HIMALAYAN
FERNS.
Mr. Henderson

from the author
A HANDY GUIDE
TO THE KNOWN
FERNS OF THE HIMALAYAS
OF Northern India,
BY AN AMATEUR.
LAHORE:
PRINTED AT THE CENTRAL JAIL PRESS,
1877.
J. Mahon, Manager Central Jail Press, Lahore.
John 10, 29

My dear Henderson,  

I am about to leave to visit my sisters who are at the front of the other kind of Yalleron. I did not succeed with them. I shall see if I can send any of the money I have left a regular collection of my own. I was at Yalleron for 6 days last year and I was not there for the year before. However, I have reported me at Government for the past year. There is a large supply of...
He replied that no one from the acting here, had not been appointed here for being abroad for six weeks in the cholera section, without any leave. Torreres states that Yellicnes attack is quite ground, they do not seem to have been the business ordered to be expelled. His absence from there is going to prove that he is not afraid of cholera. This communication began on the 12 of December and I do not think it will finish till the next of the General Council will have time to attend.
met through his late dear and his wife then and I say well that I came or I supposed what she considered a very unhealthy place. He had also a little room than 2 years to serve so he thought he ought as well there it is a healthy climate I think also the fact that I never has a great deal of the poison had something to do with it though he does not say so. Until to the whole river to go to the yard as a bank and I come not quite what he will do
Would you be kind enough to have a Buffalo shot at the 1st and 3rd of October as this is a holy day when I first met of the town of the plan to have a few of the 2d and some 1st class
of cattle.

Yours truly,

C. B. Brown

Herewith a list of plants of Adiantum candae as well as Asplenium regress

Capillus Venen.

C. E. H. Babcock

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Capillus Venen.
“Ruhige Pflanzenwelt, in deiner kunstreichen Stille vernehme ich das Wandeln der Gottheit; deine verdienstlose Trefflichkeit trägt meinen forschenden Geist hinauf zu dem höchsten Verstande; aus deinem ruhigen Spiegel strahlt mir sein göttliches Bild.”

*Schiller Der Menschenfeind.*

*Scene VII.*
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Fig 1. Woodsia.

2. Dicksonia. *Balantium*.

3. Hymenophyllum.

4. Trichomanes.

5–6. Davallia. 5. — *Humata*.


PLATE II.


14—17. Polypondium.

11. Eupolypondium segment. 15.—Goniopteris.


18. Eugymnogramme, pinnule.


20. Drymoglossum, st. and fert. frond.

PREFACE.

The pursuit of pteridology is at once a convenient inducement to healthful recreation in the midst of beautiful scenery, and a stimulus in one of its most attractive forms to the further study of Natural History, which is so useful and powerful a training of the faculties of observation. For Ferns,—the tender gracefulness of which is everywhere allowed, unfolding from a stem whose slender unsightliness gives no heed to the opulence of beauty so suddenly to be displayed with a fidelity of likeness reproduced in minutest detail, through a marvellous delicacy and exactness of cutting that may well excite our wonder,—will not alone continue to absorb the attention. Perfumed orchids curious in growth and flower, panicled grasses and graceful lycopods, sculptured mosses and painted lichens; precious gems in river beds, land shells and occasional fossils, offering Earth's history as she has imprinted it; butterflies mimicking one another's painting, sole bright colour between precipice and stream; beetles brilliantly spotted; birds of gayest plumage, more than 1,600 in number; most gorgeously-coloured of all ocean fishes, most delicately painted of all sea shells, woo the lover of Natural History in these lands.

Collection and nomenclature are then but first steps in a world of admiration and wonder;—with increasing knowledge of the natural objects around us, in reverent enjoyment of all which the Creator for His pleasure has
ordained, our own existence as head and prime creature of all, becomes dignified above the strife of faction, the fretfulness of petty cares:

"He liveth best who loveth best,
All things both great and small;
For the good God above us,
He made and loveth all."

This pursuit, too, leads us into contemplative solitude in the gloom of forests, whose hushed stillness, waved with the alternate hum of cicalas, is broken but by the infrequent alarm of a bird, or the graceful vault of a monkey. 'Mid pine-clad precipices looming over water-falls, whose force working in ceaseless detrition, measured nor utilised by human machinery, is so compassed by brushwood, fern and crag, that the roar of its toil disturbs not the harmony immediately around, till, soothed and overflowing in gentle stream, the waters again glide softly along or plash playfully from boulder to boulder in most musical of ripples, haunted by butterflies.

Amid this ceaseless activity of growth and decay,—of power migrating from form to form,—we may imbibe somewhat of the perfect repose which envelops it, and, braced with renewed energy, return contentedly to our own more immediate labours:

"O forest green and fair, O pine tree waving high,
How sweet your cool retreat, how full of rest,
Here free from care and pain; gay as a child again,
Peace and contentment reign
Within my breast."
INTRODUCTION.

These pages are intended for those who, having only a limited knowledge of Botany, are not satisfied with admiring and collecting Ferns, but would willingly become better acquainted with such species as grow in their immediate neighbourhood, were they not deterred by the difficulties attending a voluminous reference or a minute scientific phraseology.

2. By a few characters capable of easy observation, the ferns growing in the Himalayas and Northern India, regionally grouped apart from all other species, can be readily distinguished by comparison one with another. Character, where it could possibly be avoided, has however not been taken from what would seem a ready distinction, i.e., size, for the reason that it is subject to most variation; intermediate plants of stunted growth would often have been difficult of recognition. Those who desire fuller information,—and it is the object of this Guide, by making its access more easy, to stimulate, and not to satisfy,—should procure Hooker's Synopsis Filicum, edited by Baker, (Hardwicke, 1873) which is now the standard work on this subject. Rudimentary principles of Pteridology may be further studied in Oliver, Balfour, or any other botanical work at hand. Beddome's Ferns of British and Southern India contains figures of most of these species, to which reference has therefore been made for those who are able to consult so valuable and
useful a work, and a few species will also be found in the magnificent folios of Wallich. Fern plates are, however, of less assistance to the young student than is commonly supposed, not only from the extent of variation in many species, but because only enlarged portions of a frond are usually given, and not drawings of the whole plant as it is seen in life. Lowe’s Ferns contain such lifelike coloured figures, but the work is necessarily expensive, and embracing the species in cultivation at home, which are largely Brazilian, has so few Indian, that it is not quoted in reference.

3. For collecting, a convenient case can be made of tin, 22 by 16 in., either ribbed or in 3 lengths soldered together for strength: and where a large collection is expected, a third sheet of plain tin of same size should be used as a middle leaf to equalise pressure. Perforated zinc if obtainable, is better; and in dry weather, cardboard is lighter. Unvarnished brown paper may be placed in the case, and two straps united by a small one, as a handle, like a long H, passing through four soldered clasps, buckles all together, and these straps must always be kept sufficiently tight to prevent rubbing. Should roots also be collected, the smaller ones may be placed together evenly at one end upon the tin, root outwards, and afterwards this side must be placed on the ground for opening, and fronds filled in from next sheet upwards. Large roots should be slung together, and carried apart. Large fronds should be carefully divided by alternately oblique cuts, so as to facilitate their future correct readjustment, and in many
cases only portions need be preserved, one side with part of stem, or the top and lowest pinnæ for instance; but no pinnæ should be torn off from rachis; this latter should be cut above and below, and the opposite pinnæ shortened, so that the divisions of the frond continue to be shown. Fronds shrivelled and apparently undeterminable, may be recovered by softening in water, flattening, and again pressing.

Several fronds may conveniently be placed together in the pad; they should be laid front downwards, especially when later removed to blotting paper, each slightly pushed upwards as the sheet is pressed down upon it, so that the segments are opened out.

If intended for the plains, roots should be packed in dry moss or earth in a tin case: they may also be sent safely by parcel post in cotton wool, packed in a cardboard box. For England they may be put in damp moss in a wax clothed box.

4. When on the spot it is necessary to note the general habit of a plant, its surroundings and mode of growth, colour and texture, and character of root; shape, size, colour, and position of scales, if any; whether hairy or naked, (seen by holding a frond horizontally against the light); all which can best be examined in the fresh plant. Fronds of different ages should be collected, and the position and shape of sori and of involucre,—which if deciduous will only be found on young seed—if possible determined.
5. On the day after collection, the fronds should be carefully laid in the same manner as before, between sheets of blotting paper, and when all foldings are opened out, so that each segment is in position, subjected to moderate sustained pressure, under a board on which a stone or other convenient weight is placed. This paper, whenever damp, and at first daily, must be replaced by dry; with delicate plants, such as Athyrium Oxyphyllum, it is better to avoid deranging the fronds by laying an extra dry sheet upon them, at first on one, then reversing the whole, on the other side.

6. During this drying process, cases should be prepared for each genus, or for groups of genera, according to extent of collection and amount of duplicates into which the dried specimens can be at once sorted by genera. This will facilitate comparison and identification, after which the species themselves may be systematically arranged. It is always convenient to make a preliminary list of the ferns reported to have been found in the particular locality, with a column of altitudes, as a rough indication of what to look for in the neighbourhood. Lists of older collections may thus be utilised, care being taken that the fronds were actually gathered at the place. Species are often very locally restricted, and the exact place of collection should always be noted under the name, as well as the nature of locality,—rock, tree or marsh, &c.,—and date, so as to render such information of value.
7. Ferns may be discovered which are not included in this Guide. If not variations, they will either be known neighbouring species, extending into this region from south, west, or north; or altogether new. These may be referred to some experienced friend, or if not then identified in Synopsis Filicum, referred to the Herbarium at Kew, in a complete state with root, &c., and in fructification not too far advanced; if possible, fronds in different stages should be forwarded.

8. So much difficulty is often experienced through not obtaining definite ideas of the exact meaning of scientific terms from a glossary alone, that the following botanical explanations with illustrative local examples, will no doubt be found to facilitate the preliminary study of pteridology.

9. Ferns, thus, have a root, caudex or large, stipe or small, stem, and a frond; and in Lygodiums a petiole or pinnule stalk. The caudex has (basal) scales at base, and is sometimes arborescent, forming a tree, as in Cyathea, Hemitelia, Alsophilla, and in some Dicksonias.

10. The root is descending like other plants, or a rhizome, creeping either above ground as in most Davallias, or beneath (Hypogeous underground) as in D. immersa, Polypodium urophyllum, &c.; villose as in P. punctatum, &c. The mode of junction of stem and caudex divides ferns into two series; Desmobryoid when these are continuous one with the other, as in Asplenium, Nephro-
di um; *Eremobryoid* when articulated as in Dav. (humata) Eupolypodium, (gonioph) &c.

11. The stem is *tufted*, (Nephr. barbigerum, Asplenium nigripes,) scattered (Aspl. resectum,) *polished* (Adiantum Cap. veneris) tomentose, (Cheilanthes rufa) *wiry*, (Adiantum caudatum) *green* (Aspl. viride), *aculeate* (Cyathea spinulosa), *viscid* (P. punctatum), *fibrillose* (Cheilanthes varians), *ferruginous* (Nothochlæna Marantæ). It is either *arborescent* (Cyathea), *subarborescent*, (Aspl. esculentum), *erect*, (Aspl. maximum), *branched* (P. proliferum, Lygodium and Gleichenia), *dichotomous* or branching in pairs, (Gleichenia dichotoma). In Gleichenia and Lygodium it is called a *stipe*, and in the latter, *petiole* is used for the *primary* (from main stem) and *secondary* (from last again) stalk of *pinnule*.

12. The *frond* is in shape *spathulate* spoon-shaped (P. adnascens), *lanceolate*, or lance-shaped( Cheil. varians) *ovate* or egg-shaped, (Onychium japonicum), *deltoid* or triangular as the Greek letter delta (P. Dryopteris, N. sparsum), Ad. venustum ; or these are modified by combination as *oblong-lanc.* (N. spinulosum); *ovate-lanc.* (P. appendiculatum, Dipl. japonicum), *ov. acuminate* (Cheil. fragrans), or by a prefix as *subdeltoid* partially deltoid (N. cicutarium); is caudate or tailed, (Ad. caudatum and lunulatum,) when it roots again from its prolonged extremities. When young it is generally rolled like a crozier (Nephr. barbigerum) and the *vernation*, or mode of unfolding growth, is then *circinate* ; in a few species only
(Ophioglossacieæ), the vernation is erect. It is entire (Aspl. ensiforme, P. membranaceum) when altogether without cutting. When cut—the cutting estimated from the ultimate or final divisions,—it is pinnatifid when cut less than down to midrib or rachis, (Aspl. alternans, P. ebenipes, amænum) pinnate when cut down completely to rachis into separate sessile or unstalked pinnae, (Pteris longifolia, Woodsia elongata), stalked below, sessile above (Aspl. longifolium) stalked (Ad. lunulatum, Aspl. Trichomanes, Aspidium falcatum).

When the pinna is again partially or completely cut to its rachis, bi or twice is prefixed, and the frond is in the former case bipinnatifid (Aspl. japonicum Nephr. canum and Filix Mas. P. auriculatum and appendiculatum) bipinnate in the second instance (Nephr. barbigeraum Aspid aculeatum); cut partially, or completely to this third rachis, it is tri (thrice) pinnatifid (Aspl. poly-podiodes, D. urophylla) tripinnate (Aspl. nitidum) respectively. Similarly divided partially or quite to fourth rachis, the cutting is quadri—(fourth) pinnatifid (D. chærophylla Aspl. fimbriatum, Onychium japonicum) quadri pinnate, (D. nodosa). A frond almost bipinnate is bipinnatifid only. If Onychium japonicum or any other finely divided frond be taken, and division by division broken off from the main stem, we have a ready illustration in cutting.

