.—Leicestershire. Rutland. Lincolnshire. Derbyshire. Nottinghamshire.

Mersey.—Crosby (vars. *polystachyon* and *nudum*); Formby (var. *polystachyon*); Broadbank (var. *nudum*), Lancashire. Cheshire.

Humber.—Aldingham (var. *nudum*), and elsewhere, Yorkshire.

Tyne.—Durham. Northumberland.

Lakes.—Westmoreland. Cumberland.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Lanarkshire.

E. Lowlands.—Berwickshire. Roxburghshire. Edinburghshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Kinrossshire. Fifeshire. Kincardineshire. Morayshire. Breadalbane Mountains, Perthshire (vars. *polystachyon* and *nudum*). Sands of Barry, Forfarshire (var. *nudum*). Braemar (var. *polystachyon*), and elsewhere, Aberdeenshire.

W. Highlands.—W. Inverness-shire. Argyleshire. Isles of Islay and Cantyre.

N. Highlands.—Caithness. Ross-shire.

N. Isles.—Orkney, common, *T. Anderson*. Shetland.

W. Isles.—Roddal, Harris.

Ulster.—Logan Canal (var. *polystachyon*); near the Giant's Causeway, Antrim.

Connaught. Leinster. Munster. } Abundant in Ireland, especially in the north.

Channel Isles.—Jersey.

Equisetum pratense, *Ehrhart.*

Mersey.—[Cheshire.] Near Mere Clough, Manchester, Lancashire.

Humber.—Yorkshire.

Tyne.—Wynch Bridge, Teesdale, Durham. Near Felton; Warkworth, Northumberland.

Lakes.—Westmoreland.

W. Lowlands.—Bonnington Woods; woods near Corra Linn; Finglen, near Glasgow, Lanarkshire.

E. Lowlands.—Woods on the banks of the Esk, below Auchindenny, Edinburghshire. Woodcock Dale; Belleryde, *W. H. Campbell, B.S.E.*, Linlithgowshire.

E. Highlands.—Campsie Glen, Stirlingshire. Banks of the Devon, near Cauldron Linn, *Dr. Balfour;* Castle Campbell Woods, near Dollar, Clackmannanshire, *J. T. Syme.* Woods near Dunfermline, Fifeshire. Glen Tilt; Ballater; Lethen's Dene, Ochils; Glen Devon, Perthshire. Ravine of the White-water, Glen Dole, Clova; banks of the Isla,

Den of Airly, below Reeky Lyn, *G. Lawson;* Canlochen, Glen Isla; by the Caledonian Canal, near Forfar, Forfarshire. Aberdeenshire. Banffshire. Morayshire.

Ulster.—Mountain glens of Antrim; as at Wolfhill, and Glendoon, near Cushendall.

Equisetum ramosum, *Schleicher.*

E. Highlands.—Den of Airly, Forfarshire. Banks of the Dee, Aberdeen and Kincardineshire.

Ulster.—Colin Glen, Belfast; "The Glens;" Calton Glen, Antrim. Ballyharrigan Glen, Londonderry.

Equisetum sylvaticum, *Linnæus.*

Peninsula.—Devonshire. Somersetshire.

Channel.—Parsonage Lynch, Newchurch; Apse Heath, Isle of Wight. Dorsetshire. Wiltshire. Sussex.

Thames.—Bell Wood and Bayford Wood, Hertfordshire. Highgate, Middlesex. Kent. Burgate, Godalming, Surrey. Bagley Wood, Berkshire. High Beech, Essex.

Ouse.—Suffolk. Norfolk. Chesterton; Madingley Wood, Cambridgeshire. Bedfordshire. Northamptonshire.

Severn.—Arbury; Mosely Bog, near Birmingham, Warwickshire. Gloucestershire. Herefordshire. Worcestershire. Staffordshire. Benthal Edge, Shropshire.

S. Wales. –Hafod, and about the Devil's Bridge, Cardigan-

shire. Carmarthenshire. Neath, Glamorganshire. *E. Lees, B.S.L.*

N. Wales.—Near Bala, Merionethshire. Denbighshire.

Trent.—Leicestershire. Rutland. Southwood, near Calke Abbey; Cromford Moor, Derbyshire. Aspley Wood; Southwell, Nottinghamshire.

Mersey.—Cheshire. Hurst Clough, Manchester; Egerton, near Bolton, and elsewhere, Lancashire.

Humber.—Huddersfield; Arncliffe Woods; Castle Howard; Settle; Richmond; Leeds; Whitby; Forge Valley, near Scarborough, &c., Yorkshire.

Tyne.—Morpeth; Hexham, Northumberland. Durham.

Lakes.—Ennerdale, &c., Cumberland. Westmoreland.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrew-shire. Lanarkshire.

E. Lowlands.—Houndwood; Langridge Dean, Berwickshire. Rosslyn Wood, and elsewhere, Edinburgh. Roxburghshire.

E. Highlands.—Clackmannanshire. Kinross-shire. Banks of Bruar, Blair Athol; Vicar's Bridge; Breadalbane Mountains, Perthshire. Montrose; Craig, &c., Forfarshire. Fifeshire. Woodstone Hills, Kincardineshire. Aberdeen-shire. Cawdor, Nairnshire. Morayshire.

W. Highlands.—W. Inverness-shire. By Loch Fine, Argyle-shire.

N. Highlands.—Ross-shire. Sutherlandshire.

N. Isles.—Orkney. Shetland.

W. Isles.—Roddal, Harris.
Ulster.—Antrim. Londonderry, Donegal.
Connaught.—Oughterard; Connemara, Galway.
Leinster.—Stagstown, Dublin co. Wicklow.

