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THE FERNS OF KASHMIR

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The native state of Kashmir is the most northerly part of the British Indian Empire. It extends roughly from 32′ to 36′ north latitude and from 74′ to 78′ east longitude. It is bounded on the west by the Northwest Frontier Province, on the north by the U. R. S. S. and Sinkiang, on the northeast by Tibet, on the east by the Punjab Himalaya, and on the south by the Punjab. Except for the famous Vale of Kashmir the whole country is mountainous. The backbone of the Himalayas forms the watershed which separates the streams flowing toward the Punjab by the Jhelum and Chenab river systems from the streams which flow into the Indus. The Indus follows a remarkable course, flowing northwest from Tibet, curving around the Nanga Parbat range in the north of Kashmir, and then cutting across the whole of the Himalayan chain to enter the plains at Attock.

That part of Kashmir which is behind the main Himalayan range and is drained by the Indus is almost rainless in summer because the high mountains check the moisture-laden monsoon winds. However, there is a heavy snowfall in winter, which produces numerous glaciers and permanent snowfields. This part of Kashmir is Tibetan in character. It is treeless, except for willows, poplars, apricots, and a few other species which are cultivated by the villagers. Except for the alpine meadows near the snowfields and the irrigated land about the villages the whole country is desert. In this region the only common fern is *Cystopteris fragilis*.

South of the Himalayas conditions are very different. There is a semi-tropical foothill zone of low xerophytic shrubs, which gradually changes as one ascends into a scrub forest in which the chief trees are *Olea cuspidata* and *Acacia modesta*. At about 3000 feet *Pinus longifolia* comes in on the ridges and steep slopes. The temperate Himalayan zone begins between 5000 and 6000 feet, where *Pinus longifolia* is replaced by *P. excelsa* and temperate hardwoods of many familiar northern genera.

The Himalayan flora extends to the limit of tree growth at from 11,000 to 12,000 feet. The position of the tree line varies with local conditions and in some inner valleys the alpine zone descends to below 10,000 feet. Above the last trees, which are commonly birches (*Betula utilis*), one usually finds shrubby junipers, willows, and rhododendrons, which are gradually replaced by the herbs of meadows, moraines, and talus slopes. The permanent snow line is at about 14,000 feet on the south slope of the Himalayas and as high as 19,000 feet on the Tibetan side.

Ferns have been collected in this region for more than a hundred years, but I have not been able to find a list of Kashmir ferns; one could be compiled from the publications of Beddome (1), Clarke (6), and Hope (9), the three men who have done most work on the ferns of North India. This list is based on their work and on the rich collections at the Dehra Dun Herbarium of the Imperial Forestry Research Institute in the United Provinces, North India, on the collections at the Royal Botanic Gardens at Kew, on the Underwood Herbarium at the New York Botanical Garden, and on the collections at Gordon College, Rawalpindi, North Punjab.

Gordon College is fortunate in possessing the Trotter collection of ferns which lay for more than forty years in a private house in Murree. It consists of about 2000 sheets of Himalayan ferns accumulated by E. W. Trotter of the Punjab Post and Telegraph Department, chiefly between 1885 and 1892. He himself collected a great many, from the Indus on the west almost to the boundary of Nepal. He obtained a large number also by exchange, thus building up an excellent working collection which includes most of the ferns known to grow between the Indus and the Burma line. He had exchanged specimens with the numerous fern enthusiasts of that golden period of fern collecting in north India, so that his herbarium contains many specimens of Gustav Mann, C. W. Hope, the Mackinnon brothers, J. C. McDonell, H. F. Blanford, Col. R. W. MacLeod, J. S. Gamble, and other contemporaries. Trotter was the discoverer of *Dryopteris* (*Polypodium*) *laterepens.*

Besides the Trotter Collection the Gordon College Herbarium contains my own collections from 1912 to 1940, those made by Prof. Mohindar Nath, and a few hundred sheets which have come in by exchange.

I have not attempted to list all the synonyms which have been used for Kashmir ferns, but only to give the correct name according to the *International Rules of Botanical Nomenclature* (ed. 3. 1935), and enough synonymy to make it possible for one using the older works of Beddome or Clarke to locate the species. I have followed the *Index Filicum* of Carl Christensen for the generic and for most of the specific names. I have not attempted to list all the specimens seen, but to cite enough from the Gordon College collections and those of the New York Botanical Garden to indicate their distribution and abundance.

A new fern flora for British India is badly needed. Beddome's *Handbook* (1), though excellent in its day, is out of date. Since 1892 much collecting has been done, many additional species have been described, and generic concepts have changed. Beddome knew the ferns of South India much better than he did those of the north. C. B. Clarke and C. W. Hope have been the outstanding students of North Indian ferns, but their publications are not readily accessible, and need revision. No one should work on the ferns of North India without C. W. Hope's *Ferns of Northwestern India* (9). He

knew the ferns in the field and saw almost all the specimens which had been collected in the area before his time. It is unfortunate that his work was not published in book form instead of in parts in the *Journal of the Bombay Natural History Society*. He checked the determinations of all the Indian specimens in the Trotter collection and those at Dehra Dun and studied the Indian collections at Calcutta, Kew, and Dublin. Little work has been done on the ferns of North India since his time. He was able to build on the work of Clarke and he described 211 ferns growing to the west of Nepal, against 149 in Clarke's Review.

Although Kashmir is not so rich in ferns as the parts of the Himalaya farther east, it has more true ferns than are to be found in the northern part of the United States and Canada as treated by Britton and Brown in their *Illustrated Flora* (4). There are 106 species and varieties in the present list. C. B. Clarke admits 363 species for the whole of North India (omitting Lycopodiaceae and Equisetaceae), while Beddome treats 405 species and varieties. Although it is not likely that many Kashmir species have been overlooked entirely, there is still much work to be done. Many species are poorly represented in herbaria and ten per cent of the total have only been reported once. There are *Dryopteris hexagonoptera, D. hirtipes, D. marginata, D. macrocarpa* (*Schimperiana*), *D. repens, D. prolifera, Polystichum aristatum, Athyrium setiferum, Notholaena vellea, Polypodium Stracheyi,* and *Woodwardia radicans.* The first species was reported from Zanskar by Sir George Watt, and this is the only Indian record of it, but all the others grow east of Kashmir, where most of them are common. I suspect that some of them do not grow in Kashmir, but since they have been reported by Clarke or Beddome I have entered them in this list. Nine species are reported by Beddome or Clarke which neither Hope or I have been able to find in the field or in collections, and I do not know the basis of their inclusion as natives of the state. If they are really Kashmir plants I should expect to find them on the eastern border, for I have specimens of them all from farther east. They are *Dryopteris africana, D. repens, Leucostegia pulchra, Notholaena marantae, Polypodium microrhizoma, P. lachnopus, P. argutum, Cyclophorus porosus,* and *Diplazium maximum.* The parts of Kashmir most likely to yield new records are the southern slopes of the Pir Panjal Range from the Jhelum River to the Chamba line, especially the area nearest Chamba.

Although the fern flora of Kashmir cannot compare in richness with the area to the east where the ground ferns are supplemented by many epiphytes, yet it is quite rich in comparison with that of the British Isles, which have only 37 species, and has twice as many as are found in the Middle East. In the small area about Simla, in the Punjab Himalaya, there are 124 ferns; these were published in Collett's *Flora simlensis* (7) with identifications by Hope.

There seem to be no endemic species in the state.