13. The following peculiarities of habit and growth are convenient to remember:—
Eremobryoid Series.

Humata { Davallia.  
Leucostegia

Oleandra.
Eupolypodium  
Goniophlebium { Polypodium.
Niphobolus  
Phymatodes


,, arborescent. Cyathea Hemitelia Alsophila.
Dicksonia Barometz.

Acrost. (Gymnopteris). (Chrysodium). Drymoglossum.

,, grasslike. Vittaria.

,, matted beneath. Nothochlæna P. (niphobolus.)
P. angustatum.


,, with alternate divisions linear, cuneate, Onychium. Aspl. (Darea), Actiniopteris radiata.

,, with segments dimidiate. Dav. (Odontoloma).

,, Adiantum. Lindsaya.

,, or subdimidiate Dav. immersa.

14. As a rule, fertile and barren fronds do not differ; when they do, the species is *dimorphous*, two-shaped: this is not a narrowing only of fertile frond which is a
common occurrence, *Pt. cretica* for instance, and due to inversion of margin, but a change of form, as in *Drynaria* (polypodium) when the sterile frond resembles a withered oak leaf, *Onoclea*, *Cryptogramme*, *Lomaria*, and many *Acrostichums*; among these also an intermediate difference is sometimes seen, as in *A. variabile* and *quercifolium*. It must not be forgotten that young fronds sometimes vary developmentally in shape and colour from the type, as *Woodwardia radicans*. Fronds are also often affected by their locality; *Ad. caudatum* exposed to the sun is coriaceous, under the next bush, subcoriaceous or herbaceous; and the cutting is much deeper in the former position. Plants in certain situations cease to be farinose as they develop, also with diminished cutting, as *Cheilanthes farinosa*, the *Ch. Dalhousiae* of higher rock, where it grows more luxuriantly. Frond and stem are measured separately.

15. A change of cutting affects venation (§ 17) by the division not descending to lowest veins, which therefore unite in arches, *Pteris quadriaurita* thus probably assumes a so-called Campteriod form as *pt. (compt.) biaurita*; a mode of variation which may also possibly extend to other plants at present reckoned as species, as *Aspl. ceterach* and *alternans*, &c. Whenever therefore an abnormal form is found affecting all the fronds of a plant, anything unusual in its surroundings should be noted, and its neighbourhood searched for intermediate stages of development. There is an obscure fern *Psilodochea salicifolia*, reported to have been found near Lahore, like
Angiopteris evecta, but without an involucre, which requires searching for and investigating.

16. Pinnae are described also by the same terms as the frond, in regard to their shape, as dimidiate one half undeveloped (Aspl. heterocarpum and resectum) oblong (N. polymorphum) lance. (Aspl. subtriangularare) cuneate, wedge-shaped, &c., fiabellat cuneate fan-wedge-shapedo-to-cun (Ab. lunulatum, Cap. veneris, &c.), and are acute, or sharp-pointed, Aspl. planicaule), acuminata or longpointed (P. lineatum); and are stalked (Aspl. planicaule) or sessile without stalk (Ad. caudatum); are spreading (N. Molle & pteroides), close (N. cucullatum) horizontal (N. crinipes) &c. Their divisions are into pinnales, cut again into segments, which again may be lobed. These ultimate divisions are, as to shape, in similar terms, blunt, acute, crescentic, oblong, &c. and may further be aristate, armed or bristled, (Aspid. aculeatum). Some ferns are proliferous from upper surface of pinnae, where a complete young plant is formed, as Woodwardia radicans, and some Aspleniums, especially bulbiferum. In Lygodium the pinnaule is stalked or petiolated.

17. Venation is the mode in which veins are arranged, and requires particular attention as affording the basis on which classification proceeds in subdivision of genera. It is free (Dicksonia) when the veins do not unite directly or indirectly with one another, springing from rachis as a main vein, and running towards or to margin, (Polystichum, Lastræa, Eupteris). When these
veinlets are unbranched it is *simple* (Darea); when branched, pinnately or irregularly, it is *forked* (Lastraea apiciflorum and Filix Mas.)

When the veinlets of contiguous groups, instead of being lost on the frond, or so ending at margin, unite, the venation is compound; and this may occur in various patterns; pinnately, the lower series meeting in arches, (Eunephrodium, Goniopteris); arching freely (Anisogramnium, Meniscium); forming a network of *areolae*; when it is *anastomosing*, uniform and hexagonal, (Antrophyum Hemionitis) irregular, Cyrtomium, Pleocnemia, Cyrtomiphlebium); each areola including one or more free veinlets, one (Goniophlebium) two (Campyloneuron) two or more spreading, (Amphiblestra, Sagenia, Phymatodes, Selliguea). Main veins may (Campyloneuron Goniopteris) or may not (Phymatodes) be distinct to edge, or indeed throughout (Chrysodium) and all the veins may be observed (P. normale, Allosorus, Platyloma).

18. *Surfaces* are smooth or *glabrous*, rough or *scabrous*, covered with firm points or *muricate*; short haired or *pubescent*, cottony or *tomentose*, coated with fine soft hairs or *villose*, (Woodsia elongata); *viscid* as in P. punctatum.

19. *Texture* refers to firmness of structure, and is *herbaceous* (D. chærophylla) *coriaceous* (Asp. aculeatum) *pellucid* (Adiantum); combinations and the prefix of papyraceous, and of sub again modify these terms, papyraceo-
herbaceous (Ad. lunulatum, Nephr. dissectum) subcoriaceous (Nephr. splendens and syrmaticum).

20. Scales are of various shapes, peltate or shield-shape, ovate-lanc. linear, &c.; and are adpressed or closely adherent, deciduous or easily detached and falling off, ferruginous, rusty-coloured; and vary through shades of brown to black. They are usually found on stems, but may extend to under-rachis, and are largest at base of stem. In describing these, basal scales should first be noted.

Having so far gained a general idea of these different parts, the following description of a few common species should be compared, step by step, with living specimens:—

P(olypodium) (Phym.) membranaceum, Don; rhiz(ome) stout, scales ovate, spreading, membranous, lurid green; stem 1—4 in. l.(ong), firm, erect; fr.(ond), 1—3 ft. l., 2—6 in. broad, edge entire or repand, both ends narrowed gradually; text. very thin, membranous; main veins distinct with very copious fine areolæ with free veinlets between them; sori mostly in 2 rather irreg. rows near main veins.

A.(splenium) alternans Wall.(ich); st. tufted 2—4 in. l., clothed with linear scales; fr. 6—8 in. l. 1—1½ in. br. lanc. obl.(ong), cut down into numerous bluntly rounded lobes on each side, which reach very nearly down to rachis, the lower gradually growing smaller and some-
times distinct; text. subcoriaceous. both surfaces an opaque greyish green; veins free, subflabellate; sori copious.

D. (avallia) (Leucos.) chærophylla, Wall. rhiz. wide-creeping, clothed with broad obtuse adpressed scales; st. 4—6 in. l., naked; fr. 9—15 in. l., 1 in. br. lanc. delt. 3 or 4 pinnatifid; lowest pinnl. (nules) 1—2 in. l., 1 in. br. cut down to narrowly winged rachis into deeply pinnatifid segm. (ents), ult. lobes narrow and acute in fertile, rather broader in barren, fr.; text. thinly herb., rather flaccid; sori copious, at base of teeth of segm., which they about equal in breadth.

21. The fructification at back of frond consists of groups of capsules (sporangia) covered (indusiate) or not (non-indusiate) by a membranous covering called the indusium, or more generally, involucre.

This involucre in shape is globose, (Cyathea, Dicksonia) reniform (Nephrodium, Oleandra) tubular (Davallia, Trichomanes) of same shape as sorus (Asplenium); it is lipped (Trichomanes, Dicksonia) or entire as generally; is in texture soft membranous (Woodsia) subcoriaceous (Woodwardia) coriaceous (Sphæropteris), formed of changed margin of frond (Pteridieæ); arising from beneath sorus and therefore inferior, (Cyathea, Woodsia) from above and superior, (Aspidium). Its character is best determined by the aid of young fronds, which should be observed in different stages of fructification. Many ferns shed their involucre early, it is evanescent, or deciduous; and since this envelope determines the shape of sorus and
the genus, species have often been described as nonindusiate from the involucre having already disappeared. Between the peltate centrally fixed involucre of Aspidium and the reniform one, attached by its sinus, of Nephrodium, many transfers have been made tending to the absorption of Aspidium in the latter genus.

22. Sori are arranged in definite relation with the veins, and their position with regard to these and to the margin and midrib must be carefully noted. Whether marginal or medial, submarginal, &c.; whether upon, or at end of vein or veinlet; whether on both sides as in Diplazium and Anisogonium. In the nonindusiate orders, Polypodium and Acrostichum, the venation and the relative position of sori must be carefully noticed, often most readily by holding up the frond to the light, or to a lamp, and looking through. In all cases a small magnifying glass is necessary.

This fructification consists, not of seed, but of minute spores grouped in capsules (sporangia), encircled generally by an elastic jointed ring, complete or incomplete, and covered or not by indusium, through which these spores are in various ways discharged, and develop into cellular unisexual plants called prothallia, the male Antheridium, and the female Archonia. From the former a ciliated spiral filament emerges, and entering the central canal of the archyonia, is secured there by resulting cell development; and thus fertilised the vesicle within produces the stem of the young fern.
23. Spores may be best made to germinate by broken bits of seeded pinnæ being laid on pieces of charcoal placed in a flower pot half filled with wood-ash, pounded bricks, or earth well burnt so as to destroy other germs. The pot must be well drained, covered with a bell glass or tumbler, and kept standing in a saucer of water; in the bath-room, if in the plains. A plate of glass does not sufficiently exclude the dry hot air, damp tolerably uniform heat being essential to germination. Young plants, as they are formed, must be removed by cutting the charcoal through beneath with a penknife, and placed in a shaded pot similarly kept damp and protected, the soil for which may be made with equal parts river sand and leaf mould (decayed leaves). Good drainage is a necessity, and small pieces of gumlah should be freely placed at bottom of the pots, on which shreds of old kuskus grass or moss may be laid beneath the earth, and the sides, as well as bottom of the pots should be bored low down. Spores may generally be shaken from paper in which fronds are kept.

24. Ferns are grouped by genera and sub-orders into an Order Filices. The parts above described together form an individual plant or species, which differs from other individuals by slender shades of differentiation, yet always retains its own character and propagates itself only. Several such species are grouped into a genus, which holds them together by a character common to all; genera of true ferns are similarly grouped into Tribes, and these again into Sub-orders. Naturally the Order consists of
the great division of ferns having a ringed capsule, and sometimes now called true ferns, which are ranged in two—indusiate and nonindusiate—series, and of a few additional genera grouped in four additional sub-orders of genera without this encircling ring, the capsules being sunk in a fleshy or coryk receptacle. These additional sub-orders are Osmundacese, Schizaceae, Marattiaceae, and Ophioglossaceae; the genera are few, and they are not arranged in Tribes. The true ferns have a well marked similarity between the two series, which as it were represent one another, the indusium only presenting a difference; Cystheca and Alsophila, for instance, Asplenium and Gymnogramme, Cheilanthes and Nothochlæna, &c.

25. Species appear to ally one genera in same series to another, (Meniscium cuspedatum and P. urophyllum); D. (odont) repens is a doubtful Lindsaya. These are Indian plants, and offer a good field for further observation. Light may be thrown on the true relationship of genera, by a careful study of variable ferns, whose range of variation and number are greater than was supposed, to the obliteration of several named species. A wide field is still therefore left for future observation and research in scientific pteridology.

26. Ferns are commonly spoken of by their subgeneric name, which in many cases was that of former classifications; but in writing out lists for guidance, it is better to add this last in brackets. Thus: Nephrodium canum a lastræa, should be Nephr. (lastr.) canum; Diplazium
polypodiodes as Aspl. (dipl.) polypodioides; phlegopteris punctatum, Polypodium, or P. (phleg.) punctatum.

27. The locality of the species is mainly taken from Mrs. Lyell's useful Handbook, where will be found a ready reference to neighbouring groups, Mascarene eastward, Southern Indian to Cingalese and Malayan southward; partly from private sources, and where possible a particular spot has been indicated from personal observation. Should this compilation prove useful, the Compiler would gladly avail himself of any special information as to localities which may be placed at his service, there being reason to suppose that this list of Himalayan species is by no means exhaustive. Private collections are often indiscriminately mingled, and not a safe guide; even in a collection of Bojer's a foreign species added by accident was thus for a long time sought for, of course in vain, as a local Mascarene plant. But in Bargi forest, near Narkunda, several southerly ferns are reported to have been collected.

28. So many names have been given by different collectors to widely distributed species as to present a difficulty at times. Where such synonyms are likely to be locally useful, they are given.

Local names for species are too few to be of service in the Analysis. Roxburgh gives the following:—

Ceratopteris thalictroides. Jangli Jhau, Beng.
P. quercifolium. Goroor, Beng.
Hemionitis cordata. Chacooly, Beng.
Lygodium pinnatifidum. Bhootrag, Beng.

29. The following Analysis consists of two tables. Table first containing genera, the second species.

Table I should be studied with the aid of any ferns at hand, and the principal genera made familiar, Asplenium, Aspidium, Nephrodium, Polypodium, then Davallia and Gymnogramme, and in the southern Himalayas, Acrostichum. When a plant can at sight be assigned to one of these genera, the student will find his labor easy. Fronds should be gathered at intervals by the way, examined, and the genera determined for practice until the horseshoe shape of Athyrium is not liable to be mistaken for the full kidney sorus of Nephrodium. When Table I is thus mapped out in memory so as to require only occasionally consulting, reference to the genera can be made directly to Table II, and the name of the fern under examination at once found.