Equisetum Telmateia, *Ehrhart.*

Peninsula.—Cornwall. Undercliff, near Sidmouth, &c., Devonshire. Somersetshire.
Channel.—Hampshire. Luccomb Cliff, &c., Isle of Wight. Dorsetshire. Wiltshire. Hastings, Sussex.
Thames.—Hertfordshire. Hampstead, Middlesex. West Farleigh, Kent. Reigate; Norwood; Godalming, Surrey. Oxfordshire. Berkshire. Buckinghamshire. Coggeshall; Warley, Essex.
Ouse.—Ipswich, Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Northamptonshire.
Severn.—Woods near Arbury Hall, Warwickshire. Gloucestershire. Worcestershire. Staffordshire. Shropshire.
S. Wales.—Glamorgan. Carmarthenshire. Pembrokeshire.
N. Wales.—Anglesea. Denbighshire. Bangor, Carnarvonshire.
Trent.—Leicestershire. Derbyshire. Nottinghamshire.
Mersey.—Poulton; Arden Hall, Cheshire. Broadbank, near Coln; Todmorden; Manchester, Lancashire.
Humber.—Arncliffe Wood, and elsewhere, Yorkshire.
Tyne.—Hawthorn Dene, Durham. Morpeth, Northumberland.

Lakes.—Cumberland. Westmoreland.

W. Lowlands.—Renfrewshire. Lanarkshire.

E. Lowlands.—Lamberton, between Berwick and Ayton, Berwickshire. Rosslyn and various places about Edinburgh.

E. Highlands.—Montrose; banks of S. Esk, Forfarshire. Kincardineshire. Aberdeenshire.

W. Highlands.—Dunglass, Dumbartonshire, *Dr. Balfour*, Campbelton, Argyleshire. Islay. Arran.

N. Isles.—[Orkney.]

Ulster.
Connaught.
Leinster.
Munster.
} Frequent in Ireland.

Channel Isles.—Jersey.

Equisetum variegatum, *Weber and Mohr.*

Peninsula.—Salcombe Cliff, Sidmouth, Devonshire. [Somersetshire.]

Mersey.—New Brighton, and near the Magazines, Cheshire. Bootle Sands; Southport; Waterloo, near Liverpool (var. *arenarium*), Lancashire.

Humber.—Aysgarth Force, Yorkshire, *B.S.E.*

Tyne.—Widdy Bank; Wynch Bridge; Middleton, Teesdale; and elsewhere near the Tees, Durham. Northumberland.

Lakes.—By the Irthing, at Gilsland, Cumberland.

W. Lowlands.—Lanarkshire.

E. Lowlands.—Near N. Berwick, Haddingtonshire.

E. Highlands.—Sands of Barry, Dundee, Forfarshire (var. *arenarium*). Banks of the Dee, Kincardineshire (with var. *Wilsoni*).

N. Highlands.—Tain, Ross-shire, *B.S.E.*

Leinster.—Portmarnock Sands; Royal Canal (var. *Wilsoni*), both near Dublin. Mullingar, Westmeath (var. *Wilsoni*), *R. W. Rawson.*

Munster.—Mucruss, Killarney, Kerry (var *Wilsoni*).

Isoëtes lacustris, *Linnæus.*

Severn.—[Shropshire.]

S. Wales.—Lake below Brecon Beacon, Brecknockshire. Glamorganshire.

N. Wales.—Lakes of Denbighshire. Merionethshire. Ogwen; Llyn-y-Cwm; Lakes of Llanberis, &c., Carnarvonshire.

Humber.—Castle Howard Lake; Foss Reservoir near Coxwold, Yorkshire.

Tyne.—Prestwick Car, Northumberland.

Lakes.—Rydal, and other Lakes of Westmoreland. Ulleswater; Floutern Tarn, near Buttermere; Crummock Water; Derwent Water; Ennerdale; Wastwater, &c., Cumberland. Conistone, N. Lancashire.

E. Highlands.—Stirlingshire. Fifeshire. Loch Tay; Loch Lubnaig; Ben Voirlich, Perthshire. Loch Brandy; Loch Whirral, near Kettin, Forfarshire. Loch Callader, Aberdeenshire.

W. Highlands.—Loch Sloy, Dumbartonshire. Lakes in the Isles of Skye and Bute.

N. Highlands.—Sutherlandshire.

N. Isles.—Kirkwall (near the Sea), Orkney, *T. Anderson.*

Ulster.—Lakes in the Rosses, Donegal. Castle Blaney Lake, Monaghan.

Connaught.—Lakes of Connemara.

Leinster.—Upper Lough Bray. Glendalough, Wicklow.

Munster.—Lough Graney, Clare, *J. R. Kinahan.*

Lycopodium alpinum, *Linnæus.*

Peninsula.—Exmoor, Devonshire, *R. J. Gray.* Somerset, *A. Southby.*

Channel.—[Hampshire.]

Severn.—[Shropshire.]

S. Wales.—Brecon Beacon, Brecknockshire. Glamorganshire. Plinlymmon, Cardiganshire.

N. Wales.—Flintshire. Denbighshire. Llanidloes, Montgomeryshire. Cader Idris, Merionethshire. Cwm-Idwal; Glyder-Vawr; Carnedd David, Carnarvonshire.

Trent.—Derbyshire.

Mersey.—Micklehurst, Cheshire. Todmorden; Fo-edge; Mottram; Cliviger, Lancashire.

Humber.—Ingleborough; Sowerby; Cronckley Fell; Scarborough, &c., Yorkshire.

Tyne.—Falcon Clints, and elsewhere in Teesdale, Durham. S.E. of Crag Lake; Cheviot, Northumberland.

Lakes.—Kirkston, and other parts of Westmoreland. Great Gable; Ennerdale; Wastwater, and other parts of Cumberland. Conistone, N. Lancashire.

W. Lowlands.—Hills west of the Vale of Dumfries. Hills above Dalscairth, Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Lammermuirs; Lamberton Moor, Berwickshire. Pentland Hills, Edinburgh.

E. Highlands.—Clackmannanshire. Kinross-shire. Fifeshire. Ben Lawers; Blair Athol; Killin; Ben Voirlich, &c., Perthshire. Sidlaw Hills; Glen Dole and Glen Fiadh, Clova, &c., Forfarshire. Bay of Nigg, Kincardineshire. Invercauld, &c., Aberdeenshire (3,600 feet). Badenoch, Morayshire. Banffshire. Nairnshire.

W. Highlands.—Freuch Corrie, Strath Affarie; Ben Nevis (3,450 feet), &c., W. Inverness-shire. Ben More; Tobermory, Isle of Mull; and other islands of the Inner Hebrides.