A number of critical groups need further study. This is particularly true of the ferns formerly attached to *Dryopteris Filix-mas* as varieties but which are now recognized by C. Christensen and others as species, and the ferns called *Dryopteris Linnaeana* or *D. Robertiana*. More work needs to be done on the linear-leaved species commonly referred to as *Polypodium lineare* or *P. loriforme*. The ferns related to *Athyrium Filix-femina* are also difficult.

From the standpoint of distribution the most interesting fern is *Microlepia Wilfordii,* which has not been found anywhere else in India but which grows in Japan, Korea, and China. It was discovered in 1897 by McDonell in the Buniar Nullah near Rampur in the Jhelum Valley at about 4000 feet, and I found it in 1927, possibly in the same spot.

There are enough widespread northern ferns growing in Kashmir to make an American or European botanist feel at home while collecting there, especially in the temperate and alpine zone. The following, listed in Britton and Brown's *Illustrated Flora,* are also Kashmir plants, and most of them are common there.

Osmunda Claytoniana
Woodsia alpina
Cystopteris fragilis
C. montana
Dryopteris thelypteris
D. phegopteris
D. Linnaeana
D. Filix-mas
Asplenium trichomanes
A. viride
A. Ruta-muraria
A. fontanum
Athyrium Filix-femina
A. acrostichoides
Adiantum Capillus-veneris
A. pedatum
Pteridium aquilinum
Cryptogramma Stelleri

A number of others, not found in America, are North European ferns, while others belong to the Mediterranean flora. Four of the five ferns listed by Pampanini in his *Flora of Tripolitania* (10) are Kashmir plants. They are *Adiantum Capillus-veneris, Ceterach officinarum, Cheilanthes pteridioides,* and *Notholaena vellea,* while the fifth, *Anogramma* (*Gymnogramma*) *leptophylla,* grows to the east of Kashmir and may have been overlooked.

Of the 24 ferns in Post's *Flora of Syria, Palestine and Sinai* (11) all but five are found in Kashmir or to the east of Kashmir. Those in common are

Osmunda regalis
Anogramma leptophylla
Ceterach officinarum
Notholaena marantae
Cheilanthes pteridioides
Pteris cretica
P. vittata (*"P. longifolia"* Auct.)
Pteridium aquilinum
Adiantum Capillus-veneris
Asplenium fontanum
A. trichomanes
A. Ruta-muraria
A. Adiantum-nigrum
A. septentrionale
Athyrium Filix-femina
Polystichum aculeatum
Dryopteris thelypteris
Dryopteris Filix-mas vel. aff.
Cystopteris fragilis

Boissier (3) describes 54 ferns found in Persia and adjacent countries, all but 18 of which grow in Kashmir.

Kashmir is just west of the area which has enough moisture during the monsoon to permit an epiphytic flora. Only a few miles to the east the zone of epiphytes begins, and the nearer one gets to the Bay of Bengal the richer the forests are in epiphytic ferns, orchids, aroids, mosses, liverworts, and lichens. From the region extending two hundred miles to the west of Kashmir only a few ferns are known which do not grow in the state, while more than a hundred others appear within two hundred miles eastward. *Adiantum aethiopicum* is the only fern I know from the Afghan frontier which does not grow in Kashmir or to the east of Kashmir. General Gatacre found 27 ferns in the Chitral region (8), of which all are Indian and 19 are European. The two most remarkable finds are *Dryopteris ludens* and *Lygodium microphyllum*, which do not grow in Kashmir but are known from farther east.

There are a number of tropical or subtropical ferns in the Kashmir foothills, but this element is not very large because of the long dry season and the small number of perennial waterfalls or streams. The Mediterranean ferns find themselves more at home here. Examples of the tropical element are *Dryopteris rampans, Dryopteris dentata* (*parasitica*), *D. prolifera, Pteris vittata, Cyrtomium caryotideum, Polypodium membranaceum,* and *Adiantum caudatum.*

A note is perhaps necessary in explanation of the varied spelling of Indian place names. There has been an evolution in the spelling of many names. Kashmir was formerly Cashmere. Rawalpindi was Rawul Pindee. The Punjab was the Punjaub and should probably be written Panjab. The province with headquarters at Karachi has been spelled Scinde, Scind, or Sind. Even good maps differ in the spelling of names. One reason is that the natives themselves differ and another is that scientific visitors are dependent on their pony men or coolies for names and with no better guide it is not strange that variations crept in. The sound is the important thing and small differences in spelling should be overlooked.

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POLYPODIACEAE

WOODSIA ALPINA (Bolton) Gray, Nat. Arr. Brit. Pl. **2**: 17. 1821. *Acrostichum alpinum* Bolton, Fil. Brit. 76. 1790. *Woodsia hyperborea* R. Br. Prodr. Fl. Nov. Holl. **1**: 158. 1810.

Sonamarg, *6829*[1]; Mt. Kolahoi, *9446;* Masjid Valley, *Duthie 13,226;* Thajwas Nullah, *Duthie 13,644;* Sonsal Nullah, 13,000–14,000 feet, *Duthie.*

An alpine plant of rock clefts. Not common.
Distribution: Boreal North America, central Europe, Himalaya, Altai.

CYSTOPTERIS FRAGILIS (L.) Bernh. Schrad. Jour. Bot. **1**[2]: 27. 1806. *Polypodium fragile* L. Sp. Pl. 1091. 1753.

The commonest fern at high altitudes and almost the only fern in the Tibetan zone behind the Himalayas. It is usually found from 10,000 to 15,000 feet but I found it as low as 5500 feet under a rock in the Keran Nullah, Kishenganga Valley. It varies greatly in size.
Distribution: The Arctic and Antarctic zones and the mountains of the world.

CYSTOPTERIS MONTANA (Lam.) Bernh.; Desv. Mém. Soc. Linn. Paris **6**: 264. 1827. *Polypodium montanum* Lam. Fl. Fr. **1**: 23. 1778. *Filix montana* Underw. Nat. Ferns ed. 6, 119. 1900.

Bungas, Muzaffarabad, *Inayat 20,786;* Gulmarg, in woods, 9000 feet, *Aitchison;* Sonamarg, 10,500 feet, rock crevices in birch forest, *6868;* 3–9–1884, *Duthie 3647.*

A rare fern at high levels.
Distribution: Boreal North America, Europe, Asia.

DRYOPTERIS ROSTHORNII (Diels) C. Chr. Ind. Fil. 289. 1905; Suppl. 3: 96. 1934. *Nephrodium Rosthornii* Diels, Engl. Jahrb. **29**: 190. 1900. *Nephrodium Filix-mas* var. *fibrillosa Clarke,* Trans. Linn. Soc. II. **1**: 520, *pl. 70.* 1880. *Lastrea Filix-mas* var. *parallellogramma* Bedd. Handb. 249, in part. 1883.

Sonamarg, *6340; 13,451;* Khillanmarg, above Gulmarg, *10,412;* Pahlgam, *8141; 8242;* Keran, *17,264;* Below Kel, Kishenganga Valley. Alt. 6000–11,000 feet.

This is a beautiful, shuttelcock-like form with shiny black scales. It is only once pinnate, the pinnules are very regular and only slightly denticu-

[1] Specimens listed without collector's name are those of the author.

late. It replaces the more eastern *D. paleacea* in Kashmir. It is very close to *D. Blanfordii* but is usually smaller, with darker ramentae and pinnules less denticulate.
Distribution: Himalaya, China.