30. *Abbreviations* have been freely used to save space and facilitate reference, but with the occasional full printing they need be no puzzle, as *pinnifid.* for pinnatifid, *membr., cor.,* for membranaceous, coriaceus, *fr.* and *segm.* —frond and segment, &c.
GLOSSARY.

Acuminate, long-pointed.
Acute, sharp-pointed.
Adpressed, pressed close.
Aristate, awned.
Articulated, jointed.
Auricled, with appendages, eared.
Bipinnate, twice pinnate.
Caespitose, tufted.
Caudate, tailed.
Caudex, stem.
Circinnate, folded like a crozier.
Concrete, massed together.
Coriaceous, leathery.
Crenate, marginal divisions rounded.
Dentate, toothed.
Dichotomous, forking in pairs.
Digitate, divided as fingers.
Dimorphous, of two shapes.
Discoidal, disklike.
Entire, without marginal divisions.
Exserted, prolonged outside.
Falcate, scythe-shaped.
Flabellate, fan-shaped.
Glabrous, smooth.
Glaucous, with pale sea-green bloom.
Hypogaeous, underground.
Incised, cut deeply.
Indusium, involucre.
Involucre, membrane covering seed.

Lanceolate, lancet-shaped.
Lunulate, crescent-shaped.
Mucronate, st Rf point ed.
Muricate, covered with fine points.
Ovate, egg-shaped.
Peltate, shield-shaped.
Petiole, stalk of pin. Lygodium.
Pinnate, with separate pinnae.
Pinnatifid, not cut to rachis.
Proliferous, producing abnormal buds.
Pubescent, short haired.
Quadri, four times.
Rachis, midrib.
Receptacle, in which sori rest.
Reniform, kidney-shaped.
Repand, margin wavy, sinuous.
Rhizome, horizontal stem above or under ground.
Scabrous, rough.
Serrate, toothed like a saw.
Sessile, without stalk.
Stipe, short stem.
Tetragonal, square.
Tomentose, cottony.
Tri, three times.
Truncate, cut abruptly.
Vernation, mode of growth.
Villos e, coated with soft hairs.
ANALYSIS OF GENERA.

GEN. 3—47.

SORI FURNISHED WITH AN INVOLUCRE.

† SORI GLOBOSE.

* Dorsal.

At or near forking of vein (Cyatheae).

On vein or in axil of forking of vein.

Invol. globose covering sorus, bursting at top, and forming a cup.

Caudex arborescent, fr. ample.

On vein or veinlet.

Invol. a scale, deciduous.

Invol. globose, hard, bursting, irregularly at top.

4 Cyathea.

5. Hemitelia.

On back or apex of vein (Dicksoniæ).

Of contracted frond, quite concealed by revolute margins of pinnae.

Invol. delicate, membranous, half cup-shaped, originating from beneath sorus.

9 Onoclea.

(Fronds dimorphous, herbaceous, large).

Invol. soft membranous, cup-shaped or globose, bursting at top, margin fringed or irregularly lobed.

7 Diacalpe.

11 Woodsia.

(Fronds small, herbaceous, much tufted.)

Invol. globose, coriaceous, bursting vertically into two spreading lobes.

12 Sphæropteris.

** Intramarginal.

Invol. subglobose, cup-shaped, entire or two-valved.

13 Dicksonia.

(One half the species arborescent, with large coriaceous decompound fronds: the other half with creeping rhizomes).
Marginal.

Terminating costa or vein, sunk in frond or exserted, invol, of same text, as frond, receptacle elongated.

Invol. two-lipped, toothed or fringed or entire, receptacle columnar.

(Frond small, delicately membranous).

16 Hymenophyllum.

Invol. tubular, with winged or truncated or slightly two-lipped mouth: receptacle filiform.

(Habit similar to last).

17 Trichomanes.

Intra or submarginal, globose or elongated either way.

Invol. terminal on veins, free at apex.

(Four types of involucre, and two distinct habits of growth. Veins free).

18 Davallia.

Invol. membr. like a hood.

(Fronds small, text. thin. Veins free).

19 Cystopteris.

† † Subglobose.

Dorsal.

Invol. orbicular, fixed by centre: sori terminal on veinlets.

Invol. reniform attached by sinus.

Sori dorsal or terminal on veinlets.

(Species numerous, differing widely in size, cutting, and venation).

43 Aspidium.

Invol. reniform attached by sinus.

Sori at apex of upper branch of vein, generally near edge.

44 Nephrodium.

Fronds pinnate, veins free; pinnae articulated at base, dotted (cretaceous) white on upper surface.

Sori in row near base, or below centre of compact, free veinlets.

45 Nephrolepis.

† † † Linear.

At or near edge of frond, at apex of and uniting two or more veins.
Invol. double, opening outwardly, inner valve formed of slightly changed margin of frond.

20 LINDSAYA.

Pinnæ overrided, quadrant-shaped.

† † † † LIN. OROBL.  

Invol. formed of reflexed edge of frond, opening inwardly.

Sori obl. globose to linear.

(Segments onesided, text. pellucid). 21 ADIANTUM.

Sori subglobose, becoming confluent and lin.

25 CHEILANTHES.

Sori continuous linear; connecting several veins. Invol. pressed down reaching from edge of segment to midrib. 2 ONYCHIUM.

Sori dotlike upon veins, soon becoming confluent and linear.

(Habit of Cheilanthes; text. coriaceous.) 30 PELLEA

Sori lin. continuous. 31 PTERIS.

Sori filling whole space between edge and midrib, frond dimorphous. 33 LOMARIA.

Frond floated by air-cells in water. 32 CERATOPTERIS.

Sori near midrib

In parallel rows; invol. subcoriaceous closing in sori. 36 WOODWARDIA.

In continuous line; invol. distinct from edge of frond 33 BLECHNUM.

Sori attached to veins, obliquely to midrib: invol. when single, opening towards midrib, (Asple- nieæ.)

Invol. straight or curved (Athyr.) single, Euasple- nium and Darea, or double (Dipl. Anisog). 38 ASPLENIUM.
Invol. bursting irregularly down centre: sori on primary veins.
(Single species.) 39 Allantodia.
Sori submarginal.
Frond flabellate. (Single species).
40 Actiniopteris.

Sori without involucre.—Gen. 2 and 60—48—61.

Sori on back of lobes, (to 55.)
Fr. creeping, branched or dichotomous: segm small, suborbicular or pectinate.
2 Gleichenia.
Fr. arborescent: sori globose, at or in forking of vein.
(Distinguished from Cyathea by absence of involucre).
6 Alsophilla.
† Sori not more than twice as long as broad: round. rarely obl.
48 Polypodium.
* Desmobryoid series. Stems continuous with caudex (as Aspidium): sori medial on veins.
Euphlegopteris Goniopteris, Dietyopteris.
** Esemobryoid series. Stems articulated to rhizome: sori (generally) terminal on veins.
Eupolypodium, Goniophlebium, Campyloneuron including Niphobolus, Phymatodes including Drynaria and Dipteris.
(The largest genus, including the above two different habits of growth, and various kinds of venation.)

† † Sori more than twice as long as broad, usually linear.
On veins over undersurface, simple or forked.
52 Gymnogramme.
Habit and growth of Aspidium: sori not forked. (Leptogramme Stegnogramme).


54 Meniscium.

On veins imperfectly reticulated.

55 Antrophyum.

On veins copiously reticulated, and sometimes also between them. 59 Hemionitis.

† † † Sori in single line.

Between edge and midrib: fr. dimorphous.

58 Drymoglossum.

In margin of grasslike fr. 56 Vittaria.

Marginal: obl. or roundish, soon becoming confluent and lin.: fr. matted beneath, edge frequently inflexed. 50 Nothochlœna.

† † † † Sori widespread, 60—61.

General over under (rarely both) surfaces.

60 Achrostichum.

In patches on upper part of undersurface: fert, fr. stag-hornlike. 61 Platycerium.

Sori in separate panicôles.

62 Osmunda.

in distichous spikes at apex of frond.

64 Schizœa.

in spikes or pinnae, wide scandent climbing. 68 Lygodinium.
Sori in capsules sunk in a many-celled receptacle, opening by clefts.

*Capsule sessiles* 69—72.

Opening by cleft down side, close to one another in boat-shaped sori, near edge of frond.

69 *Angiopteris*.

In raised, circular, hollowed masses, with oblong clefts on inner face: frond like chestnut leaf.

72 *Kaulfussia*.

Capsule deeply two-valved, opening down side nearly to base, vernation erect.

73 *Ophioglossum*.

Capsule in small crested clusters, forming a long, loose spike.

74 *Helminthostachys*.

Capsule sessile, in two rows on face of spikes, which form a compound panicle.

75 *Botrychium*.

69, 72, 74, each a single species. 69, 75 differ from the true ferns in the sori not being held together by an elastic ring.
ANALYSIS OF SPECIES OF NORTHERN INDIAN FERNS.

Sub-order I.—Gleicheniaceae.

Genera 2.—Gleichenia (f Mertensia).

2. Stipes zigzag, repeatedly dichotomous. dichotoma.

Sub-order II.—Polypodiaceae.

Tribe I. Cyathea.—Gen. 4 Cyathea (Tree Ferns).

1. Fr. and main rach. strongly aculeated. spinulosa.
Loc. Continent generally.

5. Hemitelia (Tree Ferns).

1. Fr. 3 pinnate, pin. obl. lanc., pinml. subsessile. decipiens.

6. Alsophilla (Tree Ferns),

f Frond 3 pinnatifid.

1. St. and rach. paleaceous at base, purplish brown, glossy, prickles short, tipped with gland; surfaces galbrous, glaucous beneath: text. coriaceous; veins once or twice forked.
(Brunoniana Wall). contaminans.
Loc. Assam to Naga Hills, Khasia, Mishmi, Cachar, Sylhet. Bedd., F.B.I., 85-6,
2. *St. and rach.* paleaceous; scales pale brown; *rach.* tawny villose above; *fr.* yel. green, glabrous scaleless; *veins* rarely forked; *sori* orange colored, (unarmed). *Comosa.*


3. *St.* paleaceous at base, asperous; *st. and rach.* purple ebeneous, polished; *text.* subcoriaceous membranaceous; *veins* pinnated, *veinlets* simple. *galbra.*


4. *St.* aculeate at base, muricated upwards, dark mahogany brown; *surfaces* upper dark green, naked, lower naked or slightly hairy and scaly; *text.* herbaceous; *veins* forked. *latebrosa.* (Khasyana Moore).


5. *Rach.* dark castaneous, naked, rough beneath with raised points; *surfaces* green with ribs densely bristly, not scaly; *text.* firm thin; *veins* 9—10 forked. *Andersoni.*


6. *Rach.* castaneous, naked and smooth beneath; *surfaces* green, without hairs or scales; *text.* firm; *veins* 6—7 simple. *Scottiana.*


(ff *Fr. tripinnate.*)


7. **Diacalpe.**


II.—**Dicksonieæ.**


Loc. Sikkim, 12,000 ft. Assam. Bedd. 130 & 171.

* Invol. smaller than sorus, fringed with hairs that extend beyond. (Euwoodsia).

Fr. glabrous; st. and rach. slightly hairy. hyperborea.

14. Fr. shaggy. lanosa.
Loc. Sikkim, 14—16,000 ft. Kumaon 11—12,000 ft.

** Invol. larger than sorus. (Physematium).

2. Fr. shaggy. lanosa.
Krande. 10,000 ft. Bedd., F.B.I., 14.

12. Sphæropteris.

1. Fr. 3 pinnate, 2—3 ft. 1. barbata.


2. Fr. deltoid or lanc., pinn. not cut to midrib; text. thinly herbaceous; stipe often asperous and hairy. scabra.
Loc. Rock. Assam to Simla. (Chadwick falls below Bishop Cotton School to third waterfall).

3. Fr. lanc. 12—18 in l., pinnl. cut to midrib; text. herb. appendiculata.
(Resembles Ath. filix fiem. in habit).

III.—Hymenophylleæ.


* Fr. glabrous, 1—5.

Fr. bipinnatifid.

1. Pin. large lanc., with central half entire. exsertum.

Fr. tripinnatifid, 2—5.
† Stem wingless.

   Loc. 11,000 ft. Sikkim. Himal., (intermediate between, last and following).

   Blumeanuni Spr., F. S. I., 256.

† † Stem winged.

4. *Fr.* obl. or ovate lanc. acuminate; *st.* winged above only. *badium.*

   (Fimbriatum Sm.)

** Frond ciliated and hairy on surface.


*** Margin of frond spinuloso-dentate (Leptocionium).

Fr. not crisped, more or less compound, 7—9.

7. *St.* naked, slender; *fr.* pinfid to broadly winged *rach.* *Simonsianum.*

8. *St.* naked or tomentose; *fr.* bipinfid; *rach.* ciliated below, winged above. *Smithii.*

17. **Trichomanes.**

* Fr. with distinct central costa from apex to base.

1. Fr. $\frac{1}{4}-\frac{1}{2}$ in. l., edge minutely ciliated. **exiguum.**
   Loc. Western Ind. Bedd., F. B. I., 275.

** Fr. entire below, palmate or digitate above.

2. Fr. $\frac{1}{2}$-in. each way. **nanum.**

*** Fr. deeply pinnatifid, main rachis not winged in lower part, 3—6.

3. Fr. bipinnatifid; st. strong. (dissectum). **auriculatum.**

** Fr. tripinnatifid, 4—6.

4. Rhiz. slender, wide creeping, 4—5.
   Mouth of tube two-lipped; text. firm. **Filicula,**

5. Mouth of tube broadly dilated; text. herb. **pyxidiferum**
   Rhiz. wiry; st. ascending.
   Loc. generally as last. Khasia and below.