N. Highlands.—Ross-shire. Ben Hope (3,000 feet), Sutherland. Morven, Caithness, *T. Anderson*.

N. Isles.—Hoy, Orkney, common, *T. Anderson*. Unst, Shetland.

W. Isles.—Langa, Harris, *Dr. Balfour*.

Ulster.—Belfast Mountains, Antrim. Aghla; Barnesmoor; Muckish, Donegal. Mourne Mountains, Down.

Munster.—Mangerton; Brandon, Kerry.

Lycopodium annotinum, *Linnæus.*

N. Wales.—Glyder-Vawr, above Llyn-y-Cwm, Carnarvonshire.

Trent.—Charnwood Forest, Leicestershire, *A. Bloxam.*

Mersey.—Rumworth Moss, Lancashire, *R. Withers.*

Tyne.—[Teesdale, Durham.]

Lakes.—Bowfell, Cumberland, *H. E. Smith.* Langdale, Westmoreland, *R. Rolleston.*

E. Highlands.—Mountains of Perthshire, Aberdeenshire, Morayshire, and Banffshire; as Loch-na-gar, Munth Keane, Ben-na-Baird, and the Cairngorm Mountains (elev. 1,500—2,550 feet). Glen Dole; Clova Mountains; by Loch Esk, Forfarshire.

W. Highlands.—Freuch Corrie, Strath Affaric, West Inverness-shire. Goat Fell, Isle of Arran. Isle of Mull.

N. Highlands.—Freevater, Ross-shire.

N. Isles.—Hoy Hill; Rackwick, *J. T. Syme*, Orkney.

Lycopodium clavatum, *Linnæus.*

Peninsula.—Exmoor; Brandon Common, *R. J. Gray*, Devonshire. Brendon Hill, and elsewhere, Somersetshire.

Channel.—Hampshire. Dorsetshire. Wiltshire. Tilgate Forest, Sussex.

Thames.—Tring, Hertfordshire. Hampstead, Middlesex. Highdown Heath; Cæsar's Camp, Farnham; Woking Common; between Dorking and Leith Hill; Addington Hills, Croydon; and other parts of Surrey. Oxfordshire. [High Beech, Essex.]

Ouse.—Norfolk. Gamlingay, Cambridgeshire. Bedfordshire.

Severn.—[Coleshill, Warwickshire.] Worcestershire. Staffordshire, Stiperstone, Shropshire.

S. Wales.—Glamorganshire. Plinlymmon, Cardiganshire.

N. Wales.—Cader Idris, Merionethshire. Denbighshire. Snowdon, Carnarvonshire.

Trent.—Charnwood Forest, Leicestershire. Nottinghamshire. Denbighshire.

Mersey. — Todmorden; Simmons-wood Moss, Lancashire. Cheshire.

Humber.—Frequent in the N. and W. Ridings of Yorkshire.

Tyne.—Northumberland. Durham.

Lakes.—Mountains of Cumberland. Langdale, Westmoreland.

W. Lowlands.—Dumfries-shire. Kircudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Peebleshire, Roxburghshire. Pentland Hills, Edinburghshire. Berwickshire.

E. Highlands.—Clackmannanshire. Kinross-shire. Fifeshire. Clova Mountains, Forfarshire. Ben Lawers, Perthshire.

Aberdeenshire. Mortlach, Banffshire. Badenoch, Morayshire.

W. Highlands.—W. Inverness-shire. Argyleshire. Dumbartonshire. Tobermory, Isle of Mull.

N. Highlands.—Ben Wyvis, Ross-shire. Sutherlandshire. Morven, Caithness, *T. Anderson.*

N. Isles.—Hoy and Ronsay, Orkney. [Shetland.]

Leinster.—Kelly's Glen; Ballynascorney; and Dublin Mountains. Wicklow Mountains.

Munster.—Feacle, Clare, *J. R. Kinahan.* Ardmore, Waterford, *J. R. Kinahan.*

Lycopodium inundatum, *Linnæus.*

Peninsula.—Cornwall. Bovey, Heathfield, Devonshire. Somersetshire.

Channel.—Titchfield; Christchurch; Selborne; St. Jermyn's, near Romsey, and other parts of Hampshire. Poole, Dorsetshire. Wiltshire. Sussex.

Thames.—Keston Heath; St. Paul's Cray; Chiselhurst, &c., Kent. Godalming; Witley; Bagshot; Chobham; Wimbledon; Esher, &c., Surrey. Hampstead, Middlesex. Berkshire. Essex.

Ouse.—Belton, Suffolk. S. Wootton; Norwich; Filby; Holt Heath; Yarmouth, Norfolk. Gamlingay, Cambridgeshire. Bedfordshire. Huntingdonshire.

Severn.—Coleshill, Warwickshire. Hartlebury, Worcestershire. Staffordshire.

Trent.—Leicestershire. Bogs by the Rainworth, Nottinghamshire. Derbyshire.

Mersey.—Delamere Forest; Thurstaston; Bagueley Moor; Bidston, Cheshire. Lancashire.

Humber.—Stockton Forest; Sandpit, Malton Road, near York; Norland Moor, near Halifax, Yorkshire.

Lakes.—Wastwater, Cumberland. Westmoreland.

E. Highlands.—Tents Mairs, Fifeshire, *C. Howie.* Clunie Loch; Blair Athol, Perthshire. Ardorie Wood, Forfarshire. Cawdor Castle, &c., Nairnshire. Carse of Ardersier, near Fort St. George, Morayshire.

W. Highlands.—Inverarnon; between Luss and Inverglass, Dumbartonshire.

N. Highlands.—Craig Darrock, Ross-shire. Morven, Caithness, rare, *T. Anderson.*

Connaught.—Connemara, Galway.

Lycopodium Selago, *Linnæus.*

Peninsula.—Cornwall. Sidmouth; Dartmoor, Devonshire. Somersetshire.

Channel.—Near Aldershot, Hampshire. Dorsetshire. Wiltshire. Waldron Down; Tilgate Forest, &c., Sussex.