DRYOPTERIS FILIX-MAS (L.) Schott. Gen. Fil. ad *pl. 9.* 1834. *Polypodium Filix-mas* L. Sp. Pl. 1090. 1753. *Nephrodium Filix-mas* Rich.; Marthe, Cat. Jard. Méd. Paris 129. 1801. *Aspidium Filix-mas* Sw. Schrad. Jour. Bot. **1800**[2]: 38. 1801.

Hirpour, *Jacquemont 586;* Rembiara Valley, 6500–7000 feet, *Trotter 191;* Liddarwat, 9000 feet, *Trotter 404;* also specimens of MacLeod, Duthie, and McDonell. Cited by Hope, Jour. Bomb. Nat. Hist. Soc. **14**: 727. 1903.

Distribution: Temperate parts of the world except Australia and southern South America.

DRYOPTERIS BLANFORDII (Hope) C. Chr. Ind. Fil. 254. 1905. *Nephrodium Blanfordii* Hope, Jour. Bomb. Nat. Hist. Soc. **12**: 624. *pl. 11.* 1899. *Nephrodium remotum* of Blanford, Jour. As. Soc. Beng. **57**[2]: 4. 1888; non Hook. 1861.

Pahlgam, *5324a; 8128;* Sonamarg, *9744; 9767; 13,452;* Nagmarg and Sonamarg in 1888, *Trotter,* cited by Hope. Alt. usually 6000–9000 feet.

Close to *D. Rosthornii* when the specimens are small and the pinnules are more nearly entire than usual. The pinnae are not so regularly cut or so close together and the basal ramentae are shorter and broader and not so numerous upward on the rachis. The scales are dark, black or brownish-black. The short stipe is a good character in distinguishing this species from *D. odontoloma.*
Distribution: North India.

DRYOPTERIS ODONTOLOMA (Moore) C. Chr. Acta Hort. Goth. **1**: 59. 1924; Suppl. **3**: 93. 1934. *Dryopteris Filix-mas* var. *odontoloma* (Moore) C. Chr. Index 265. 1905. *Lastrea odontoloma* Moore, Ind. Fil. 90. 1858. *Nephrodium Filix-mas* var. *normalis* Clarke, Tr. Linn. Soc. II. **1**: 521. *pl. 71.* 1880. ? *Nephrodium rigidum* Clarke, l.c. 523. *Nephrodium odontoloma* Hope, Jour. Bomb. Nat. Hist. Soc. **14**: 736. *pl. 31.* 1903.

Batot, Jumu Road, *12,483;* Between Uri and Aliabad, *13,982c;* Titwal to Surkhala, Kishenganga Valley, *71,445;*? Burzil Chowki, *19,782;* Sonamarg, *6334;* Mitsahoi, Ladak Road, *9920a;* Gilgit, 10,000 feet, in 1847, *Winterbottom,* cited by Hope. Alt. 3000–10,000 feet.

This is another variable fern belonging to the *D. Filix-mas* complex which is sometimes difficult to tell from *D. Blanfordii* on the one hand and *D. marginata* and *D. ramosa* on the other. It is usually twice pinnate and the stipe is long, not short as in *D. Blanfordii.* The sori are small and the pinnae are distant, increasingly so downwards. The three to five lowest pinnae are barren. The stipes are paler and more straw-colored than in *D. Blanfordii* and the fronds dry a pale color. The general outline of the frond is oblong lanceolate to ovate or deltoid lanceolate. *D. marginata* and *D. ramosa* are usually larger, tripinnate instead of bipinnate, and the general outline of the frond is more triangular.
Distribution: Afghanistan to Assam, Mts. of South India. China.

DRYOPTERIS MARGINATA (Wall.) Christ, Phil. Jour. Sci. **2**: 212. 1907. *Aspidium marginatum* Wall. List 391, nomen, in part. 1829. *Nephrodium Filix-mas* var. *marginata* Clarke, Trans. Linn. Soc. II. **1**: 521. *pl. 71.* 1880. *Nephrodium Filix-mas* var. *elongatum* auct. *Nephrodium marginatum* Hope, Jour. Bomb. Nat. Hist. Soc. **14**: 740. *pl. 33.* 1903.

Hope cites Col. MacLeod as authority for treating *D. marginata* as a Kashmir plant. MacLeod states that it is common from 6000 to 11,000 feet between the Jhelum and Kishenganga Valleys. I am not sure whether authentic *D. marginata* grows in Kashmir or not; it becomes common east of Kashmir. It is a large fern, often tripinnate, with long stipes; the outline of the frond is triangular.

Distribution: North India, South China.

DRYOPTERIS RAMOSA (Hope) C. Chr. Ind. Fil. 287. 1905. *Nephrodium ramosum* Hope, Jour. Bot. **34**: 126. 1896; Jour. Bomb. Nat. Hist. Soc. **14**: 739. *pl. 32.* 1903.

Dras Valley, *Duthie 11,667;* Pahlgam, *5725;* near Gulmarg, *10,401a; 10,447;* Banihal Pass, *14,089b;* Sharda, Kishenganga Valley, *17,776;* above Chorwan, *18,602;* Badwan, *19,562; 19,602;* etc.

This is the largest of the species related to *D. Filix-mas* which is common in Kashmir and largely if not completely replaces *D. marginata* in the state. Hope well states the characteristic features of the species "frond broad, hardly ever reduced at the base, pinnae, very long, broad and distant; pinnules, very long and narrow; frond pale green in color and scales almost invariably pale." It is perhaps nearest to *D. Blanfordii,* which may be distinguished by the dark ramentae, short stipe, and less compound cutting.

Distribution: Afghanistan to Tehri Garhwal.

Dryopteris macrocarpa R. R. Stewart, nom. nov. *Lastrea Filix-mas* var. *elongata* Bedd. Handb. 250. 1883. *Lastrea Filix-mas* var. *Schimperiana* Bedd. Handb. Suppl. 58. 1892. *Dryopteris cochleata* var. *Schimperiana* C. Chr. Ind. Fil. Suppl. **3**: 86. 1934. *Nephrodium Schimperianum* Hope, Jour. Bomb. Nat. Hist. Soc. **14**: 733. 1903. *Nephrodium Filix-mas* var. *Schimperiana* Clarke, Trans. Linn. Soc. II. **1**: 520. *pl. 69, f. 2.* 1880.

Only reported by Trotter from Rattanpir at 8000 feet. Becomes very common farther east and is one of the commonest ferns in the *Quercus incana* zone at Mussoorie. I consider it to be distinct and cannot understand why C. Christensen united it with *D. cochleata. D. cochleata* is dimorphic with many sterile fronds and the lower surfaces of the fertile fronds are completely hidden by the sori. This is not the case in *D. macrocarpa.* According to Christ the Ethiopian material is different from Indian "*D. Schimperiana.*" See Hope, Jour. Bombay Nat. Hist. Soc. **14**: 734. 1903.

Distribution: Kashmir to Assam.

DRYOPTERIS SERRATO-DENTATA (Bedd.) Hayata, Ic. Pl. Formosa **4**: 179. *pl. 116.* 1914. *Lastrea Filix-mas* var. *odontoloma* of Bedd. Ferns Brit. Ind. 248. *pl. 373.* 1863–5. *Lastrea Filix-mas* var. *serrato-dentata* Bedd. Handb. Suppl. 55. 1892. *Nephrodium serrato-dentatum* Hope, Jour. Bomb. Nat. Hist. Soc. **12**: 622. *pl. 10.* 1899. ? *Nephrodium Kingii* Hope, Jour. Bomb. Nat. Hist. Soc. **12**: 621. *pl. 9.* 1899.