6. L. *pin.* and *pinnl.* ov. rhomb., cut down to narrowly-winged rach. **radicans.**

*** *Main rachis quite free.

7. Fr. simply pinnate, *pinnl.* not divided; caudex tufted. **Javanicum.**
   Loc. tropical Hindustan.
IV.—Davallieae.

18. Davallia.

(1) A. Stem articulated at point of junction with caudex. Esemobryoid series, 31—42.

f. Invol. coriaceous, reniform, attached by a broad base, sides and apex free.

* Invol. ample. Humata.

Loc. trees, Khasia. Sylhet southward.

** Invol. small, narrow, thin. (Leucostegia).

† Rhiz. creeping, 4—7.

2. Rhiz. hypogœus (underground); segm. subdimidiate. immersa.

The only Dav. with underground rhiz.
Loc. 7—8,000 ft., shady bank and rock. Sheopore Mt. Parasnath. Landour, Jaberkait. Simla, rock on upper path descending to glen; Chadwick falls.

3. Fr. pinnate, lanc., main rach. slightly winged above. membranulosa.

4. Fr. 2 to 3 pinnatifid lanc. subcoriaceous; rhiz. scaly, silvery brown. Assamica.
Loc. Assam to Bhotan. Bedd. F. B. I., 94.

5. Fr. bipinnate, ovate-delt. multidentata. Thomsoni Moore.
Loc. 5—7,000 ft. Himal. of Sikkim and Nepal.

6. Fr. 3—4 pinnatifid lanc. delt. flaccid. chærophylla. Pulchra Don.

7. Fr. pinnate lanc. delt. Clarkei.
Doubtfully distinct from last (Hookeri Moore).
Loc. 8—19,000 ft. Khasia. Sikkim.
† † Frond tufted.

8. Fr. 4 pinnate, broadly ovate, 2—4 ft. l.; text. herb. *nodosa.*

Loc. 7—10,000 ft. Sikkim. Bedd. F. B. I., 93.

9. Caudex erect; st. grey stramineous, slightly scaly; fr. deltoid, 1—2 ft. l. 4 pinnatifid; surfaces green with scattered subulate scales; text. membr. *setosa.*


*** Invol. as last, becoming confluent; pinnl. pel-lucid, herbaceous, dimidiate. (Odontoloma).

10. Fr. pinnate. *repens.*


f f. Invol. coriaceous, attached at sides as well as base, half cup-shaped. (Eudavallia.)

* Fr. ample deltoid, tri or quadri-pinnatifid, coriaceous.

11. Fr. 3 pinfid., 2—3 ft. l., sori at some distance from edge obliquely to central veins. *divaricata.*


12. Fr. 3—4 pinfid., 1 ft. l. or less; sori large, broadly cup-shaped. *Griffithiana.*


13. Fr. 4 pinfid., sori with horns outside. *bullata.*


B. Stems continuous with caudex. (Desmobryoid series) 14—21.

f f f Invol. membranaceous, attached at sides as well as base, shallow, half cup-shaped. (Microlepia).

Rhiz. wide creeping, 14—17.

Fr. pinnate 14—15.

14. Fr. truncate and auricled above; toothed. *Hookeriana.*

15. Fr. bluntly lobed half way or less to rach. * marginalis.*
Bedd. F. B. I., 102.

Fr. bipinnatifid.

Loc. Khasia. Himal. 3—5,000 ft.; similar to last in habit.
Bedd. F. S. I., 255.

Fr. tripinnatifid.

17. Pinnl. cut nearly to rach. below. * platyphylla.*

18. St. strong erect; pinnl. cut down to rach. below.
* caudigera* Moore. * urophylla.*

Fr. 3—4 pinnatifid: deltoid.

19. St. strong erect; text. coriaceous.
* hirta.*

Habit of next, combined with text., and prominent venation of *strigosa.*

20. St. erect; text. herbaceous; fr. 3—6 ft. 1, 12—24 in. br.

Loc. shady marsh, 1—7,000 ft., Assam. Nepal.

ffff Invol. forming compressed suborbicular or cup-shaped pouch, terminal on segment, and open only at top.

* Ult. segm. cuneate. (Stenoloma).

21. Fr. 4 pinfid, upper surface shining. * tenuifolia.*
* Chinensis* I. Sm.
Simla, below Cotton’s school, on damp rock.


1. Fr. 3 pinfid. ov. lanc.
V.—Lindsayæ.

20. LINDSAYA.

* Fronds pinnate below. (Schizoloma.)

1. Rhiz. short creeping, st. flexuose; text. coriaceo-membr. cultrata.

2. Rhiz. wide creeping; st. erect; text. pellucid. pectinata.
Habit of Daval. repens.
Loc. Assam.

** Main rachis branched.

3. St. wiry, blackish, polished. flabellulata.

ff Pinnæ equilateral; veins anastomosing. Fronds entire or pinnate, not pellucid. (Schizoloma.)

* Fruit in continuous line along both margins.

4. Fr. pinnate below. ensifolia.

VI.—Pterideæ.

21. ADIANTUM.

* Frond simply pinnate. rachis often elongated and rooting at apex. (Radicantes group).

f Veins free. (Euadiantum) to 6.
1. *St.*, *rach.* and *surfaces* naked; *text.* herb. *lunulatum.*

2. *St.* tomentose, *rach.* and *surfaces* villose; *text.* coriaceous. *caudatum.*

*B var. Edgeworthii, text. membr., surf. glabr., pin. subentire.*

* * * *Frond more than once pinnate, segments flabel-late-cuneate, with petiole near centre; sori obversely reniform.* (Capillus Veneris group).

3. Lowest *pin.* branched; edge of *segm.* rounded, deeply lobed, lobes contracted. *Capillus Veneris.*
Loc. wet rock. Himal. to 6,000 feet. Assam to Simla, and in wells throughout plains.

(More coriaceous in text. than last).

* * * *Fr. dichotomously forked, with numerous *pin.; springing from upper side of each of two branches.* (Pedatum group).

5. *Text.* pellucido-herb.; *pinnl.* broadest next stem, lobed sometimes 1-3rd down, lowest shortly stalked *pedatum.*
(Main forks 4—6 branched from upper side, central largest)

6. *Text.* coriaceous; *pinnl.* entire or slightly toothed, lower edge nearly straight, upper rounded, outer blunt. *flabellulatum.*
25. *Cheilanthes* (ff *Eucheilanthes*).

* Segments large and flat 1—5.

1. *St.* densely scaly throughout.  
   Loc. N. W. Himal., 5,000 ft.  
   * St. polished 2—6.

2. *Fr.* 2 *pinfid*, lanc., surface naked, text. herb.  
   *Maderensis* Lowe.  

3. *Fr.* ov. lanc., *rach.* slightly pubescent, lower surface only villose, especially on costa, *invol.* greenish.  
   *subvillosa.*  

   *Hattoo.*  
   Loc. Simla to Kumaon to 10,000 ft. Denudate variety of farinosa. Bedd. F. S. I., 193. This and last differ from the rest in their broader *segm.* and more herbaceous texture.

   *tenuisolia.*  

*ff Segments very small, beadlike (Physapteris).*


*ff Frond coated beneath with white or yellow powder. (Aleuropteris).*

* * * * St. densely tomentose.

7. *rufa.*  
8. Fr. delt. 3—4 in. l., 2—3 pinfid.; st. polished; powder white, ceraceous.
Powder yellow, var. B Chrysophylla.

9. Fr. deltoid or lanc., powder pure white. farinosa.
(Much larger than last, and doubtfully distinct from Dalhousiæ). Bedd. F. S. I., 191.
Loc. exposed rock to 7,000 ft. Assam to Simla. Hattoo.
9,000 ft. Around Masuri and Simla replaced by Dalhousiæ form above 5,000 ft.

27. Onychium.

1. Invol. and sori golden. auratum.
Invol. and sori brown. japonicum.

29. Cryptogramme.

1. St. tufted, fert. segm. podshaped. crispa.
B var. Brunoniana Wall, fert. segm. obl.

30. Pellæa.

f Text. herbaceous or subcoriaceous; veins distinct; invol. broad. (Cheiroplecton).

1. Fr. ovate lanc., 2—3 pinfid.; st. not tufted, fert. fr. contracted. gracilis.

2. Fr. deltoid, 3 principal pinnae. Tamburi.
Loc. Tambur Valley, East Nepal.

ff Text. coriaceous; veins indistinct.
† Invol. broad, conspicuous. (Allosorus.)

3. Fr. 2—3 pinnid. nitidula.

†† Invol. narrow, sori hidden. (Platyloma.)


31. PTERIS.

f. Veins free, 1—12.

½ Stems cespitose, invol. singlé, to 11:
* Lower pinnae linear, entire.

1. Fr. obl. lanc. longifolia.
Loc. to 4,000 ft., common. Himal. and plains. Masauri, Camptie falls, Murray’s falls. Simla, Prospect Hill S. Road sides above Kalka.

** Lower pinnae forked, with a long lin. entire point.

2. St. polished, bar. pin. edge serrated, fert. narrower; invol pale. Cretica.

B var. stenophylla, pin. 3—5, clustered at apex, edge entire, all same breadth, and mostly fert.

3. Lowest pinnae only occasionally forked, both surfaces bright green glossy. pellucida.
Not satisfactorily distinct from former.

Loc. Assam to Mishmi and Nepal.

4. *Pinnata* arising from near same point, lin. slightly serrated; veins conspicuous, 1 line apart at base.

*(Habit of *Stenophylla*, with different venation.)*


5. *Fert. pin.* compound; lower barren pin. subdeltoid, cut down to rach. below into 4—6 ovate obl. slightly toothed pin.

*ensiformis.*

*Barr. fr.* of present *fert.* of next group. *Crenata* Sw.


* * * * *Lowest pinnæ pinnate.* *(pinnatæ.)*


7. *Fr.* 6—9 in. broad.


* * * * *Lowest pinnæ at base pinnatifid.* *(Bipartitæ.)*

*Fr.* with terminal and similar lateral pinnæ.

*Fr.* 3 ft. or less 1.

8. *Lobes* entire or serrated, lin. obl.; lowest *pin.* usually branched at base; *sori* often continuous to apex. *quadriaurita.*

Loc. 3—11,000 ft. generally throughout tropics.


*(Very doubtfully distinct from preceeding.)*


*Fr.* 5—6 ft. 1.

(Like quadriaurita on a large scale.)


* * * * * Lowest pinnae much the largest, often nearly equalling central portion of frond. (Tripartitae.)


† † Rhizome creeping; stems subdistant; involucre more or less distinctly double. (Poesia.)

12. Fr. subdeltoid. *aquilina.*

Loc. Himla., 2—9,000 ft.—general.

*f f Veins of last division but one connected by arching veins at very base. (Campteria.)

13. Fr. with term. and lat. pin. cut down nearly to rachis into lin. obl. lobes, lowest usually forked, veins prominent. *biaurita.*

(Possibly only a Campteroid form of quadriaurita.)


14. Fr. *tripartite,* with lat. forked divisions nearly as large as terminal one, veins not conspicuous. *Wallichiana.*


*f f f Veins copiously anastomosing. (Litobrachia.)

15. Fr. bipinnate, bluish green, often glaucous. *incisa.*

Loc. marshy ground, borders of forests. Khasia. Sikkim.


Loc. near water. Sylhet.
32. Ceratopteris.

1. St. aircelled. \( \text{thalycroides} \)

33. Lomaria.

\( f \) Base of stipe suddenly dilated, fleshy, triquetrous, 1 furnished with large spongy glands. (Plagiogyria.)

\* Central pinnae of barren fr. narrowed at base, and distinct from one another.

2. Under surface silvery white. \( \text{glaucia} \)
   Loc. Khasia, 6,000 ft. Bedd. F. B. I., 90.

3. Pin. numerous, contiguous, veins inconspicuous. (Gland often at base of pin.) \( \text{pycnophylla} \)

4. Pin. 1 in. or more apart at base, linear, erectopatent, veins prominent. \( \text{euphlebia} \)
   (Less coriaceous, pin. less numerous and more distant than last, venation less fine.)

34. Blechnum.

1. \* Fr. pinifid. \( \text{nitidum} \)

\* \* Fr. pinnate.

2. Pin. lin. obl., finely incised, veins fine \( \text{serrulata} \)
   Loc. marshes—Mishmi.

3. Pin. lin. entire bases distinct, upper decurrent, lowest mere auricles, veins fine. \( \text{orientale} \)

4. Pin. lin., falcate entire, upper adnate, those below centre distinct, veins in large areoles. Cuticle of undersurface loose and wrinkled. \( \text{Melanopus} \)

(1) 3 angled with faces hollowed.
WOODWARDIA.

1. Veins forming at least one series of areolæ between sori and margin. **radicans.**


 VIII—Asplenieæ.

38. ASPLENIUM.

f. Fronds undivided. Veins connected at apex by transverse intramarginal line. *(Thamnopteris.)*

1. Sori reaching half way to margin, fr. 2 ft. or more l. **Phyllitidis Don.**


2. Fr. lanc. spathulate narrowed suddenly below to winged stipe, midrib keeled. **Grevillei.**


3. Fr. acuminate above, tapering to short stem below, midrib rounded. **Simonsianum.**


ff Veins free, single or branched; sori linear or lin. obl. straight, discoidal. *(Euasplenium.)*

* Frond quite entire.

4. Edge entire. **ensiforme.**

B stenophyllum, fr. very narrow.