Thames.—Highdown Heath; near Cæsar's Camp, Farnham, Surrey. Shotover Hill, Oxfordshire.

Ouse.—Felthorpe Heath ; Holt Heath, Norfolk.

Severn.—[Coleshill ; Birmingham, Warwickshire.] Worcestershire. Staffordshire. Titterstone Clee, Shropshire.

S. Wales.—Glamorganshire. Plinlymmon, Cardiganshire.

N. Wales.—Anglesea. Denbighshire. Cader-Idris ; between Festiniog and Llyn Cromorddyn, Merionethshire. Llanberis ; Cwm-Idwal, &c., Snowdon, Carnarvonshire.

Trent.—Leicestershire. Rutland. Mansfield, Nottinghamshire. Above Edale Chapel, Derbyshire.

Mersey.—Bidston, Cheshire. Woolston Moss, near Warrington ; Todmorden, Lancashire.

Humber.—Settle ; Halifax ; Ingleborough ; Wensleydale, &c., Yorkshire.

Tyne.—Falcon Clints, Teesdale, Durham. Prestwick Car, near Ponteland ; Haltwhistle ; Cheviot, Northumberland.

Lakes.—Skiddaw ; Ennerdale ; Helvellyn, Cumberland. Westmoreland.

W. Lowlands.—Lochan Moss, Dumfries-shire, *P. Gray*. Hills above Dalscairth, and Mabie ; Criffel, Kircudbrightshire, *P. Gray*. Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Belford ; Lamberton Moor, &c., Berwickshire. Pentland Hills, Edinburghshire.

E. Highlands.—Clackmannanshire. Kinross-shire. Fifeshire. Ben Lawers, Perthshire. Glen Callater ; Stocket Moor ; Ben-na-muich-Dhu (4,320 feet) ; Loch-na-gar, Aberdeen-

shire. Nigg, Kincardineshire. Banffshire. Badenoch; Kingussie, Morayshire.

W. Highlands.—Ben Nevis, W. Inverness-shire. Dunoon. Argyleshire. Goat Fell, Isle of Arran. Ben More, Isle of Mull. Ben Vigors, Islay. Cantyre. Skye.

N. Highlands.—Sutherlandshire. Ben Wyvis, Ross-shire. Morven, Caithness, *T. Anderson.*

N. Isles.—Kirkwall, Mainland, *J. T. Syme;* Hoy, *T. Anderson,* Orkney. Shetland.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Devis Mountain, Antrim. Arrigal; Muckish, &c., Donegal. Slieve Donard, Down.

Leinster.—Dublin Mountains. All Saints' Bogs, and Bogs generally in King's co. Lough Breagh, and Mountains of Wicklow, *J. R. Kinahan.*

Munster.—Mangerton; Brandon; Carran-Tual; Killarney, Kerry. Glentonniff Bog; Feacle, Clare. Tipperary.

Pilularia globulifera, *Linnæus.*

Peninsula.—Roche; Marazion Marsh, near Penzance, Cornwall. Blackdown; Polwhele, Devonshire. Maiden Down, Somersetshire.

Channel.—Lymington; Holt Forest; Southampton; Badderley, Hampshire. Between Corfe Mullein and Poole; Sandford Bridge, near Wareham, Dorsetshire. Warminster,

Wiltshire. Piltdown; Charley North, common; Quaybrook, near Forest Row; Chiltington, Sussex.

THAMES.—Northaw, Hertfordshire. Iver Heath; Hounslow Heath; Hillingdon, Middlesex. Esher Common; near Reigate; Walton-on-the-Hill; Henley Park, Pirbright; Roehampton, Surrey.

OUSE.—Hopton, Suffolk. Filby; St. Faith's Newton; Yarmouth, Norfolk. Hinton Bog, Cambridgeshire, *J. W. G. Gutch, B.S.L.* Fen, near Peterborough, Northamptonshire.

SEVERN.—Coleshill Pool, Warwickshire. Staffordshire. Bomere Pool, Shropshire.

S. WALES.—Rhos Goch, near Llandegly, Radnorshire. Mountain Pool, near Pont-nedd-Vechn, Glamorganshire. St. David's Head, Pembrokeshire.

N. WALES.—Near Llanfaelog, Anglesea. Llyn Idwal; Llanberis Lake, Carnarvonshire.

TRENT.—Leicestershire.

MERSEY.—Bagueley Moor; Beam Heath, near Nantwich; Barlington Heath; Woove, Cheshire. Allerton, Lancashire.

HUMBER.—Near Richmond; Stockton Forest; Gormire Pool, near Thirsk; Terrington Car, &c., Yorkshire.

TYNE.—Near Wolsingham, Durham. Prestwick Car, Ponteland. Northumberland.

LAKES.—Ennerdale Lake, *J. Robson.*

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Rotherglen, Lanarkshire.

E. Lowlands.—Pentland Hills; Braid Hill Marshes, Edinburghshire.

E. Highlands.—Perthshire. Slateford; Monroman Moor; Alyth; near Forfar, and other parts of Forfarshire. Loch of Drum, Kincardineshire. Morayshire.

W. Highlands.—Loch Lomond, Dumbartonshire.

N. Highlands.—Sutherlandshire.

Ulster.—By the Blackwater, near Lough Neagh; by the Bann, below Jackson's Hall, Coleraine, Antrim.

Connaught.—Ballinahinch; Connemara, Galway.

Selaginella spinosa.

Peninsula.—[Devonshire.]

N. Wales.—Aberffraw, Anglesea. Denbighshire. Cwm-Idwal; Clogwyn-du-Yrarddu; Glyder-Vawr; Llanberis; Capel Curig, Carnarvonshire.

Trent.—Kinderscout, Derbyshire.

Mersey.—New Brighton, Cheshire. Near Southport; Seaforth Common, Bootle, Lancashire.

Humber.—Cronckley Fell; Stockton Forest; Settle; Richmond; York; Knaresborough; Whitsuncliffe, near Thirsk, &c., Yorkshire.

Tyne.—Middleton, Teesdale ; Gateshead Fell, Durham. Prestwick Car, near Ponteland, Northumberland.