Chatponsal Nullah, *Duthie 13,221;* Sind Valley near Baltal, *Duthie 11,613.* Both cited by Hope.

A very rare high level fern, closely related to *D. barbigera* and *D. Brunoniana,* but more delicate. The stipes are very long for the size of the plant, being as long as or longer than the frond. The basal scales wear off more easily than they do in *D. barbigera.*
Distribution: Hazara to Bhotan, China.

DRYOPTERIS BARBIGERA (Moore) Kuntze, Rev. Gen. **2**: 812. 1891. *Nephrodium barbigerum* Moore ex. Hook. Sp. Fil. **4**: 113. 1862. *Lastrea barbigera* Bedd. Ferns Brit. Ind. *pl. 227.* 1867.

This is a very common and handsome alpine fern growing gregariously on alpine meadows. The fronds are broad for their length while in *D. Brunoniana* they are comparatively narrow. The stipe and rachis of *D. Brunoniana* are black or reddish-black, blacker than the scales, while those of *D. barbigera* are pale brown, paler than the scales (Hope). Alt. 9000–13,000 feet.
Distribution: Afghanistan to Sikkim, China.

DRYOPTERIS BARBIGERA var. **Falconeri** (Hook.) R. R. Stewart, comb. nov. *Nephrodium Falconeri* Hook. Sp. Fil. **4**: 123. 1862. *Lastrea Falconeri* Bedd. Ferns Brit. Ind. *pl. 41.* 1865.

Hooker's species was based on a single frond of Falconer's from Kashmir. Clarke considered *D. Falconeri* to be the same as *D. barbigera,* as did Beddome in his Handbook (p. 248. 1892). There are specimens like my *8642* and *10,645* from Khillanmarg, above Gulmarg with larger fronds, the pinnules longer and narrower, and the rachises more glandular-resinous. Perhaps they are no more than a vigorous form of *D. barbigera* and not worth a separate name.

DRYOPTERIS BRUNONIANA (Wall.) Kuntze, Rev. Gen. **2**: 812. 1891. *Aspidium Brunonianum* Wall. List 344, nomen. 1829. *Lastrea Brunoniana* Pr. Tent. 76. 1836. *Nephrodium Brunonianum* Hook. Sp. Fil. **4**: 113. *pl. 251.* 1862.

Trunkal, Gangabal Lakes, *4551;* Sonamarg, *3542; 6664;* Pahlgam, *5901;* Mt. Kolahoi, *8275a;* Khillanmarg, *8658a; 10,415; 10,422;* Kamri Pass, *18,715;* Zojibal to Mengandob, *18,253;* Burzil to Deosai, *19,994;* etc. Alt. 10,000–16,000 feet.

A common high level fern.
Distribution: Hazara to Bhotan.

DRYOPTERIS CRENATA (Forsk.) Kuntze, Rev. Gen. **2**: 811. 1891. *Polypodium crenatum* Forsk. Fl. Aegypt.-Arab. 185. 1775. *Lastrea crenata* Bedd. Ferns Brit. Ind. 18. 1876.

Not listed from Kashmir by either Beddome or Hope, but I found it between Muzaffarabad and Dhanni in the Kishenganga Valley and at Ramban, Jumu Road, 3000 feet, *10,732.* There is also a specimen from the Tawi Valley, 5000 feet, by Trotter.

This is one of the finest ferns in the Himalayas and very easily recognized. It likes the sun and grows on cliffs in the outer hills, usually from 2000 to 6000 feet. The rhizome is usually wedged firmly in the rocks and the

base of the stipe is covered by long, chestnut-colored scales unlike those of any other fern in North India. Common on limestone.
Distribution: Cape Verde Islands to North India, Malacca, South China.

DRYOPTERIS THELYPTERIS (L.) A. Gray, Man. 630. 1848. *Acrostichum thelypteris* L. Sp. Pl. 1071. 1753. *Lastrea thelypteris* Bory, Dict. Class. **9**: 233. 1826.

Kangan, Sind Valley, 6000 feet, *6925; 13,450.* Near Dal Lake, Srinagar, 5200 feet, *Thomson, Gammie, Levinge,* etc.

This is a plant of springs and shallow water.
Distribution: Most parts of the northern hemisphere, New Zealand.

DRYOPTERIS REPENS (Hope) C. Chr. Ind. 288. 1905. *Nephrodium repens* Hope, Jour. Bomb. Nat. Hist. Soc. **12**: 535. 1899. ? *Nephrodium prolixum* Baker, Syn. Fil. 268. 1867.

I include this in the list of Kashmir ferns on the authority of Clarke. Hope found no Kashmir specimens, nor have I. It is common from Chamba eastward.
Distribution: North India, Sierra Leone.

DRYOPTERIS RAMPANS (Bak.) C. Chr. Ind. Fil. 287. 1905. *Nephrodium rampans* Bak. Jour. Bot. **27**: 177. 1889. *Polypodium lineatum* Colebr. Wall. List 300, nomen. 1829. *Goniopteris lineata* Bedd. Pr. Tent. 183. 1836. *Nephrodium costatum* of Bedd. Handb. 275. 1883.

Jhelum Valley Road, 35th mile, *MacLeod;* Tawi Valley, 4000 feet, *Levinge;* Poonch, 3000 feet, *Sage,* as *D. multilineatum.* Alt. 3000–7000 feet.

This plant has often been called *D. penangiana,* a plant of Malacca and Borneo (see. C. Chr. Index. Fil. Suppl. **3**: 94. 1934). It is a large fern growing at low altitudes in the outer ranges on damp shady banks. The leaflets are narrower and smaller than in *D. moulmeinensis* with which it has been confused. At Mussoorie the fertile fronds come up in August.
Distribution: North India and China.

DRYOPTERIS ERUBESCENS (Wall.) C. Chr. Ind. Fil. 263. 1905. *Polypodium erubescens* Wall. List 330, nomen. 1829. *Phegopteris erubescens* J. Sm. Hist. Fil. 233. 1875.

Jhelum Valley Road, 3000 feet, *Trotter;* Jumu Road near Banihal Village, Kishenganga Valley, 3000 feet (Herb. Gordon); Basaoli, 5500 feet, *Clarke.* Alt. 3000–7000 feet.

A large fern growing in the wet ground below springs or by the side of streams, suggesting a *Pteris.* Grows in the same sort of places as *Woodwardia radicans.* Not common in Kashmir but becomes abundant farther east.
Distribution: North India, Malaya, South China.

DRYOPTERIS HIRTIPES var. ATRATA (Wall.) C. Chr. Contr. U. S. Nat. Herb. **26**: 278. 1931. *Aspidium atratum* Wall. List 380, nomen. 1829. *Lastrea atrata* Pr. Tent. 77. 1836. *Nephrodium hirtipes* Hook. Sp. Fil. **4**: 115. 1862. *Lastrea hirtipes* Moore, Ind. Fil. 85. 1858.

McDonell found this at Ghantamula in 1891 at 5300 feet and his are the only Kashmir specimens I have seen. Very rare.
Distribution: Himalaya, South China.

DRYOPTERIS LATEREPENS (Trotter) C. Chr. Ind. Fil. 274. 1905. *Polypodium repens* Trotter; Hope, Jour. Bomb. Nat. Hist. Soc. **12**: 628. *pl. 14.* 1899.

Chittapani Valley and Rattanpir, 7500–8500 feet, *Trotter;* Dardpura, 4000–6000 feet, *MacLeod.*

This is a plant of swampy or wet ground and the type collections are in the Trotter Herbarium at Gordon College. The rhizome is necessary to distinguish it from *D. brunnea,* with which it has often been confused. All the specimens labelled *D. brunnea* in the Dehra Dun Herbarium are without rhizomes and cannot be identified with certainty; I suspect that they are really *D. laterepens.*
Distribution: North India.