5. Edge crenate.  
   Griffithianum.  
   Loc. Assam, Mishmi, Sikkim below Darjeeling, to 4,000 ft.  
   Bedd. F. B. I., 58.  
   * * Frond lobed.

   alternans.  
   Loc. Himal. to 6,000 ft. Kumaon to Simla, Chumbra hills.  
   Bedd. F. B. I., 59.  
   Venation not compound as in ceterach, otherwise similar.  
   * * * Frond pinnate, 7—14.  
   † Pin. 1/4—1/2 in. broad blunt.

7. Rach. green, slender.  
   viride.  
   Loc. Himal. to 12,000 ft. Glacier of Pindari, Kumaon.  
   Bedd. F. B. I., 64.  
   Rach. wiry, polished.

8. St. 1—4 in. l., densely tufted, with rach. chestnut brown,  
   pin. sessile.  
   Trichomanes.  
   Loc. Damp banks and rock, Himal, 6—13,000 ft. Ladakh,  
   Kashmir, Simla to Kumaon, Bhotan.

9. St. 4—6 in. l., with rach. blackish, pin. auricled on upper  
   side, lower deflexed.  
   normale.

10. † † Pinnae 1—3 lin. cuneate.  
   septentrionale.  
   Loc. Gharwal, 11,000 ft. Kashmir, 9,000 ft. Bedd. F. B. I.,  
   60.  
   † † † Pinnae numerous, lin. or lin. obl. usually  
   ample, acute or acuminate, narrowed  
   suddenly at base on upper side, inner  
   edge nearly parallel with main rachis,  
   lower side obliquely truncate. 11—14.

   A Sori and veins long, irregular, subflabellate, very oblique.  
   (Falcatum group.)

11. Pin. numerous lobed, sometimes more than half way  
   to villose rach., and deeply toothed; the sides unequal, upper  
   auricled; st. fibrillose.  
   Caudatum.

12. Pin. opposite stalked, sharply serrated; the two sides nearly equal, st. and rach. naked. \textit{macrophyllum}.

Loc. Assam. Bedd. F. S. I., 142. (Pin. \textit{few}, larger, text. less coriaceous than last.)

B \textit{Pinnæ with from half to whole of lower side cut away.} (Resectum group.)

13. St. slender, with rach. polished dark chestnut or grey opaque, pin. subsessile, almost dimidiate. \textit{resectum}.


14. St. firm, and rachis chestnut, pin. \textit{dimidiate.} \textit{heterocarpum}.

(Upper edge more deeply incised than last, and resembling a dimidiate Adiantum.)


\textit{*** Pinnae cut down at any rate in lower part, nearly or quite to rachis.}

15. Pin. lobed half way or more, and deeply inciso-serrate. \textit{planicaule}.


16. Pin. cut down nearly or quite to rach. below into stalked lobes.


\textit{*** Fronds bi to quadri-pinnate.}

\textit{† Venation subflabellate 17—21.}

A \textit{Text. coriaceous. Ultimate divisions of frond lin. or ovate-cuneate, often shining on upper surface.} (Cuneatum group.)

17. \textit{Fr. 1—2 in. l., deltoid.} \textit{Rutamuraria.}


\textit{Fr. under 1½ ft. l. coriaceous.}

18. St. and rach. chestnut polished, winged and compressed above, lower pin. deltoid; sori occupying whole surface. \textit{adiantum nigrum.}

19. St. and rach. deciduously clothed with woolly hairs; pin.-lanc.-delt., sori radiant linear. 
   Loc. Assam. 
   Fr. 2 ft. or more l.; st. naked.


   Fripinnatum Roxb. 
   Loc. Assam.

† Venation pinnate, 22—25.

B Text. herb. or slightly coriac., fr. 4—9 in. l. lanc. 
   (Lanceolatum group.)

22. Lower pin. subdelroid; cut down to rach. into cuneate; flabellate pinnules. 

   Fontanum. 
   Loc. Himalayas. B. Simla on glen just below elbow of road to Annandale; rock on roadside beyond Thig. Bedd. F. B. I., 146.

C Fr. 1 ft. or more l. Ultimate divisions ample. Text. herbaceous. (Bulbiferum group.)

24. Fr. obl. deltoid. 
   Bulbiferum. 

D Frond 1 ft. or less l.; bright green. Ultimate divisions firmly cut, text. thinly herb. (Cicutarium group.)

25. Fr. obl. lanc. 
   Temuifolium. 

130. 

fff Veins simple, ultimate divisions of frond narrowly lin., sori lin. or tid. obl. marginal or submarginal. (Darea.)
Veins simple, ultimate divisions of frond narrowly lin; sori lin. or lin. obl, marginal or submarginal. Darea.

26. Fr. 6—15 in l., pale green, rach. compressed. rutæfolium.

The only Dareoid Asplenium yet found in India.

Veins free, sori curved, or horseshoe-shaped. (Athyrium).
† Fr. deltoid.

27. Fr. 1 ft. each way, 4 pinfid. subtriangularare.
† † Fr. lanc. or ovate lanc.
Fr. 2 pinnatifid, herbaceous.


a allantoides, pinnl. inciso-dentate, sori obl. Bedd. F. B. I.

Distinguishable by its long sori in regular rows.
Frond 2—3 pinnatifid. (30—35.)

(A few sori double but separate at apex.)

31. Fr. 6—12 in l. bipinfid, lance.; pin. lanc. blunt, sessile bluntly lobed; lower distant, lowest produced above; rach. winged in upper half; text. mod. firm; sori obl. oblique in regular row near midrib. drepanophyllum.
Frond ovate lanceolate, herb. (31—33), pinnules elliptic-rhomboideal. 12—24 in. l. (30—32.)
32. Pin. cut to rach. into inciso-crenate or pinnifd pinnl., sori copious large. macrocarpum.
   a membranacea. Arnot.
   b Atkinsoni, fr. membr. 3—4 in. l., lanc. 2 pinnifd.
33. Pin. cut to rach. into ellipt. rhomb., pinnl. broadly lobed halfway down, and slightly toothed. St. often pink. much tufted, rather spinulose above; sori in parallel rows close to midrib. nigripes.
Frond lanceolate, text. subcoriaceous.
34. Pinnl. lanc., sometimes auricled above, or again pinnifd; teeth mucronate; midrib spinulose above. oxyphyllum.
L. Eburnea I. Sm.
Very delicate, and one of the most beautiful Ind. sp.
35. Fr. obl. lanc., 1—3 ft. l., rachis winged compressed, pinnl. ovate or rhomb. deeply incised. Text. thin, st. tufted. Filix femina.
   (pectinatum, tenuifrons, tenellum Wall.)
36. Fr. ov. lanc. 2—3 ft. l., lower pin. 1 ft. or more; pinnl. distant with lanc., segm. deeply sharply toothed; sori small in two rows near midrib. brevisorum.
   (Lower sori often double.)
Fr. tripinnatifid.
37. *Fr. 2—4 ft. 1., pinnl. lanc., segm. subdeltoid stalked, deeply pinnatifid with mucronate teeth.*  
*Fimbriatum.*  

*Fr. 3—5 ft., pin. ov. lanc. cut to rachis into unequalsided ellipt. rhomboid, deeply crenate lobes, colour bright green.*  
*Umbrosum.*

*a Australis*. R. Br. *fr. 3. pinnifid, ult. segm. broader, and sori longer than type.*


*c Procerum* Wall: *fr. 4 pinnate, ult. lobes blunt entire, with single sorus at base.*

*d Griffithii*, Bedd. F. B. I., 328, No. 44 p. 30 possibly a fourth variety.


**fff** Veins free, sori and involucres extending to both sides of some of them. (Diplazium.)

38. Frond simple, entire.  
*lanceum*


** Fr. with lower part half or three quarters pinnate.  
† Pinnæ entire, or very slightly lobed.*

39. Sori short of edge, deltoid lobed apex, and sharply toothed pinnae.  
*pinnatifido-pinnatum.*  

40. Sori from midrib to edge, terminal and lat., pinnae nearly entire, ends narrowed.  
*bantamense.*  
*(fraxinifolium Wall.)*


† † Pinnæ lobed from half to two-thirds down to rachis, in lower part.

41. Rhizome creeping, colour bright green.  
*Japonicum*

42. St. tufted densely fibrillose below, pin. cut 3/3ds into blunt spreading lobes. sorzogonense.


43. St. and rach. tomentose firm subcoriaceous tomentosum.


44. St. slender, scaly below pinifid apex; pin. falcate, lower ones stalked. —6 in br. longisfolium.

(Lobulosum Wall.)

Loc. 5—6,000 ft. Nepal to Simla (Chadwick falls, Glen), Masauri (Mossy falls) on damp rock. Bedd. F. B. I., 247.

45. St. and rach. glabr. fr. 10 in br. pin. cut 3/3ds down.

Stoliczkæ.

(Near Sorzogonense with broader pinnl.)


** Fronds copiously bipinnate.

† Fr. less than 2 ft. l., text. subcoriaceous.

46. Fr. nearly as broad as long; sori obl. on each (6) vein reaching from costa nearly \( \frac{1}{2} \) way to edge. Griffithii.

Differs from next mainly in sori, and see note to umbrosum No. 37, ante p. 28.


†† Fr. Ample, text. herbaceous.

47. Caudex subarborescent, densely fibrillose at crown; st. not scaly, densely tufted and muricated; pin. 8—9 on each side; pinnl. cut nearly to rachis into lin. obl. slightly toothed lobes; sori fall short of edge.

A frondosum Wall. polypodioides.

48. Caud. woody, St. stout 2 ft. or more l. fr. very l. tripin. below, with deeply pinfid pinnl.

\textit{dilatatum} Bl. \textit{latifolium}.

(Distinct from \textit{sylvaticum} ? Bedd.)

Loc.? India. Bedd. F. S. I., 162.

\textit{Veins anastomosing; sori as in Diplazium.} (Anisogonium.)

\[\textit{Fronds pinnate.}\]

49. \textit{St.} scaly throughout, fr. 12—18 in l., apex pinfid, text thinly herb. \textit{heterophlebium}


50. \textit{St.} strong often muricated, pin. often proliferous in axils. \textit{decussatum}.

Loc. Himal, Bedd. F. B. I., 70.

\[\textit{Fronds bipinnate.}\]

51. Caud. subarborescent, fr. ample, text. subcoriaceous. \textit{esculentum}.

Bipinnatum Roxb. \textit{malabaricum} sprengl.

\textit{Fr.} sometimes only pinrate. See ante 36, p. 29.


\[\textit{Veins anastomosing towards margin.} (Hemi-}\textit{dictyum.}\]

52. \textit{St.} densely tufted, wiry ebeneus, chaffy: fr. 4—6 in l. lobed nearly or quite to rach \textit{Ceterach}.

Differs in \textit{venation} from \textit{alternans}; invol. disappears early.


53. \textit{St.} green, compressed, nearly naked: fr. pinnate \textit{(Asplenidictyon. J Sm.)} \textit{Finlaysonianum}.

39 **Allantodia**.

I. *Fr.* pinnate. *Brunoniana*.

Differs from (Aspl. hemidictyum) by invol. bursting in **irregular line down centre**.

Loc. to 6,000 ft. Assam, Sikkim, Nepal, Sheopur Mt. Bedd. F. B. I., 159.

40 **Actiniopteris**.


Like miniature palm tree (Chainœrops) sori between Asplenium and Pteris.

*Beng.* Morpankha.


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**X. Aspidiae.**

43 **Aspidium**.

*f Veins free. Text. coriaceous [except Sikkimense].
teeth usually awned. Polystichum.*

• *Fr. once primate.*

† *St. densely tufted.*

1. *St. ebeneous above, scaly below.*

*Fr. 12—18 in l. pin. ov. rhomb, subfalcate unequal, point mucronate.* *Lonchitis.*


2. *Fr. 4—5 in. pin. ov. delt., bluntly lobed half way down and serrated.* *Lachenense.*


3. *St. scaly slender pin, subdeltoid, cut down below to rachis into lanc. lobes. ilicisfolium.*

†† St. tufted.

   a. *Marginatum* Wall. pin. lobed upper edge. *(radicans Roxb.)*
   b. *Obliquum* Don; fr. less than 6 in l., pinnate, pin. shorter and broader, and more blunt *(cespitosum Wall).*
   c. *Lentum* Don, pin. cut into obl-mucronate lobes half-way to rachis.


5. *St. fibrillose,* slender, pin fr. 4—8 in l. ov. delt, lobed half-way down with sharp mucronate teeth. *Thomsoni.*


6. *St. stram.* fr. 2—3 in l. throughout pinnate, sori on upper half of pin. *Atkinsoni.*


Intermediate between 2 and 3. **Lower pinna once pinnate.**

7. Fr. flaccid narrow, finely cut: pin. cut down to rach. into obl. rhomb pinnl. with aristate teeth. *Prescottianum.*

Loc. 10—12,000 ft. Simla, Narkunda; to Bhotan. Bedd F. B. I. 34.