Lakes.—Loughrigg ; Fairfield ; Kirkstone, &c., Westmoreland. Borrowdale ; Keswick ; Derwentwater ; Scaw Fell ; Ennerdale, &c., Cumberland. Conistone, N. Lancashire.

W. Lowlands.—Grey Mare's Tail, and elsewhere, Dumfriesshire, *P. Gray*. Hills above Dalscairth ; Port Ling, coast of Colvend, Kirkcudbrightshire, *P. Gray*.

E. Lowlands.—Lammermuirs ; Lamberton Moor, Berwickshire. Roxburghshire. Haddingtonshire. Edinburghshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Kinrossshire. Fifeshire. Craig Challiach ; Ben Lawers (3,000 feet), Perthshire. Canlochen ; Glen Dole, Clova ; Sidlaw Hills ; Sands of Barry, Dundee, Forfarshire. Glen Callater ; Deanston, &c., Aberdeenshire. Kingussie ; Dalwhynnie, Morayshire.

W. Highlands.—Freuch Corrie, Strath Affarie, &c., W. Inverness-shire. Dunoon ; Glencroe, Argyleshire. Dumbartonshire. Banks of Loch Sligachan, Isle of Skye. Isles of Islay and Cantyre.

N. Highlands.—Ross-shire. Sutherlandshire. Caithness, common, *T. Anderson*

N. Isles.—Howton Head, and elsewhere, Orkney. Shetland.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Belfast Mountains; near Larne, Antrim. Arrigal; Muckish, and other hills of Donegal. Slieve Donard; Mourne Mountains, Down.

Connaught.—Hills by the Killery; Leenane; Connemara, Galway.

Leinster.—Carlingford Mountain, Louth. Dublin co.

INDEX.

COX AND WYMAN, PRINTERS, GREAT QUEEN STREET, LONDON.

Plate II.

Plate IV.

Plate V.

Plate VI.

Plate VII.

Plate VIII.

Plate IX.

Plate X.

Plate XI.

Plate XII.

Plate XIII.

Plate XIV

Plate XV

Plate XVI.

Plate XVII.

Plate XVIII.

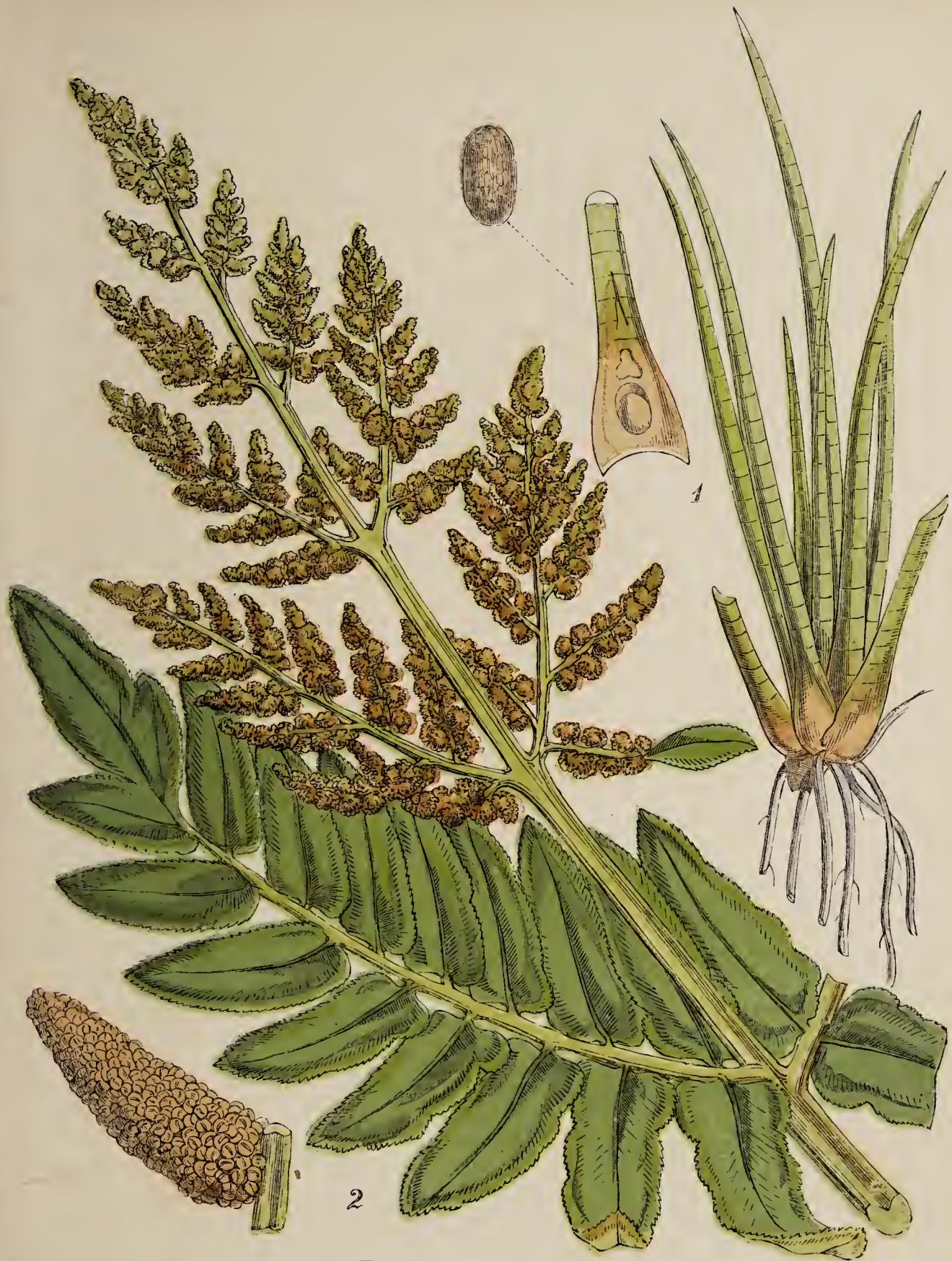

Plate XIX.

Plate XX.

Plate XXI.

Plate XXII.

ROUTLEDGE, WARNE, & ROUTLEDGE'S

New Publications.