DRYOPTERIS LEVINGEI (Clarke) C. Chr. Ind. Fil. 275. 1905. *Gymnogramme aurita* var. *Levingei* Clarke, Trans. Linn. Soc. II. **1**: 568. 1880. *Gymnogramme Levingei* Baker, Ann. Bot. **5**: 483. 1891.

Pahlgam, 7500 feet, *5334; 5489;* Gulmarg, *10,206a;* Surkhala to Keran, 5000–6000 feet, *17,554.* Alt. 4500–9500 feet.

Like *D. laterepens,* this has a creeping rootstock and grows in damp soil.
Distribution: Himalaya.

DRYOPTERIS DENTATA (Forsk.) C. Chr. Vid. Selsk. Skr. VIII. **6**: 24. 1920. *Polypodium dentatum* Forsk. Fl. Aegypt.-Arab. 185. 1775. *Dryopteris parasitica* auct. non L.

Domel, 2000 feet, *5150;* Garhi, 3000 feet, *5145;* Chenari, 3500 feet, *12,170.* All Jhelum Valley Road.

This is a common fern in the foothills up to about 3000 feet and is often called *Nephrodium molle, Dryopteris parasitica,* or *D. subpubescens.* The lower pinnae of *D. dentata* are gradually reduced to mere auricles, while in *D. parasitica* (L.) Kuntze the basal pinnae are unreduced. Is *D. subpubescens* a synonym?
Distribution: Tropical America, Atlantic Islands, Africa, Arabia, India, Tropical Asia?

DRYOPTERIS AFRICANA (Desv. C. Chr. Ind. Fil. 251. 1905. *Polypodium africana* Desv. Prod. 239. 1827. *Gymnogramma totta* Schlecht. Adumbr. 15. *pl. 6.* 1825. *Leptogramma totta* J. Sm. Jour. Bot. **4**: 52. 1841.

Reported from Kashmir by Beddome without data. I have seen no specimens. It grows from Chamba eastward.
Distribution: Azores, North Africa, India, Malaya, China, Japan.

DRYOPTERIS PROLIFERA (Retz.) C. Chr. Ind. Fil. 286. 1905. *Hemionitis prolifera* Retz. Obs. **6**: 38. 1791. *Polypodium prolifera* Roxb. Wall. List 312, nomen. 1829. *Goniopteris prolifera* Pr. Tent. 183. 1836.

The only Kashmir record seems to be *Jacquemont 1419* from Rajaori in Poonch. It is a vigorous plant of the plains or low foothills, commonly growing in ditches. In 1928 I collected it at Maksud in Hazara (*9653*) and it probably grows in the foothills of Poonch and Jumu. It becomes common toward the east, like many other ferns which are not common in Kashmir.
Distribution: Tropical Africa, India, Malaya, China, Polynesia, Australia.

DRYOPTERIS PHEGOPTERIS (L.) C. Chr. Ind. Fil. 284. 1905. *Polypodium phegopteris* L. Sp. Pl. 1083. 1753. *Phegopteris vulgaris* Mett. Fil. Lips. 83. 1856.

Khillanmarg, above Gulmarg, 10,000 feet, *8698;* Gulmarg, 8000 feet, *10,480;* Sonamarg, 9000 feet, *9702;* Rajdhiangan Pass, 9000–10,000 feet, *18,003; 19,478.* Alt. 9000–12,000 feet.

Grows in forest humus. Easily recognized by the deflexed basal pinnae and the pubescence.
Distribution: Temperate and arctic America, Europe, North Asia, Himalaya, Japan, etc.

DRYOPTERIS LINNAEANA, C. Chr. Ind. Fil. 275. 1905. *Polypodium dryopteris* L. Sp. Pl. 1093. 1753. *Phegopteris dryopteris* Fée, Gen. 243. 1850–52. ? *Gymnocarpium dryopteris* var. *disjunctum* (Rupr.) Ching, Contr. Biol. Lab. Sci. Soc. China Bot. **9**: 41. 1933.

A number of specimens from Kashmir and the adjacent mountains have been referred to *D. Linnaeana.* Ching cites two Indian specimens as being his var. *disjunctum,* a Hooker and Thomson specimen from Kishtwar and *Aitchison 382* from the Afghan frontier. Not having seen them, I cannot say whether they are the same as specimens hitherto referred to *D. Linnaeana* or to *D. Robertiana* in India.
Distribution: Temperate and arctic America; North Europe and Asia, Western Himalaya, China, Japan.

DRYOPTERIS ROBERTIANA (Hoffm.) C. Chr. Ind. Fil. 289. 1905. *Polypodium Robertianum* Hoffm. Deuts. Fl. **2**: 20. 1795. *Polypodium calcareum* Sm. Fl. Brit. 1117. 1804. *Phegopteris Robertiana* A. Br.; Aschers. Fl. Brand. **2**: 198. 1859. ? *Gymnocarpium remotum* Ching, Contr. Biol. Lab. Sci. Soc. China **9**: 41. 1933.

Tragbal, *4562;* Sonamarg, *7188;* Aliabad Pass, *13,690;* Ferozepur Nullah, *14,753;* Keran to Reshna, Kishenganga Valley, *17,681;* Sharda, *17,775;* Chorwan to Kamri, *18,625;* Rajdhiangan Pass, *19,479;* Chorwan to Minimarg, *19,709.* Alt. 5000–11,000 feet.

There has been much difference of opinion about the two Indian oak ferns. Hope did not think it worth while to keep them distinct in India, although there are specimens which might be sorted out as one or other of the two species which are recognized in Europe. Clarke only reported one species for India but he was inclined to unite the two European forms as well. He concludes by saying: "If *P. Robertianum* be distinct it grows in the West Himalaya." Christensen recognizes both as Asiatic plants. Ching revives the generic name *Gymnocarpium* for the oak ferns and recognizes three species which he keys out as follows:

Frond tripartito-bipinnatifid. *Eugymnocarpium.*

Habit "gracile," the two lateral divisions almost as large as the terminal; lamina perfectly naked and glabrous. *G. dryopteris.*
Habit much stouter, the two lateral divisions much smaller than the terminal.
Lamina eglandular or sometimes only rachis, at the insertion, sparsely and shortly glandular. *G. remotum.*
Rachis and underside of lamina always densely glandular. *G. Robertianum.*

The Indian material does not seem to sort out satisfactorily into Ching's units, but is mostly intermediate between his *G. dryopteris* and *G. Roberti-*

anum. It is more glandular than his first two species and usually less glandular than his third. He states that his *G. Robertianum* is always on limestone debris but my recollection is that in India it grows usually in forest humus. It seems to me that what we have in India is a variable group of plants with some specimens almost glabrous and with the two lower pinnae almost as large as the rest of the frond, thus approaching *D. Linnaeana,* while the bulk of the material is nearer *D. Robertiana,* being more or less glandular and with the basal pinnae relatively smaller.
Distribution: North America, Europe, Afghanistan, North India, China.

DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. Ind. Fil. 270. 1905. *Polypodium hexagonopterum* Michx. Fl. Bor. Am. **2**: 271. 1803. *Phegopteris hexagonoptera* Fée, Gen. Fil. 243. 1850–52.

Only reported by Watt from Zanscar (Zanskar) a province of Ladak, behind the main Himalayan range and north of Simla. Not seen.
Distribution: North America.