Of this generally distributed sp. there are var:—
   (a). *lobatum,* text coriaceous, pinnl. confluent at base,
   (b). *aculeatum* Sw. text. less rigid, pinnl. sessile, lowest free.
   (c). *angulare* Willd. less rigid, lower pinnl. stalked sometimes deeply pinnatifid.
(d). rufo-barbatum Wall, rachis densely clothed with reddish brown fibrillose scales.
(e). Tsus simense Hk. slender form
9. St. scattered slender, polished, long terminal and lat. pin. lanc; segm. long rhomb, cut away one-half on lower side. amabile.
Loc. Nepal.
*** Lower pinnae more than once pinnate.
Rhizome creeping 10—11.
11. Fr. 3—4 pinfid, or lanc, teeth copious, aristate, lowest pin. largest; soir near midrib in 2 rows. aristatum.
   a. coniifolium Wall more divided, segm. copiously toothed with lower lobes distinct.
   b. Assamicum Kuhn, fr. subcor, 3 pinfid, lower pinnl. distant stalked, obl. lanc, acum.
12. Fr. 4—5 pinfid, ov. delt; ult. div. lin. awned, sori solitary. feniculaceum.
Loc. Cholä, Sikkim 7—10,000 ft.
   (Cyrtomium).
   13. Pin. lanc. lobed (sometimes down to rachis below), sori in rows.
Loc. Assam to Simla to 7,000 ft. Bedd F. B. I., 45.
   14. Pin. falcate, edge entire or slightly undulated, sori small scattered
      falcatum. B. caryotideum Wall, pin. large sharply toothed, slightly lobed or auricled.
Loc. Moist shade to 8,200 ft. Bhotan to Masauri (Lindhurst). Simla Khud between Elysium and Jacko.

* Some of its many forms seem to connect ilicifolium, Thomsonia, Prescottianum, and through Atkinsonia, Lachenense.
† Amabilis, aristatum, coniifolium, feniculaceum have frequent reniform involucres.
§ Veins all free (Lastræa) 1—28.

* Pin. lobed less than one-third down to midrib.

1. St. and rachis naked. cuspidatum.
(P. elongatum Wall), invl. fugacious.

2. St. and rachis densely fibrillose, blackish. hirtipes.
(Resembles filix. mas in venation A. Atratum Wall.

* * Pin. cut more than halfway down to rachis into close, regular, entire, or nearly entire, lobes.
† Veinlets simple. Invol. generally thin and fugacious.
A. Lower pinnæ hardly, if at all, reduced. (Patens group.)

   (Invol. like Aspidium.)

5. St. densely tufted, with rach. and underside villose above, sori medial. *calcaratum*.
   (Lower pin. sometimes reduced.)

B. Lower pinnae conspicuously reduced. (Conterminum group.)

   Pin. cut nearly to rachis.

6. St. densely tufted, villose 6—8 in l.: fr. 8—12 in l.; lobes close slightly crenated; lower pin. distant; dwindling gradually; text. herb; veinlets 6—8. sori submarg. *canum*.

8. St. glossy naked or nearly so 1—2 ft. l.; fr. 2—3 ft. l.; lobes bluntish entire or falcate, with prominent gland at base of pin. beneath, rach. and underside villose; text. subcor. sori submarg. veinlets prominent 10—12. *prolixum*.


Loc. Sikkim.
9. St. naked or finely villose, 6—8 in. l.; fr. 1½—2 ft. l.; lobes close entire; rach and underside villose; text, herb. veinlets 6—8 sori medial.

*Patens. Desv.? F. B. I. 370.*
(BPossibly only a form with reduced pin.)

Loc. Khasia.
†† Veinlets forked.


St. tufted.

11. *St. rach and surfaces, naked.* *Smyrmaticum.*

St. and rach. scaly.

12. Pin. lobed nearly to rach.; text. herb. *Felix Mas.*

a. *Affine,* pin. less blunt, narrower, edge toothed.

b. *Elongatum,* fr. subdeltoid; 4 pinni; 1 pin. 1 ft. or more l. 4—6 in br. F. S. I. 112 and 114.


d. *Odontoloma.* Bedd; fr. sm. lanc. 3 pinfid; *st. and rach naked* stram: pin. delt. lobes incisodentate, sori in one row. Bedd. F. B. I., 114.

e. *Nidus,* Clarke. St. in dense circ. tuft.; st. and rach. densely scaly; fr. lanc. 2 pinnate, pinnl blunt obl. incisocrenate: sori 6—8 to each, medial. F. B. I. 372.


g. *Odontoloma Moore* text. membr. invol. much fimbriated. F. B. I. 373.
h. *Patentissima* Presl. (intermedia Bedd.) F. S. I. 111. Very variable according to elevation. *Clarkei* and *Nidus* are stunted forms at great elevations; *elongata* a somewhat higher form of *cochleata*, which, with the rest, are general.

Loc. 8—15,000 ft. general *Nidus*, Yakla Sikkim 12,000 ft. *Clarkei* do. 10,000 ft.

13. Pin. lobed down to rach. *sori restricted* to tip of lobes. *apiciflorum*.

(Resembles last except in restricted sori.)

14. Scales dense, lin. black brown, firm; fr. lance. 2 pinnate. 1—2 ft. 1, 3—5 in br: pin. sessile, cut to rach below, into close truncate entire lobes dilated at base and reduced below to auricles; subcor.; surf. glab., veins 5—6 forked low down. *Clarkei*.

(Intermediate between two former and possibly only a form of *Filix mas*. Otherwise the name of this *Lastrea* must be changed, as it is attached to a Euneoploido p 44:

**Pin. cut nearly to rachis into toothed or pinnatifid lobes.**

† St. tufted.

St. 12—18 in 1.

15. St. naked lower pin. distant, deflexed. *flaccidum*.

(rembises bastard forms of *filix femina*.)


St. 2—3 ft. 1.

17. St. and rachis densely scaly, scales large, bright brown with silky hairs: pin. lance: pinul. blunt, lower pinnatifid, with copious aristate teeth, edge often incurved, sori close to midrib. *barbigerum*. 
a. *Falconeri* Bedd. F. B. I. 41, see further.


*** Caudex erect, frond small or middle sized, tri-or quadri-pinnatifid: invol. firm persistent.

† Fr. lanceolate; text herb.

18. Lowest pin. equal to next; St. and rach. sparingly scaly fr. obl. lanc. 12—18 in. 1.

a dilatatum; fr. ov. lance or subdeltoid, larger and deeper cut under surf. glandular. (Color, pale green; very variable in size and form.)

Loc. West Himalaya generally.

19. Lowest pin. largest: St. glossy above, rach. naked or slightly scaly; fr. 1—2 ft. 1", ov lance., pinul, lanc. with blunt obl. lobes, lowest sometimes compound.


Loc. Simla to Nepal, Khasia, Assam. Simla below spur of Elysium Hill.

20. St. densely scaly, rach. densely fibillose throughout; fr. obl. lanc. lobes obl. blunt with revolute edges, sori close to midrib of pinul. *Falconeri.*

(Var of barbigerum. Bedd F. B. I. 41.)


† †. Fr. deltoid.

21. Rach. and underside pubescent, sori copious *odoratum.*
Loc. Rocky crevices exposed, 7—8,000 ft. Simla to Kumaon Sikkim.

**** Fronds ample (18 in. or more t., 12 in br.) decompound. Involure often small and fugacious. ♦ Text. herbaceous (or subcoriaceus.)

Sori submarginal.

-22. St. 1 ft. or more. tufted slender glossy; basal scales dark brown lin.; fr. deltoid, 1—3 ft. 1. 9—18 in b., lower pin. often 1 ft. 1. with centre uncut for $\frac{1}{4}$—$\frac{1}{2}$ in. bluntly lobed or with similar pinfid pinnl.; rach. and surfaces nearly naked, text. pap. herbaceous; colour bright green; sori copious. *dissectum*, *Membranifolium*. Presl.


Sori near midrib (23-26.)

23. St. stout, polished, chestnut or blackish, scaly; lower pin, 1 ft: 1.; 6 in br., close lanc. *pinnl.* blunt, unequal-sided, a broad centre uncut; text. coriaceus: rach. chestnut brown sori in rows:


24. St. stram, or brown, scaly: lower pin; 12—18 in 1. 6 in br., *pinnl.* cut to a winged rach. into blunt toothed lobes: text. herb.; sori in rows. *Boryanum.*

Loc. Simla to Kumaon to 7000 ft. Khasia to Assam.

25 St. stout, clothed at base (and rach) with light-brown silk fibrils, *fr.* subdeltoid, lower pin. lanc. often 12 in 1. 4—5 in br. *pinnl.* close with distinct segm. and subentire lobes: text. firm; sori small copious (Invol. fugacious). *Intermedium.*

Loc. North India.


Loc. East Himalayas, Bedd, F. B. I., 333.

Sori medial, 27.
27. St. and rach. purplish, purple scaly; fr subdelt. ripin. tert. pinnl. pinfid with crenated segm.; lowest pin. largest delt. unequal-sided, 2 lower basal second. pin. much produced: setoe copious on chiefly upper, costoe, otherwise glab. *Hendersonii.*

Loc. Shillong Hills Khasia, 6,000 ft. (near pulvinulifera) Bedd F. B. I. 377.

*Rhiz.* creeping (28—29).

28. St ebeneous scaly; pin. flexuose; pinnl distant, cut to rach. below into toothed lobes: text. firm; rach. and surf. naked; sori in rows close to midrib of pinnl. *Angustifrons.*

(text. firmer than next).  
Local. Nepal.

29. St. scaly at base or throughout; fr. deltoid; lowest pin largest; pinnl close, cut to rach. into close pinfid lobes rach. of pinnl. and underside, finely villose; sori minute copious. *Setigerum.*

(Invol. very fugacious).

*a.* ornatum Wall. (Baker) St. erect and invol. wanting. Phlegopteris Bedd. F. S. I., 171.


†*Text coriaceus.*

30. St. densely (bright), scaly at base, smooth glossy: rach and surfaces naked glossy; fr. deltoid; pinnl. deltoid, base truncate on lower side; lower segms. often free, ov. obl.; teeth mucronate; sori large copious close to midrib. *platypus.*

Var. of *Asp. aristatum?* Bedd F. B. I., 228.

Local. Khasia 5,000 ft. F. B. I., 228.

**ff** Lower veinlets of contiguous groups united.—*Eunephrodium.* (30—41).

Fr. large pinnate.

A. Rhiz. wide creeping. (30—35).

† Lower pin hardly, if at all, reduced.

*Lobes triangular.*
31. Text. coriaceous; sori near extremity, principally in lobes. 
   *a. propinquum*; rach. and under side villose. 
   Loc. near water: Chittagong, Khasia, Assam.

32. Text. papyr. herb; sori marginal; confined to lobes. 
   *pteroides.*

Terminans Wall.

33. Text. papyr. herb.; sori terminal, in rows, not confined to lobes. 
   *extensum.*
   (Lobes further apart and deeper; text. more herb. than last), 
   Loc. Khasia, Assam.

†† *Lower pinnae conspicuously reduced.*
St. naked, pin. cut ½rd down into triangular acute lobes.

34. Rach. and under surface densely pubescent; pin dwindling suddenly to auricles; sori subterminal. 
   *cucullatum.*
   *(Canescens Presl).*

Loc. Himalayas.

35. Rach. and under surface naked or slightly hairy; sori medial. 
   *aridum.*
   *(Venulosum Wall).*

Loc. Northern India, Bedd F. B. I., 297.

St. villose.

36. Pin. cut ½ down into entire obl. falcate lobes; base of lower pinna and under surface glandular. rach. densely hairy 
   *Hirsutum.*

Loc. Assam, Bedd F. B. I. 46.

37. Pin. cut to br. wing into close falc. blunt lobes, lowest distant much reduced. rach. ribs and edges densely downy. 
   *elatum.*


B. Caudex erect, or sub-erect.

† Pin. entire or slightly lobed, so that most of the vainlets unite.
38. Pin. entire or slightly lobed truncate at base, or auricled fertile and contracted; rach. and under surface sometimes glandular.  
Glandulosum.


39. Pin. cut ¼ down into bluntish, slightly falcate lobes lower shorter deflexed: text. papyr. herb; veinlets 4—6; sori in rows close to midrib.  
Amboynense.


Loc. North India. a. Ceylon.

40. Pin. cut ¼ down into falc. lobes; lower pin. divergent: distant, veinlets 6—9; sori medial.  
Pennigerum.

Multilineatum Wall.

Abruptum. Bedd F. S. I., 86.

a. Abortivum I. Sm.


† † Pin. cut from ¼ to ¾ down to midrib.

St. tufted.

41. Pin. distant and shortened below; rach. and surfaces villose; herb.; pin. cut half down to rach.  
molle.


42. Rach, slightly villose, under surface nearly or quite naked; papyr. herb. pin. cut ½ or more.  
truncatum.

a. Ensorum Bedd F. B. I. 130.


St. densely black fibrillose afterwards roughened; surfaces glossy coriaceous,—pin. cut ½ down to rachis, close sori in row to main vein.

ferox.

43. *St.* and rach. scaly, surfaces naked, herb; pin, horizontal cut half down to rachis. *crinipes.*

(Distinguished from *truncatum* by scaly *St.* and rach).  


*ff* *ff* Lower veinlets of contiguous groups united, and those of same group slightly so. (*Pleocnemia*)

*Fr.* 2 ft. or more l.

44. Caudex. subarborescent *St.* striated; *fr.* subdeltoid; pin simple or lowest with 2—3 pinnate pinnl. on lower side; segm. lobed to a broadly winged rach.

*Leuzeanum*  

(Invol. very fugacious).  


45. *St.* tufted pubescent; *fr.* delt. 3 pinnate or 4 pinfid, finely pubescent: lower pin. much largest, deltoid, unequalsided; stalked.

*giganteum*  

(Text. and hab. of cicuratium).


46. *St.* rach. and surfaces pubescent. *fr.* lanc. pin. deeply pinfid—alt., lower reduced, or to auricles: pinfid nearly to rach. pinnl. lanc. subentire or deeply pinfid, serrated and ac. to apex, Invol hairy, ciliated (sori nearly terminal on veinlets chiefly at base).

*Clarkei.*  


*ff* *ff* Veins anastomosing copiously, usually with fre included veinlets: pinnæ and segments ample.  