In 1 vol. price 5s. cloth lettered.

RUSSELL'S MODERN EUROPE EPITOMIZED. For the use of Students and Schools, with an Index, forming a complete Text-Book of Modern History; a perfect treasury of Facts, Dates, and Important Events; the History of Kingdoms and States, and Lives of celebrated Characters. By GEORGE TOWNSEND.

"This is an admirably executed and elegantly printed epitome of the best modern history in our language. The epitomiser has performed his task in a masterly style, exercising a sound judgment in giving prominence to the more interesting portions of his subject, bringing them out in full and bold relief on the map of the past, and describing them at greater length, while he has abridged less important matters, but without interrupting the thread of the narrative. We have thus supplied what has long been wanting to every student of English literature—a thoroughly trustworthy handbook, in which the chief events of modern history are set forth in a clear, concise, and intelligent form."—*Morning Herald.*

All candidates for offices in her Majesty's Civil Service are examined in "Russell's Modern Europe."

In 3 vols. post 8vo, price 18s. cloth extra.

THE RISE OF THE DUTCH REPUBLIC. A History. By J. LOTHROP MOTLEY. A New Edition, revised by the Author.

"A work of real historical value, the result of accurate criticism, written in a liberal spirit, and from first to last deeply interesting."—*Athenæum.*

"It abounds in new information."—*Examiner.*

"His 'History' is a work of which any country might be proud."—*Press.*

"Of the scope and general character of Mr. Motley's work we have given but a languid conception. The true merit of a great book must be learnt from the book itself."—*Westminster Review.*

"Mr. Motley has searched the whole range of historical documents necessary to the composition of his work. He has in no place spared himself the labour of minute and critical authentication."—*Leader.*

"Mr. Motley's volumes will well repay perusal. . . . For his learning, his liberal tone, and his generous enthusiasm, we heartily commend him, and bid him godspeed for the remainder of his interesting and heroic narrative."—*Saturday Review.*

"This is a really great work. It belongs to the class of books in which we range our Grotes, Milmans, Merivales, and Macaulays, as the glories of English literature in the department of history. . . . Mr. Motley's gifts as an historical writer are among the highest and the rarest."—*Noneconformist.*

"It is written with knowledge, carefulness, judgment as to the substance, and with force, life, and attractive grace of style."—*Globe.*

THE BEST EPITOME OF FRENCH HISTORY.

In 1 vol. post 8vo, price 5s. cloth lettered.

BONNECHOSE'S HISTORY OF FRANCE. The First English Edition with Index. Translated by W. ROBSON, Esq., Translator of Michaud's "History of the Crusades," &c.

"It is a cleverly written volume, the translation also being easy and flowing; and there is no English manual of French history at once so portable and authentic as this."—*The Guardian.*

Price **2**s. boards, or **2**s. **6**d. cloth.

PRESCOTT'S ESSAYS, BIOGRAPHICAL AND CRITICAL—Comprising:

C. B. Brown, the Novelist, Irving's Conquest of Granada, Cervantes, Sir Walter Scott, Chateaubriand's Eastern Literature, Bancroft's United States, Molière, Italian Narrative Poetry, Scottish Song, Poetry and Romance of the Italians.

"William Hickling Prescott is entitled to the foremost place, as indeed he is the ablest, of all American historians. He resembles Mr. Macaulay in all that fondness for picturesque details, pointed anecdote, and biographic threads of interest, which give to the histories of both such vividness of outline and warmth of interest."—*The Times.*

"Prescott's Works in point of style rank with the ablest English historians, and paragraphs may be found in which the grace and elegance of Addison are combined with Robertson's cadence and Gibson's brilliancy."—*Athenæum.*

In 2 vols. fcap 8vo, cloth boards, **4**s.; or in cloth lettered, **5**s.

BANCROFT'S HISTORY OF AMERICA. The Colonization and its Results. With Index.

*** This standard Work has, in the five volumes, more than 6000 references to the best Historical Works and Manuscripts in existence. It takes its stand in literature by the side of Alison's "Europe," and Macaulay's "England." Its style is lofty and eloquent, written with candour, neither exaggerating vices of character, nor reviving national animosities, but rendering a just tribute to virtue, wherever found.

In fcap 8vo, cloth boards, each vol. **2**s., or in cloth lettered, **2**s. **6**d.

BANCROFT'S HISTORY OF AMERICA. Vols. 3, 4, and 5, with Index. Continuing the History from its Colonization, and completing a period in the History of the American Revolution.

This cheap edition of Mr. Bancroft's standard Work is now complete as far as he has written it, and contains the history of the American Revolution considered in all its causes—the rise of the Union of the United States from the body of the people—the change in the colonial policy of France—and the consequences of the endeavours of Great Britain to consolidate her power over America.

"The narrative is at once lucid, eloquent, instructive, and poetical, and studded at intervals with those bright life-like pictures for which Mr. Bancroft has become so famous. In view of the mass of authorities which the historian has so assiduously collected, and for the careful examination he has given to contemporary evidence, he deserves unqualified praise. There is a dramatic power and vigour in the pages of this history which will cause it to be esteemed, not only as a most useful work of historical reference, but as an honour to American Literature."

In fcap 8vo, price **2**s. cloth extra; **1**s. **6**d. boards.

AMERICA AND THE AMERICANS. By W. E. Baxter, M.P.

"This book is not one of those ephemeral productions which, having served the purpose of producing a few hours' amusement, may be thrown aside and forgotten; but it is a publication that will bear continual reference, and prove its intrinsic value whenever it is consulted."—*Bell's Messenger.*

In 1 vol. demy 8vo, price **14**s. cloth lettered.

THE BRITISH EXPEDITION TO THE CRIMEA.

By W. H. RUSSELL, *The Times'* "Special Correspondent." Being a Revised Edition of "The War," with additions and corrections. Illustrated with Plans of the Battles, Woodcuts, and Steel Portrait of Author.