HYPOLEPIS PUNCTATA (Thunb.) Mett. Kuhn. Fil. Afr. 120. 1868. *Polypodium punctatum* Thunb. Fl. Jap. 337, 1784. *Dryopteris punctata* C. Chr. Ind. 287. 1905. *Phegopteris punctata* Mett. Ann. Lugd. Bat. **1**: 222. 1864.

Ramsu, Jumu-Kashmir Road, on steep bank, 4000 feet, Aug. 1931, *12,465.* New to Kashmir.

Distribution: Widespread in the tropics of both hemispheres.

POLYSTICHUM LONCHITIS (L.) Roth, Röm. Mag. **2**[1]: 106. 1799. *Polypodium Lonchitis* L. Sp. Pl. 1088. 1753.

Sonamarg, fir woods, 9000 feet, *3507; 6311;* Apharwat, 11,000 feet, *8638;* Rajdhiangan Pass, 11,000–12,000 feet, *18,027;* Kamri Pass, 11,000–12,000 feet, *18,692;* Minimarg, Kishenganga Valley, 9000–10,000 feet, *19,159.*

This has been considered to be rare in Kashmir but I find it fairly common from 9000 to 12,000 feet.
Distribution: Europe, colder parts of Asia and America. Northwest Frontier Province and Kashmir.

POLYSTICHUM LACHENENSE (Hook.) Bedd. Ferns Brit. Ind. *pl. 32.* 1865.

Sonamarg, *7270; 9843;* Nafran near Har Nag, Upper Lidder Valley, *12,468;* Zojibal Pass, *18,202;* Kamri Pass, *18,727.* Alt. 12,000–14,000 feet.

A plant of crevices at high altitudes. Like those of *P. Lonchitis* the old petioles of former years last over. Some smaller and more delicately cut specimens suggest *P. Thomsoni.* The species is smaller and less scaly than *P. Prescottianum,* which is a plant of open hillsides rather than rock crevices.
Distribution: Alpine Himalaya, China.

POLYSTICHUM PRESCOTTIANUM (Wall.) Moore Ind. Fil. 101. 1858. *Aspidium Prescottianum* Wall. List 363, nomen. 1829.

One of the commonest ferns in the cold temperate and alpine zone. It grows in the open and is gregarious so that there are usually dense masses on the hillside. *Dryopteris barbigera* and *D. Brunoniana, Athyrium Filix-foemina* var. *dentigera,* and *Osmunda Claytoniana* grow in similar places.

The fronds are narrow for their length and there are usually from 35 to 40 pairs of pinnae. Alt. 8000–13,000 feet.
Distribution: Abundant in the Himalaya from the Kurram Valley to Sikkim.

POLYSTICHUM PRESCOTTIANUM Moore var. BAKERIANUM W. S. Atkinson ex Clarke, Trans. Linn. Soc. II. **1**: 510. *pl. 66.* 1880. *Aspidium Bakeriana* Atkinson ex Hook. Ic. *pl. 17.* 1886. *Polystichum Bakerianum* Diels in E. & P. Nat. Pfl. 1^4: 191. 1899.

Sind Valley, 12,000 feet, *Clarke;* Sarpat, *McDonell;* Trunkal, Gangabal Lakes, 11,000 feet, *18,144.* Alt. 10,000–13,000 feet.

The fronds are larger and broader and the upper surface of the leaves is practically glabrous but, as Clarke felt, there is no good break between this and the typical *P. Prescottianum.*
Distribution: Alpine Himalaya.

POLYSTICHUM THOMSONI (Hook.) Bedd. Ferns Brit. Ind. *pl. 126.* 1866. *Aspidium Thomsoni* Hook. 2 Cent. *pl. 25,* in part. 1860; Sp. Fil. **4**: 7. 1862.

Pushana, Winterbottom, 6500 feet; Chittapani Vy., 7500–8000 feet, *Trotter 221;* Kishtwar, *Atkinson;* Tarkiti, Indus Vy., Baltistan, 7000–8000 feet and Shyok Vy., *T. Thomson;* Har Nag, Upper Lidder Vy., rock crevices, 12,500 feet, *9342;* Ascent Mir Panzil Pass to the Deosai, 12,000 feet, *20,005.* Alt. 7000–13,000 feet.

This is a rather rare fern resembling a small and delicate *P. Prescottianum.* Clarke points out that the type sheet is in part *P. Prescottianum.*
Distribution: Baltistan to Sikkim.

POLYSTICHUM TSUS-SIMENSE (Hook.) J. Sm. Hist. Fil. 219. 1875. *Aspidium tsus-simense* Hook. Sp. Fil. **4**: 16, *pl. 220.* 1862. *Aspidium luctuosum* Hope, Jour. Bombay Nat. Hist. Soc. **14**: 474. 1902. ? *Aspidium luctuosum* G. Kunze, Linnaea **10**: 548. 1835–6.

Jhelum Vy., 3500 feet; Chittapani Vy., 7500–8000 feet, *Trotter;* Jhelum Vy. near Rampur, 4500 feet, *MacLeod;* Upper Chenab Vy., 6500 feet, *McDonell;* Rampur, Jhelum Vy., *12,148;* Below Titwal, Kishenganga Vy., 3000 feet, *17,387.* Alt. 3000–8000 feet.

Distribution: Temperate Himalaya, China, Japan.

POLYSTICHUM SQUARROSUM (Don) Fée, Gen. Fil. 278. 1850–52. *Aspidium squarrosum* Don, Prodr. Fl. Nepal 4. 1825. *Polystichum aculeatum* var. *rufobarbatum* (Wall.) Bedd. Handb. 207. 1883. *Aspidium rufobarbatum* Wall. List 369, nomen. 1828.

According to Clarke, p. 509, this fern is found from Kashmir to Bhotan and in the Nilghiri Hills. I have not found what I would call typical *squarrosum* in Kashmir, and Hope gives its distribution from Chamba eastward.
Distribution: Himalaya, Chamba to Assam, 5000–8000 feet. Kashmir?

POLYSTICHUM ACULEATUM (L.) Schott, Gen. Fil. ad *pl. 9,* sensu lat. 1834. *Polypodium aculeatum* L. Sp. Pl. 1090, in part. 1753. *Aspidium angulare* Willd. Sp. Pl. **5**: 257. 1810. *Polystichum angulare* Pr. Tent. 83. 1836.

Chittapani Vy., 8000 feet, *Trotter;* Dardpura, 5000–7000 feet and Aud'rbug, 7000 feet, *MacLeod;* Pir Punjal and Gulmarg, 7000 feet, *Gammie;* Rampur, *12,259a;* Surkhala to Keran, Kishenganga Vy., 4500 feet, *17,493;* Keran, 5000–6000 feet, *17,637.* Alt. 4500–8000 feet.

This species is not as common in Kashmir as farther east. *P. aculeatum* is a "catch-all"; Hope used the name *P. angulare* for the Indian plants. Christensen says that this is a composite species which needs division but that the synonymy is very complicated.
Distribution: The composite species is found throughout the world in the temperate and tropical zones.

POLYSTICHUM ARISTATUM (Forst.) Pr. Tent. 83. 1836. *Polypodium aristatum* Forst. Prodr. 82. 1786. *Aspidium aristatum* Sw. Schrad. Jour. **1800**[2]: 37. 1801. *Nephrodium aristatum* Pr. Rel. Haenk. **1**: 37. 1825.
Trotter published a private list in which he stated that *Nephrodium aristatum* var. *affinis* Wall. List 370 had been collected in two places in Kashmir. No other Kashmir record but it is found from Chamba to Nepal.