(Sagenia)  

+ Sori copious, scattered irregularly.  

(47—50).

Rhizome creeping. 47—49.

47. *St.* narrowly winged nearly to base; *fr.* cut down to broadly winged rach. into entire lin. obl. pin. *St.* winged, main viens not distinct to edge.  

*vastum*
Alatum Wall.


St. long 1 ft. or more, main veins distinct to edge, sori on connected veinlets 48—49.

48. Fr. 12—18 in 1. subdeltoid, with deeply pinfidi lobed apex and 1—2 side pin. lowest stalked; text herb. sori rather large subtriphylum.


49. Fr. 2—4 ft. 1. with large obl. entire terminal and 2—6 similar lat. pin.; text. subcor. sori small abundant.

Aspid Wall. polymorphum.

a macrocarpum. Bedd F. S. I. 117.

Loc. Kumaon, Sikkim, Khasia; Bhotan; Mishmi, Assam to 4,000 ft. Bedd F. S. I. 116.

St. naked; fr. delt. more than 1 ft. 1. 50—1.

50. St. and rach. naked stramin fr. pinn. pin. stalked, entire. gemmiferous in axils. sori often confluent. heterosorum.


51. St. and rach. ebeneous: fr. 2 pinfidi, br. as l., pin. lanc. lowest stalked with pair of large pinfl. at base. surf glabrous, sori 3—4 serial irreg., invol. minute fugacious. Simonsii.

Loc. East Himalayas.

St. scaly, fr. subdeltoid not more than 1 ft. 1. 52.

St. with num. shining black scales (dense at crown): fr. pinnate, fert. one much contracted: pin, blunt falcate lobed, lowest unequall-sided: rach, and surfaces pubescent, areolae without free included veinlets; sori copious very l. covering contracted surface. fuscipes.


Differs from dissecta Desv. by its sm. size 8-12 in 1. and scales. Birma plants of softer text, more pubesc. and anastomosis less copious.

†† Sori large, confined to a distinct row on each side of principal veins. 52—3.
(46)

Rhizome creeping.
54. St. ebeneous: fr. subdeltoid, more than 1 ft. 1.; lowest pin. subdeltoid, deeply pinfid, or pinnate below. cicutarium.
Loc. wet rock Himalaya to 5,000 ft. Masuri, (Mossy falls) Kumaon Bedd F. S. I. 81.
55. St. scaly, fr. deltoid 10—12 in each way, 3 pinfid; rach broadly winged above lowest pin. which is shortly petioled, largest unequal-sided, with falcate lobed basal pinul. subconfluentes.

Note.—Many Sp. still grouped in Sagenia have varying involucres, from uniform to peltate, or absent altogether.

45—Nephrolepis.

1. Caud. suberect or oblique, its wiry fibres often bearing tubers, fr. 1½—2 in br. pin. imbricated, blunt; sori medial cordifolia.
Edule. Dou.
a delicatula. Decaisne, small delicate North India form.
Loc. Himalayas Kumaon.
2. St. tufted, fr. 3—6 in. br. pin. acute, sori submarginal. exaltata.

46—Oleandra.

1. * Shoots suberect, St. jointed below middle. neriiformis
* * Shoots trailing; St jointed near base.
   Loc. Dry rock and trees to 7,000 ft. Simla (Chadwick falls) to Kumaon. Sylhet. Khasia. Assam. Landour tree North East corner of mall.

   a *longipes* Hk. St. articulated near middle.

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II.—Polypodieae.

48. Polypodium.*

A. *Stems continuous with caudex* (Desmobryoid series): *sori medial on veins.*

   f *Veins free.* (Phlegopteris) 1—6.
   * Pinnæ cut more than half-way down to rachis, into close regular lobes, veinlets simple.
   † Text. coriaceous, St. naked.

1. Lower pin. not reduced fr. 3—4 feet I. surfaces naked *erubescens.*
   † † Text. herb. St. tufted villose.

* In Phlegopteris and Goniophlebium the youngest available fronds should be examined. Many have been transferred to Lastrea and others may follow. Only *proliferum* is now retained by Beddome, who finds occasional involucrate fronds of all others. For similar reason Dietvopteris is transferred by him to Aspidium, so that all the Ercmobryoid series are changing.
2. Lower pin. slightly reduced fr. 12—18 in 1, appendiculatum.

(main rach. often spinulose below).

3. Lower pin. reduced to auricles: fr. 3-4 ft 1. auriculatum.
F. B. I. 203.

**Pinnæ cut nearly or quite to rachis into toothed or pinnatifid lobes.

4. St. and rach. glossy, under side slightly hairy distans.

**Pinn. tri-or quadri-pinnatifid.

5. Rhiz. slender fr. 6—10 in each way, deltoid. Dryopteris.
Rhiz. firm villose, St. viscid fr. ample punctatum.

ff Veins pinnate, lower veinlets of contiguous groups joining (Goniopteris).

* Pinnæ pinnatifid or distinctly crenate.

Rhiz. creeping.

7. St. erect. veinlets 15—20; sori in 2 close rows. urophyllum.


Cuspidatum Roxb. Nephrod. Wall (involucrate in young state. (Doubtfully distinct from Meniscium cuspidatum).

8. Fr. branching from axils.
Loc. Himalayas, Nynee Tal, common in hilly regions low. down from Rájpur south, known as the creeping fern.

6. St. 1—2 ft. 1. reddish, pin. lobed less than 1 line deep. text papy. herb. veinlets 8 lineatum
a. costatum. F. B. I. 222 North India.


10. St. 2-4 ft. or more, pin. lobed 1 line deep, text. coriaceous
\[veinlets 15-20\]

mul tilineatum.


B. Stems articulated at point of junction with Rhizome
Eremobroid series. Sori terminal on veins.

\[Veins free (Eupolypodium).\]

* Frond pinnatifid.

† Lobes reaching nearly down to main rachis.

11. St. tufted, short, fringed with soft hairs, surface ciliated.

Khasiaishopanum.


** Frond pinnate.

† Pin. close, casually confluent at base.

Fr. half inch or less br. 12-13.

12. St. densely tufted, having sori 1 to each pin. trichomanoides


13. Rhiz. short creeping scaly, sori 2-5 to each pin. medial

Parvulum.

Loc. Trees, N. India to 8,500 ft.

Fr. More than half inch broad, flaccid, pendulous.

14. St. densely tufted hairy, surface villose, sori 1 to each tooth

Subfalcatum.


*** Fronds tri-quadripinnatifid.

15. Rhiz. wide creeping scaly; st. and rachis naked glossy
fr. subdeltoid.


174.

16. St. tufted, naked or furfuraceous; fr. 24 in 1. or more 12-18 in br.  
Subdigitatum Coniifolium Wall.

(Tubers in axils of pin., fr. larger than last; probably a Leucostegia.

ff Veins forming regular ample areole, each with a distinct free included veinlet, sori terminal on latter. (Goniophle- bium.)

† Under surface not at all, or slightly, scaly.
Fr. pinnatifid.

17. Rhiz. fibrillose; lowest pin. deflexed. Amoxanum.

Frond pinnate. Sori and areole uniserial.

18. Fr. flaccid; pin. close dilated and casually confluent at base. slightly toothed, spreading; text. papyr. herb. rach polished; rhiz. densely (black bristly) scaly. lachnopus.
Sori near midrib.

19. Fr. obl. delt. caudate; pin. obscurely repand, blunt, adnate, lowest narrowed at base; text. subcoriaceous; rach. pilose below; veins raised, distinct to edge; rhiz. thick glaucous. erythrocarpum.
Loc. Sikkim. 8—11,000 ft. Bedd F. B. I. 382.

20. Fr. lanc. pin. patent, incisocrenate, lowest slightly nar- rowed at base; text. membr.; sori crowded, rhiz. very slender Hendersoni.

22. *Fr.* obl. lanc. suberect: pin. acum. lowest not reduced text member: rhiz. castaneous. 

Argutum.


Pinnae distinctly separated at base 23-5:

Rhiz. wide creeping *fr.* 6 12 in 1. 23-4.

23. Lower pin: stalked, narrowed at base: *persicifolium*.

(cuspidatum Presl.)

Loc. Nepal. (Bedd ?) F. B. I., 79.

24. Pin. sessile; base rounded or auricled. *subauriculatum*.


25. *St.* erect *fr.* 3 ft. or more l; text. coriac pin. num. distant entire.


fff Primary veins distinct to edge, connected by parallel straight, or curved transverse veinlets; areolae containing 2 or more sori; free veinlets all directed towards edge.

* Under surface matted with woolly or cottony tomentum. (Niphobolus.)

† Tomentum thin, adpressed.


*Pertussum* Roxb.


*Fr.* uniform 26-28.

27. *Fr.* short, upper surface naked

*Lingua. latus* J. Sm. *heteractis* Mett. broader than Japan sp.


*Fr.* more than 1 ft. l. 27-28.

28. Upper surface glabrous; sori small, in several rows, continuous over *fr.*

*Costatum* Wall.

29. Upper surface naked. Sori in 1—2 irregular rows of subfurfuraceum. 

†† Tomentum thicker, more woolly and looser.

30. Fr, dimorphous, bar. fr. roundish. nummulariesfolium. 
Fr. uniform entire, narrowed gradually to both ends: veins hidden.

31. Fr. subsessile, very woolly beneath; subcoriaceous. fissum. 


32. St. very short; fr. rigid coriaceous. floccigerum. 
Loc. N. India. 
Main veins distinct to edge.

33. Stem cottony upwards, upper surface naked, coriaceous; sori bright, in 4—6 straight rows. flocculosum. 

34. St. 1 ft. or more l., upper surface glabrous in 2 irregular rows. Boothii. 
ffff Areola fine, copious, irregular; the free veinlets spreading in various directions; sori various in position, generally on back of united veinlets. (Phymatodes.)  
* Fronds simple 34-45. 
† Main veins not distinct to edge 34-38.
A—Substance thick, all the veins obscure.
Fr. uniform.
St. none, or very short.
a. Under surface naked.
Sori large immersed, in single row near midrib.
35. Fr. 2—4 in l. coriaceous.  
36. Fr. 6—12 in l. subcoriaceous.  
37. Sori large copious, scattered irregularly.  
b.—Under surface matted or furfuraceous.
38. Fr. ligulate entire.  
B. Substance thinner, veins distinct:
39. Sori large prominent, in row near midrib.  

†† Main veins distinct, nearly or quite to edge.
40. Fr. dimorphous  
Hab. to 4000 ft.  
Fr. uniform.
41. Fr. less than 12, in long, edge repand., text. coriaceous.  
Loc. Trees to 7,000 ft.—to eastwards. Mishmi, Khasia, Bhotan. Bedd F. B. I., 158.
42. Edge entire; text. herbaceous.  

(rostratum.)
(lineare.)
superciciale.
(normale.)

(coriateum Roxb Sphærocephalum Wall.

(veinlets prominent.)

(veinlets prominent.)

(rostratum.
(lineare.)
superciciale.
(normale.)

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(veinlets prominent.)

(rostratum.
(lineare.)
superciciale.
(normale.)

(coro

Fr. 1 ft. or more, long.
Text. very thin, edge entire or repand.
43. Rhiz. scales lurid green. membranaceum.
a. Grandifolium Wall; fr. large; sori scattered, copious.
Loc. trees 5—6,500 ft.: general over India proper Bedd F. B. I., 317.

44. Text. firm; edge entire; rhiz. scales brown; sori in rows of 4—6. heterocarpum.
(Resembles last, smaller and firmer.)
45. Text. subcoriaceous; fr. sessile; sori scattered copious iridoides.

Glabrum Roxb.
Loc. Trees eastern Himal. Sylhet, Assam.
46. Text. subcoriaceous; rhiz. woody, hypogynous. hemionictideum.

* * Fr. variously lobed but not regularly pinnatifid or pinnate 46-7.

47. Fr. not in two halves. pteropus.

48. Fr. flabellate, in two halves, lobed deeply from circumference towards base (Dipteris) Wallichii.

* * * Fronds deeply pinnatifid 49-58.
† Fronds uniform (barren fr. not drynaroid).
Fr. with terminal and lateral pinnae.
49. Pin. edge entire or repand; coriaceous trifidum

50. Pin. finely toothed; herbaceous malacodon.
Loc. N. W. Himal. 10,500 ft. Simla, (Hatto); Kumaon Nepal—Sikkim 12—13,000 ft.
a. N. India.

51. St. winged nearly to base; sori small irregular, often confluent, papyraceous. Dilatatum.
Loc. 4—6,000 ft. Nepal, Khasia, Bedd F. B. I., 122.
Sori prominent on upper surface.

52. Fr. 1. ft. or more br. Colour dark green sub-coriaceous, lobes sub-entire. Nigrescens.

Phymatodes Roxb. scolopendria Burm.
Loc. Sylhet, Assam.

53. Fr. 1 ft. or less br.: coriac: lobes sub-entire. Longissimum.

Rubida I. Sm. melanococca Moore. melanoneuron. Miq. (pin-much narrower than nigrescens).
Loc. Sylhet, Assam Bedd F. S. I., 176 and 388.
Sori prominent on upper surface.

54. Fr. cut down to winged rach; main veins distinct to edge. ebenipes.
† † Fronds with either a separate sterile frond, or the base of ordinary one pinnatifid like a sessile oakleaf, browned rigid: (Drynaria).

55. Sterile fr. not separate. conjugatum.
Coronans Wall.
Sterile fr. distinct.
56. **Fert fr. long stalked, rigid.** *Quercifolium.*

_Goroor Beng._

Loc. Himal 1,000 ft. Bedd F. S. I. 188.

St. short distinct.