"As a national history of the great events of which it treats, it must ever hold a foremost rank in the literature of this country, doubly valuable as being an authentic record of our trials and victories in the Crimean Peninsula, and as the first history of war ever written from personal observation by a professed author and civilian."—*Era.*

"It is impossible to over-estimate this work, either as an authentic record by one peculiarly qualified and circumstanced to collect facts, or as an animated picture of movements and incidents of one of the most memorable wars ever waged."—*Civil Service Gazette.*

"Mr. Russell is at once a most readable and successful historian of the war; and his striking and highly-coloured pictures of the events of the campaign will not only long be remembered by all who read them, but will furnish much valuable material for the future Macaulay of our era."—*Daily Scotsman.*

"This wonderful narrative will make the name of W. H. Russell immortal as the chronicler of the ever memorable campaign in the Crimea."—*Liverpool Albion.*

"A memorial of the campaign in the East, which every Englishman who loves to read of the indomitable pluck of his countrymen will endeavour to possess."—*Express.*

In 3 vols. post 8vo, price **15**s. cloth lettered.

MICHAUD'S HISTORY OF THE CRUSADES.

The First English Edition translated from the French; with Notes. Memoir and Preface by W. ROBSON.

"Michaud is faithful, accurate, and learned: his mind is lofty and generous, and exactly suitable to the proper filling up of the history of the Crusades."—ALISON. (*Blackwood's Magazine.*)

New Edition, brought down to the Peace of Paris, 1856.

In 4 vols. 8vo, price **£1 10**s. cloth lettered.

RUSSELL'S MODERN EUROPE, with a View of the

Progress of Society from the Rise of the Modern Kingdoms. A New Edition, continued to the Peace of Paris, 1856, to which is added a compendious Index compiled expressly for this Edition.

The FOURTH VOLUME, from the year 1802 to 1856, is sold separately, price 10s. 6d.; it forms the best handbook of General History for the last half-century that can be had.

All the Candidates for the Government Civil Service are examined in "Russell's Modern Europe," as to their knowledge of General History.

In small post 8vo, price **5**s. cloth extra.

EMBASSIES AND FOREIGN COURTS. A History

of Diplomacy. By THE ROVING ENGLISHMAN. The Second Edition.

"The 'Roving Englishman' is a satirical chronicler. His style is not less lively than severe—not subtle enough for irony, but caustic, free, and full of earnest meaning. This volume is also an admirable manual, skilfully adapted to the purpose of diffusing a general knowledge of history and the working of diplomacy."—*The Athenæum.*

In 2 vols. crown 8vo, cloth, price **5**s., or in 1 vol. cloth gilt, **5**s. **6**d.

THE HISTORY OF EXTRAORDINARY POPULAR DELUSIONS. By CHARLES MACKAY, LL.D The Third Edition. Illustrated with One Hundred and Twenty Engravings, from scarce Prints and other authentic sources.

Among which will be found the following interesting subjects :—The SOUTH SEA BUBBLE, The TULIPOMANIA, RELICS, MODERN PROPHECIES, DUELS and ORDEALS, LOVE OF THE MARVELLOUS, The O. P. MANIA, The CRUSADES, The WITCH MANIA, The SLOW POISONERS, HAUNTED HOUSES, The ALCHYMISTS—PRETENDED ANTIQUITY OF THE ART, AVICENNA ALBERTUS MAGNUS, THOMAS AQUINAS, RAYMOND LULLI, ROGER BACON, POPE JOHN XXII., CORNELIUS AGRIPPA, PARACELSUS, DR. DEE and EDWARD KELLY, The COSMOPOLITE, SENDIVOGIUS, The ROSICRUCIANS, Alchymical Writers of the Seventeenth Century, DE LISLE, ALBERT ALUYS, COUNT DE ST. GERMAINS, CAGLIOSTRO, Present State of the Sciences, &c.—FORTUNE-TELLING, The MAGNETISERS, &c.

"These volumes will captivate the attention of readers who, according to their various tempers, feel either inclined to laugh at or sigh over the follies of mankind." —*Times.*

In 1 vol. post 8vo, price **3**s. **6**d. cloth lettered.

FELICE'S HISTORY OF THE PROTESTANTS OF FRANCE, from the Commencement of the Reformation to the Present Time. Translated from the Revised and Corrected Edition.

"It is written with both power and brilliancy; its pictures are distinct and warm in colour; its sketches of character, although slight, are marked by penetrating intelligence and genial feeling; its information is full, and apparently sought out with great care and research. The work naturally comes into comparison with D'Aubigné's History of the Reformation; and it does not suffer by such comparison—it is, perhaps, better history, on the whole; although its limitations and special plan preclude the details and individual views which are the greater part of the charm of D'Aubigné's work."—*Nonconformist.*

In small post 8vo, price **5**s. cloth extra, gilt.

PICTURES FROM THE BATTLE FIELDS. By THE ROVING ENGLISHMAN. The Third Edition, with Illustrations from Sketches taken on the spot, and Chapters respecting—

Scutari and its Hospitals.	The Commissariat again.	The Bashi-Bazouk.
Miss Nightingale.	A Camp Dinner.	Russian Officers and Soldiers.
Balaklava.	The Heights before Sebastopol.	The French Officer.
A Snow Storm.		The Zouave.

"Who is unfamiliar with those brilliant little sketches of travel—particularly the pictures of Turkish life and manners—from the pen of the 'Roving Englishman,' that were, week after week, the very tit-bits of 'Household Words?'—Who did not hail their collection into a companionable-sized volume?—and who will not thank our truly 'fast' friend—the friend of almost everything and everybody but foreign noodles—the 'Roving Englishman,' for this new book of sketches?"

In fcap 8vo, price **1**s. **6**d. boards, **1**s. **8**d. strongly bound, or in cloth gilt, **2**s., or with the Questions and Coloured Map, red sheep, **3**s.

LANDMARKS OF THE HISTORY OF ENGLAND.

By the Rev. JAMES WHITE. (The Twenty-eighth Thousand.)