CYRTOMIUM CARYOTIDEUM (Wall.) Pr. Tent. 86. *pl. 2, f. 26.* 1836. *Aspidium caryotideum* Wall. List 376, nomen. 1829. *Polystichum falcatum* Diels in E. & P. Nat. Pfl. **1**[4]: 194. 1899. *Polystichum falcatum* ssp. *caryotideum* C. Chr. Ind. 202. 1905; 581. 1906.

Jhelum Valley, 3500 feet, *Trotter;* Chakoti, Jhelum Valley and Titwal, Kishenganga Valley, *MacLeod.* Alt. 3000–7000 feet.

Rare in Kashmir.
Distribution: Hazara east to China and Japan, Africa.

LEUCOSTEGIA PULCHRA (Don) J. Sm. Lond. Jour. Bot. **1**: 426. 1842. *Davallia pulchra* Don, Prod. Fl. Nepal. 11. 1825.
Beddome in his Supplement, p. 13, lists *L. pulchra* for Kashmir, but I have seen no specimen. It is common from Chamba east.
Distribution: Himalaya, Ceylon, Yunnan.

MICROLEPIS WILFORDII Moore, Ind. Fil. 299. 1861.
First discovered in India by McDonell in the Buniar Nullah, near Rampur, Jhelum Valley in 1897. I found a colony on Sept. 6, 1927, below an irrigation channel, perhaps on the same spot where it was first discovered, beside the Kashmir Road at about 4500 feet (*9487*). The colony was still there when I last looked for it.
Distribution: Kashmir, Japan, China, Korea.

ATHYRIUM CRENATUM (Sommerf.) Rupr. Nyland. Spicil. Pl. Fenn. **2**: 14. 1844. *Aspidium crenatum* Sommerf. Vet. Ak. Handl. **1834**: 104. 1835.

Keran Nullah, Kishenganga Valley, in 1891, 8000 feet, *McDonell;* Below Gurais, 8000 feet, *Duthie 12,630.*

This is one of the rarest plants in the Himalaya and more material is badly needed. Hope spent a good deal of time on the question of whether it is distinct or whether it should be united with *Diplazium squamigerum.* He left the two specimens cited above in *D. squamigerum,* but his final opinion is as follows: "I have again gone over the material, and while I still think that all the Himalayan material must be identified as *A. squamigerum,* I now consider it possible that in spreading westward to Norway the Japanese plant has lost in length of sori, and become *A. crenatum.*"
Distribution: Europe, northern and temperate Asia.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels in E. & P. Nat. Pfl. **1**[4]: 223. 1899. *Asplenium acrostichoides* Sw. Schrad. Jour. **1800**[2]: 54. 1801. *Asplenium thelypteroides* Michx. Fl. Bor. Am. **2**: 265. 1803. *Athyrium thelypteroides* Desv. Prodr. 266. 1827.

A very common fern, from 7000 to 10,000 feet, in damp soil.

Distribution: Himalaya, China, Russia, North America.

ATHYRIUM MCDONELLI Bedd. Handb. Suppl. 34. 1892. *Asplenium McDonelli* Bedd. Jour. Bot. **27**: 73. 1889.

Baniar-Harpat Rai Nala, 5000 feet, and Kitardaji, 6000 feet, *McDonell;* Lolab Valley, 4500–6000 feet, *MacLeod;* Kishenganga Vy., 6000 feet, *17,623.*

This species is near *A. acrostichoides,* but the lobing of the pinnae is not so regular, there is a wider sinus between the segments, which are cut down closer to the rachis, and the rhizome is distinctly though slowly creeping.

Distribution: Himalaya, China.

ATHYRIUM SETIFERUM C. Chr. Ind. Fil. 146. 1905. *Asplenium tenellum* Hope, Jour. Bombay Nat. Hist. Soc. **12**: 529. *pl. 4.* 1899; non Roxb. 1816 nec Fée, 1850–52. *Athyrium nigripes* of Bedd. Handb. 166. 1883.

Kishtwar, 14–11–1848, *T. Thomson,* cited by Hope. Alt. 4000–5000 feet.

Distribution: Northwest Himalaya.

ATHYRIUM MACKINNONI (Hope) C. Chr. Ind. Fil. 143. 1905. *Asplenium Mackinnoni* Hope, Jour. Bot. **34**: 124. 1896.

West Kashmir, 6000–10,000 feet, in 1888, *Trotter; MacLeod* in 1891; *McDonell* in 1892–3; *Duthie* in 1898. All cited by Hope. Near Keran, Kishenganga Vy., 5000–6000 feet, *17,608;* Below Kel, 6000 feet, *17,794;* Pahlgam, *8033.* The type is probably *Thomson,* Baramulla Pass, 28.8.1849. Alt. 6000–10,000 feet.

According to Hope this species includes almost all of the Himalayan specimens hitherto referred to *A. nigripes.* He does not know where to place a residue of five sheets, but states that they are not *A. nigripes.* This is a handsome fern with a pale stipe and rachis. The pinnae are attenuate at the tips and not so deeply or finely cut as in *A. pectinatum.* The stipe is long and there is an almost total absence of setae on the secondary rachises and costae.

Distribution: Trans-Indus to Sikkim.

ATHYRIUM RUPICOLA (Hope) C. Chr. Ind. Fil. 145. 1905. *Asplenium rupicola* Hope, Jour. Bombay Nat. Hist. Soc. **12**: 531. *pl. 5.* 1899.

South slope of Pir Panjal Range, 9000 feet, *Levinge* (cited by Hope); near Bagicha, Indus Valley, Baltistan, near water-fall, Aug. 1940, 8600 feet, *20,980.* Alt. 7000–12,000 feet.

Distribution: Kashmir to Kumaon.

ATHYRIUM FILIX-FEMINA (L.) Roth, Röm. Mag. **2**[1]: 106. 1799. *Polypodium Filix-femina* L. Sp. Pl. 1090. 1753.

Sarpat, 9500 feet, in 1891, *McDonell;* near Gurais and near Gulmarg, 8000–9000 feet, in 1892, *Duthie.* Cited by Hope.

Distribution: North and South America, Europe, North Africa, Asia.

ATHYRIUM FILIX-FEMINA var. DENTIGERA (Wall.) Bedd. Handb. 169. 1883. *Asplenium Filix-femina* var. *dentigera* Clarke, Trans. Linn. Soc. 11. **1**: 491. 1880. *Asplenium Filix-femina* var. *attenuata* Clarke l.c. 492. *Polypodium dentigerum* Wall. List 334, nomen. 1829.

This is one of the commonest ferns in Kashmir from 6000 to 11,000 feet. Clarke, p. 492, described a var. *attenuata* which he figured in *pl. 59, f. 1.* He collected the type north of the main valley, 10,000–12,000 feet. He admits that it comes near some forms of var. *dentigera* and Hope joined the two together as f. *dentigera* under *A. Filix-femina.*

Distribution: Kashmir to Nepal.

ATHYRIUM FILIX-FEMINA var. RETUSA (Clarke) Bedd. Handb. 170. 1883. *Asplenium Filix-femina* var. *retusa* Clarke, Trans. Linn. Soc. II. **1**: 492. 1880. *Cystopteris retusa* Dene. Jacq. Voy. Bot. **4**: 176. *pl. 177.* 1844.