57. Text subcoriaceous, lobes bluntish or acute; free veinlets variously directed. *Propinquum.*


(Much thinner than last with venation of Goniophlebium).

Loc. N. E. Himal.

**Fr. pinnate.**

_Surfaces naked._

59. **Pin. narrowed at base, entire, stalked below.** *(Ieiorhizon).*


_Pin. rounded at base._

60. Pin. edge wavy thickened; sori large 1 between each main vein; surface naked. *Juglandifolium.* *(Capitellatum Wall).*

Loc. Srinigar, Simla, Landour, Kumaon to Khasia 4,000 ft. Bedd F. B. I., 12.

61. Pin. edge entire or repand; sori in 2 rows, of 3—4 deep (Surfaces beneath finely pubescent). *Lehmannii.*


12. **GRAMMITIDÆÆ.**

50. **Notochlæna.**

† Fr. densely farinose beneath.

1 Rhiz. woody, St. matted, fr. bipinnate *Marantæ*.  

52. **Gymnogramme.**

A. Habit of *Aspidium*, sori obl. or lin.-obl. not forked.

   *f* Veins free. (Differs from *Euphleegopteris* only in elongated sori).

1. Fr. bipinnifid, pin. cut ½ way into entire blunt lobes, rach. and surface finely villose, text. herb. *Totta*.  
Loc. 4-8,000 ft. Simla, below 2nd water-fall on ledges, and Mahasoo. Kumaon. Assam.

2. St. and rach. glossy distinct, fr. bipinnifid or bipinnate, pin. distant, cut nearly or quite to rach. surfaces naked. *aurita*.  
Habit and text. (firmer than last) of *P. distans*.  
Loc. N. Ind. to 6,000 ft. Khasia. Mumbree and Nuncklow. Lachen in Sikkim, Bedd F. B. I., 152.

**Fr. tripinnatifid.**

3. Lower pin. often 1 ft. 1. *Opaca*.  
   *Obtusata* Bl.  

B. Habit of *Cheilanthes*; sori lin. usually forked.

   *ff* Veinlets of contiguous groups uniting, as in *Eune-phrodium* and Goniöpterus (Stenogramme).

Loc. Khasia, 6,000 ft. Bedd F. B. I., 149.

   *fff* Veins free, under surface not powdery. (*Eugym-nogramme*).

5. Fr. pinnate. *Vestila*. 

( 57 )
Loc. Simla rocks general, banks above Brewery fine. Landour North Mall, beyond guardroom and road to Priest’s garden. rare Kumaon 7—8,000 ft. Bedd F. B. I., 154.


7. Fr. bipinnate; rhiz. creeping. Javanica.
Loc. 7—8,000 ft. Himalayas common, Dalhousie, Khasia, Assam, Bedd F. B. I., 57.

8. Fr. quadripinnatifid, deltoid. Microphylla.

C. Habit of Eupolypodium.
ffff Veins anastomosing variously, and usually copiously. (Differs from Phymatodes only by its elongated sori),

* Fronds simple.

† Main veins hidden 9—10.

9. Fr. less than 1 in br., sori very short of edge. lanceolata
Loc. Moist rock and trees: 3—4,000 ft. Himalayas.

10. Fr. 1 in br. or more; sori reaching nearly to edge. involuta.
(Sori less oblique, midrib less slender than last).

† † Main veins prominent.

11. Fr. dimorphous sub-coriaceous. Hamiltoniana.

53. Brainea.

1. Fr. pinnate. insignis.
Loc. Khasia. 4,000 ft. Bedd. F. B. I., 139.
54. **Meniscium.**

*Fr. pinnate.*
1. Rhiz. wide creeping
2. *St.* stout.
   a. Parishii. Pin. more herb. and pubescent.

55. **Antrophyum.**

* Sori sunk in distinct groove.
1. *Fr.* less than 1 in br. very thick.
   *Fr.* broader.
2. *Fr.* acute; no midrib; sori deeply immersed.
   *Fragaria.*
   Loc. a Khasia 4,000 ft. Bedd. F. B. I., 267.
3. *Fr.* blunt or acute; midrib scarcely any; sori and areola distinctly raised above surfaces
   Loc. Himalayas.
   * * Sori superficial, or but slightly immersed.
   *Fr.* obovate, entire or repand towards cuspidate point.
   Loc. Bhotan, Bedd. F. B. I., 176;

56. **Vittaria:**

* Sori sunk in a two lipped marginal groove (Euvittaria),
   * * Sori in a slightly intramarginal line, with unaltered edge of fr. produced beyond, or rolled over it,
   (Tœniopsis).
2. Midrib distinct throughout, raised \textit{lineata}.

58. \textbf{DRYMOGLOSSUM}.
1. Sori midway between edge and midrib \textit{carnosum}.
2. Sori in submarginal line. \textit{piloselloides}.

59. \textbf{HEMIONITIS}.
1. Fr. cordate hastate, 2—3 in. each way. \textit{cordata}.
2. Fr. subdeltoid pinnate. \textit{Griffithii}.

\textbf{XXX Acrostichece}.

60. \textbf{ACROSTICHUM}.

\textit{f Veins free.}

* Fronds simple. Elaphoglossum.

1. Both surfaces of barren fr. nearly or quite naked, edge not fringed. \textit{conforme}.
Loc. Trees and damp rocks to 6,000 ft. Nepal, Khasia.

2. Frond slightly scaly \textit{viscosum}.

* * Barren frond simply pinnate; pinnæ like those of \textit{Lomaria} in shape; coriaceous texture, and fine close venation (Stenochloena)

3. Rhiz. to 40 ft l. cable like, sometimes prickly; fr. 12-18 in l. rach often winged fert. pin. 2-4 in l. \textit{Sorbifolium}.
Lom. scandens Willd, longifolia I. Sm.
Loc. Various parts of India, Roxb. continent?

*** Barren fr: not Lomarioid in habit, with the veins pinnate in ultimate divisions of barren frond. Seta in sinus of ultimate divisions (Egenolfia).
5. Fr. pinnate. *appendiculatum;*

ff Veins anastomosing copiously...
   * Fr. dimorphous.
   † Main veins distinct nearly or quite to edge.
   (Gymnopteris).*

   b *Feei* F. B. I. 274. F. S. I. 211, variable in cutting, with every form of venation to that of lanceolatum. (Bedd).


   (terminans, Wall.)*
   (b). *crispatulum* Wall. pin. coriaceous crisped.
   (c). *costatum* Wall. pin. tinged red. N. Ind.
   (d). *deltigerum* (Meniscium) Wall. fert. pin. nearly as br. as barren; sori in patches.
   (e). *undulatum* (Nothochloena) Wall. sori in br. bands along edge of pin. which is sometimes lobed between main veins.

*Venation not constant, varying to Chrysodium. *Semicordatum* (Chrys) same as *contaminans* (Gym); *axillare* (Chrys) and *lanceolatum* also exhibit every form of venation from one subgenus to another, according to Beddome (Supplement).*

†† Main veins none or indistinct (Chrysodium).
Barren. fr. entire, 8-9.
9. bar. fr. 2 in. or less l., herb. minus
10. Rhiz. woody; fert fr. 6-12 in l. on st. as l.; text. herb.;
main veins raised, but short of edge. lanceolatum;

a. normalis I. Sm. bar. fr. sessile.
b. trilobata Bedd F. S. I. 273 south Ind.
c. pinnatifida ,, F. S. I. 211 Ceylon.
d. minus Mett. small form (9).
e. metallia ,, fr. sessile 3-7 in l. nearly 1 in br. bright blue:
fert fr. sori at apex only. F. B. I. 390 Haycock Mt.
on moist rocks. And forms with contracted fr. soriferous at apex as in Hymenoepis.

11. Fert fr. 6-12 in l. flexuose, on st. half as l.: text papyr.
on main veins.

Creeping form of lanceolatum (Bedd).
Barren fr. pinnatifid.
12. bar. fr. with terminal and 2 lat. entire obl. lobes tricuspe.

(axillare.

(upper half sometimes contracted and soriferous at apex.
as Hymen).

Barren frond copiously pinnate.
Loc. Assam. N. Ind.
14. Fr. not dimorphous; upper pin fertile. auricum.

Emarginatum Buch. inaequale, speciosum, Willd. vulgare Fee.
Distinct from all others.
Loc. Sylhet, Hattia Island, Bengal, Salt marshes Bedd. F. S. I. 204.

** Frond uniform, simple, bearing fruit on contracted apex (Hymenolepis).


Seeding not constant. Bedd.

Loc. To 6,000 ft. Himal. Sikki.n. Khasia, Churra, Assam.

---

Sub-order III.—Osmundaceae.

62. Osmunda.


Pilosa and monticola Wall.


(fert. pinul. cylindrical).

*b. speciosa* Wall. fert. and bar. *fr.* distinct; lat. pin. occasionally fertile.


---

Sub-order IV.—Schizeaceae.

64. Schizæa.

*Fertile segments digitate rather than pinnate, caps. in 4 rows.* (Astinostachys).

1. *St.* flattened, midrib prominent beneath *digitata.*

68. Lygodium.

Veins free. (Eulygodium).
Habit climbing.

* Fully developed barren pinnules pinnate.
† Segments articulated at base.

† † Segments not articulated at base.

Sub-order V.—Marattiaceæ.

69. Angiopteris.

Fr. bipinnate 9—15 ft. 1. evectia. 
Crassipes Wall Marattia pinnata Roxb.

72. Kaulfussia.

1. Fr. ternate or 5 digitate eesculifolia
(Assamica Griff.)
Sub-order VI.—Ophioglossaceae.

75. Ophioglossum.

Fertile spike, springing from base of barren segment.

Euophioglossum.
1. Fr. without a distinct haft. vulgatum.
   Loc. Himalayas.
3. Fr. with distinct haft. reticulatum.
   Cordifolium Roxb. Danga ghechu or Ekteera Beng.

Fertile spike usually single, springing from centre of barren segment. Ophioderma.
3 Fr. pendulous, without stem, fleshy pendulum.

74. Helminthostachys.

1. Osmunda Roxb. ekbeera Beng.
   Loc. Himalayas.

75. Botrychium.

* Texture thick, strong bipinnate Lunaria.
   ** Text. thin.

1. Sterile segm. stalked tri-pinfid or-tripinnate daucifolium.
2. Sterile segm. sessile 4 pinfid, fr. more finely cut. virgini- nianum.
SPECIES COLLECTED NEAR SIMLA, 1875-7.

**WOODSIA ELONGATA**—
Dicksonia scabra
Trichomanes auriculatum (Lord Northbrook)
Davallia immersa
  " charophylla
  " tenuifolia
Cystopteris fragilis
Adiantum lunulatum
  " caudatum
  " Capillua Venetis
  " venustum
  " pedatum (Captain Biddulph)
Cheilanthes subvillosa
  " Dalhousiae
  " rufa
  " farinosa
Onychium Japonicum
Cryptogramme crispa
Pteris longifolia
  " cretica
  " quadriplaneta
  " longispina
  " excelsa
  " aquilina
Woodwardia radicans
Asplenium ensifolium
  " alternans
  " trichomanes
  " resectum
  " heterocarpum
  " planiscalce
  " varians
  " exigium, *Bedd.*
  " tenuifolium
  " hohenackerianum
  " thelypteroides
  " macrocarpum
  " nigripes
  " oxyphyllum
  " Filicr feminea
  " Japonicum
  " longifolium
  " polydodioidea
Aspidium ilicifolium
  " auriculatum
Aspidium Thomsoni
  " Prescotianum
  " aculeatum, Sw.
  " angulare
  " rufobarbatum
  " falcatum

Nephrodium gracilescens
  " canum
  " thelypteris
  " elongatum
  " cochleatum
  " Brunonianum
  " barbigerum
  " sparsum (Miss fouldes)
  " odoratum
  " Boryanum
  " setigerum
  " pennigerum
  " molle

Oleandra Wallichii
Polypodium erubescens
  " appendiculatum
  " auriculatum
  " distans
  " punctatum
  " lincatum
  " amœnum
  " lachnopus
  " adnascent
  " membranaceum
  " hemionitideum
  " malacodon
  " ebenipes
  " propinquium
  " Juglandifoliurn

Nothochlora Maranta
Gymnogramme Totta
  " vestita
  " javanica

Osmunda regalis
Botrychium daucifolium
  " virginianum
Species Collected at Murree, 1879.

Adiantum caudatum.
   " capillus Veneris.
   " venustum.
Cheilanthes Dalhousioe.
   " farinosa.
Onychium Japonicum.
Pteris longifolia.
   " Cretica.
   " aquilina.
Asplenium alternans.
   " Trichomanes.
   " varians.
   " nigripes.
   " Japonicum.
   " Polypodioides.
   " septentrionale (from Kashmir).
Aspidium aculeatum.
   " rufobarbatum.
Nephrodium spinulosum.
   " odoratum.
   " intermedium.
   " Boryanum.
Polypodium. (Euphlegopteris apparently new.)
Gymnogramme Javanica.
Botrychium virginianum.
( 69 )

ERRATA AND ADDITIONS.

P. S. L. 7 for galbra read Glabra.
P. 9, L. 8 from bottom for siem read fæm.
P. 17, L from bottom to Cheilanthes Szovitzii add Safvet koh Afghanistan.
P. 18, L. 16 commence 2.
P. 24 No. 9 Aspl. Normale.
A. Multijugum Wall.
Khasya, Sikkim, Assam.

NOTE.—That rare fan fern Actiniopteris radiata is found at Dalhousie.
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Brainea insignis

Camperteria, see Pteris

Ceratopteris thaljetroides

Chelanthes argantca

Calomelanos

Chrysophylla

Dalhousiae

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