"We hold this to be a pattern volume of cheap literature. It is so written that it cannot fail to amuse and enlighten the more ignorant; yet it is a book that may be read with pleasure and profit, too, by the most polished scholar. In a word, excellent gifts are applied to the advantage of the people—a poetical instinct and a full knowledge of English History. It has nothing about it of commonplace compilation. It is the work of a man of remarkable ability, having as such a style of its own, and a grace that cannot fail to exercise its refining influence upon uneducated people. The amount of solid information it compresses in a small compass excites in the reader's mind repeated surprise."—*The Examiner.*

"The style in which the book is written is elegant, the sentences being short, terse, and full of point, without the slightest effort to excel in the art of composition being apparent; whilst the facts are thoroughly to be depended upon, as a consultation of larger authorities will in every instance prove. To the young, the value of these 'Landmarks' will be past all computation, and children of an older growth will neither lose their time nor patience, but will increase their stock of knowledge, by giving them their most attentive and candid consideration."—*Bell's Weekly Messenger.*

Also, uniform with the above, and sold separately.

In fcap 8vo, price **1**s. strongly bound.

QUESTIONS ON THE LANDMARKS OF ENGLISH

History. With Genealogical and Chronological Tables, and Coloured Map of Great Britain; showing at one view its divisions into Roman Provinces, Saxon Kingdoms, and English Counties, with the positions of the Ancient British tribes. Designed by FRANCIS YOUNG, St. Edmund's School, Kingsbridge.

Uniform with "Landmarks of the History of England."

In fcap 8vo, price **1**s. **6**d. boards, or **2**s. cloth gilt.

LANDMARKS OF THE HISTORY OF GREECE.

By the Rev. JAMES WHITE.

"This book, with its companion volume, deserves to have a place in every house where there are young readers, and in many a house where there are none but elder ones, able to appreciate the genial writings of a man who, having taste and knowledge at command, sits down to write in the simplest way the story of a people for a people's reading."—*Examiner.*

"It is well proportioned, well planned, well executed from beginning to end. All the salient points of Grecian History are presented distinctly, and in their proper order and connexion. Mr. White has, too, a flexible, transparent style, particularly adapted for such a summary as he has undertaken to prepare."—*Athenæum.*

In post 8vo, price **5**s. cloth extra, or with gilt edges, **5**s. **6**d.

THE GREAT SIEGES OF HISTORY. By WILLIAM

ROBSON; including Delhi and Lucknow, by Captain SPANKIE. With Illustrations by John Gilbert.

This new Military and Historical Work is published uniform with "Napier's Battles of the Peninsula," and the "Great Battles of the British Army," and contains accurate histories of more than One Hundred Sieges.

In 1 vol. royal 8vo, price **6**s. **6**d. cloth extra.

HISTORY OF THE POPES. By LEOPOLD RANKE. Including their Church and State, the Re-organization of the Inquisition, the Rise, Progress, and Consolidation of the Jesuits, and the means taken to effect the Counter-reformation in Germany, to revive Romanism in France, and to suppress Protestant Principles in the South of Europe. Translated from the last edition of the German by WALTER K. KELLY, of Trinity College, Dublin.

"This translation of Ranke we consider to be very superior to any other in the English language."—*Dublin Review.*

LATEST POPULAR HISTORY OF INDIA.

In post 8vo, price **5**s. cloth gilt.

A HISTORY OF BRITISH INDIA, from the Earliest Period of English Intercourse to the Present Time. By CHARLES MACFARLANE. With Additions to the year 1858, by a late Editor of the *Delhi Gazette.* Illustrated with numerous Engravings.

"This admirable aid to the study of British India we particularly recommend, as one of the best epitomes that our literature possesses."—*North Wales Chronicle.*

"This volume reflects infinite credit on its author's abilities and research."

"A more valuable present than the volume before us could not have been offered for those youths who are now qualifying at Addiscombe and Haileybury to eclipse the glories of a Clive, a Hastings, or a Wellesley."—*Tait's Magazine.*

In fcap 8vo, price **2**s. cloth, or **2**s. **6**d. roan lettered.

GOLDSMITH'S HISTORY OF ENGLAND. A New Edition, with Continuation to the Death of Wellington. With Portraits of all the Sovereigns.

"In this edition, the editor has added some facts which had been overlooked by the author, and preceded the original work by a short notice of the earlier history, gathered from the old chroniclers, and continued to the present time. To each chapter is appended a series of questions, by means of which the tutor will readily be enabled to examine the pupil as to the impressions the facts have made on his memory."

In 3 vols. demy 8vo, price **9**s. cloth extra.

MEMOIRS OF THE REIGN OF GEORGE THE SECOND. By HORACE WALPOLE. Edited from the original MSS., with a Preface and Notes by the late Lord HOLLAND. Second Edition revised, with the original mottoes.

In post 8vo, price **5**s. cloth extra, or **5**s. **6**d. gilt edges.

GREAT BATTLES OF THE BRITISH ARMY; to which are now added the BATTLES of ALMA, BALAKLAVA, and INKERMAN. With Eight Illustrations by William Harvey.

This is the most complete volume published of the battles in which the English army has been from time to time engaged. It commences with the battle of Cressy, and details every important event to the close of the Russian War in 1854.

The following works by the author of "Popular British Conchology," "History of the Aquarium," &c., can be everywhere obtained on application.

THE ILLUSTRATED INDEX

OF

BRITISH SHELLS,

(*Imperial 8vo, extra cloth, price 30s. coloured, 24s plain.*)

Contains 700 Engravings on Copper, of 600 SPECIES, being EVERY ONE hitherto recognised. With Names, Synonyms, Localities, and other information.

THESAURUS CONCHYLIORUM.

(*Imp. 8vo, price 25s. coloured, 16s. plain, each part.*)

Every Part contains one or more MONOGRAPHS of the Genera of RECENT SHELLS, illustrated by about 300 figures.

Parts XVII. and XVIII. contain the Genus CONUS.

Part XIX. ANCILLARIA and other Genera.

THE SAME AUTHOR HAS ALSO IN PREPARATION, AN

INTRODUCTION

TO THE STUDY OF

BRITISH MOLLUSCA AND THEIR SHELLS,

With a description and figure of every Genus, 10*s. coloured*, 7*s. plain.*

G. B. SOWERBY, F. L. S.

Of Pembroke Square, Kensington, Author of the above, undertakes to Illustrate all Works on Natural History.


BOUNDRY
WESTLEYS
&CO
LONDON.