Sekiwas, Upper Lidder Vy., 12,000 feet, *12,475;* Burzil Chowki to Mir Panzil Pass, ca. 12,000 feet, *19,945a.*

Distribution: Himalaya, 10,000–15,000 feet, Kashmir to Bhotan.

ATHYRIUM SCHIMPERI Moug. in Fée, Gen. Fil. 187. 1850–52. *Asplenium Schimperi* A. Br. in Schweinf. Beitr. **1**: 224. 1867. ? *Asplenium Filix-femina* var. *polyspora* Clarke, Trans. Linn. Soc. II. **1**: 493. 1880.

Basaoli, 6000 feet, *Clarke 31,595;* Rattanpir, 8000 feet, *Trotter* (cited by Hope).

This has a widely creeping rootstock and is easily distinguished. It is rare in Kashmir but becomes common farther east, especially about Mussoorie.

Distribution: Himalayas, Rajputana, Ethiopia.

ATHYRIUM FIMBRIATUM (Wall.) Moore, Ind. Fil. 185. 1860. *Aspidium fimbriatum* Wall. List 339, nomen. 1829. *Asplenium fimbriatum* Hook. Sp. Fil. **3**: 234. 1860.

Sarpat, 10,000 feet, *MacLeod* and *McDonell;* north slopes of watershed between the Jhelum and Kishenganga Valleys, never lower than 10,000 feet, *MacLeod* (cited by Hope); above Gulmarg, 9500 feet, *10,484;* Sonamarg, 10,500 feet; Pahlgam.

This is the largest of the Kashmir Athyriums and has a creeping caudex. Clarke writes that it is common from 5000 to 12,000 feet but in Kashmir it does not seem to have much altitudinal range, growing near 10,000 feet.

Distribution: Kashmir to Bhotan, Yunnan.

DIPLAZIUM POLYPODIOIDES Bl. Enum. 194. 1828. *Asplenium polypodioides* Mett. Fil. Lips. 78. 1856.

Clarke, Trotter, McDonell, cited by Hope without data. Near Kangan, Sind Valley, by spring, 6000 feet, *6924.*

One of the largest ferns in Kashmir but not so common as farther to the east. In some places the young shoots are cooked.

Distribution: North India, Malaya, Tropical Australia.

DIPLAZIUM JAPONICUM (Thunb.) Bedd. Ferns Br. Ind. Suppl. 12. 1876. *Asplenium japonicum* Thunb. Fl. Jap. 334. 1784. *Athyrium japonicum* Copeland, Bish. Mus. Bull. **93**: 43. 1932.

Keran, 5500 feet, Kishenganga Valley, *McDonell 33, 34;* Mardan Ali in 1854 (Herb. Dehra) (cited by Hope).

McDonell 34 in New York is without rhizome and suggests *Athyrium McDonelli.* The rhizome is creeping, the stipe may be longer than the rest of the leaf.
Distribution: Tropical Asia, including India, China, Japan, etc. Australia.

DIPLAZIUM SQUAMIGERUM (Mett.) Christ, Bull. Soc. Fr. **52,** Mém. 1: 51. 1905. *Asplenium squamigerum* Mett. Ann. Lugd. Bat. **2**: 239. 1866.

Sharda, Kishenganga Vy. by stream, 6000 feet, *17,751;* Below Kel, Kishenganga Valley, 6300 feet, *17,818.* Hope cites several collections of McDonell and Duthie, all apparently from the extreme west of Kashmir between 7000 and 9000 feet.

This is a very rare fern in India and suggests *Athyrium crenatum* var. *glabratum* Ching. It has a black creeping rhizome, the frond is almost tripinnate, triangular, and with the stipe is about two feet high. The scales are dark, broad, ovate-lanceolate, and the pinnules crenate. Hope considers this intermediate between typical *A. crenatum* and *Diplazium squamigerum.*
Distribution: Japan, China, North India.

ASPLENIUM VIRIDE Huds. Fl. Angl. 385. 1762.

Shish Nag, Lidder Vy., 13,000 feet, *Trotter;* Kamri Vy., 10,000–11,000 feet, *Duthie 12,552;* Gangabal Lakes, 12,000 feet, *4479;* Sonamarg, 12,000 feet, *6562;* 10,500 feet, *6869;* Baltal, 9500 feet, *7528;* Shish Nag Pass, 11,000–13,000 feet, *8407;* Near Gadsar, 11,000–12,000 feet, *18,309;* Kamri Pass, *18,712;* Minimarg, 9000–10,000 feet, *19,187.*

A fairly common rock plant at high altitudes.
Distribution: Europe, Himalaya, North America.

ASPLENIUM TRICHOMANES L. Sp. Pl. 1080. 1753.

One of the commonest ferns in Kashmir forests and found also in the inner ranges. Gilgit, Baltistan, Kamri Pass, etc., from 4000 to 12,000 feet. *21,019* was found in Baltistan between Bagicha and Olthing Thang near the Indus at 8500 feet, close to a waterfall; *17,373* in the lower Kishenganga Valley at 3000 feet, the lowest altitude at which I have found it.
Distribution: Widespread in north and south temperate regions and on tropical mountains.

ASPLENIUM SEPTENTRIONALE (L.) Hoffm. Deuts. Fl. **2**: 12. 1795. *Acrostichum septentrionale* L. Sp. Pl. 1068. 1753.

Nagmarg, 9000 feet, *Trotter;* Sonamarg, 9000 feet, *3442,* 10,000 feet, *6600;* Kishenganga Valley, 6000–8000 feet, *17,740, 17,888,* etc.

This is another common rock crevice plant. It grows in tufts and may be mistaken for a grass by the uninitiated. Usually from 6000 to 10,000 feet, but has been found up to 14,000 feet.
Distribution: Europe, North Asia, Himalaya, U. S. A.

ASPLENIUM RUTA-MURARIA L. Sp. Pl. 1081. 1753.

Sonamarg, 11,000 feet, *7192;* 9200 feet, *9865;* Taobat, Kishenganga Valley, 7500 feet, *17,865;* Badwan, Kishenganga Vy., 8000 feet, *19,599,* etc.; Kangi, Nullah, above Kangi, Ladak, 13,500 feet, *Koelz 2528;* Shingo Vy., Baltistan, 10,000–11,000 feet, *Duthie* fide Hope.

Distribution: Europe, North Asia, Himalaya, U. S. A., etc.

ASPLENIUM SEPTENTRIONALE × TRICHOMANES Murbeck, Lunds. Univ. Årsskr. **27**: 35. 1892. *Asplenium germanicum* of C. Chr. Ind. Fil. 113. 1905, non Weis. 1770.

Pahlgam, on large boulder, 7200 feet, *7883;* Kishenganga Vy., *McDonell* fide Hope; *Jerdon,* Herb. Kew, as *A. germanicum.*

One of the rarest of Kashmir plants.
Distribution: Europe, Kashmir, Hongkong.

ASPLENIUM SARELII Hook. in Blakiston, Yang-tsze 363, 364. 1862. *Asplenium pekinense* Hance, Jour. Bot. **5**: 262. 1867. *Asplenium Saulii* Baker, Syn. Fil. ed. 2. 216. 1874. *Asplenium Saulii* var. *pekinense* Bedd. Handb. Suppl. 31. 1892.

4000 feet, *Trotter 371;* Rampur to Uri, *MacLeod;* 2200 feet, *Levinge;* 3600 feet, *McDonell.* All on the Jhelum Valley Road.

A very rare fern and one of the most finely cut of the Aspleniums. In India it has only been found from Hazara to Kulu.
Distribution: Himalaya, China, Japan.

ASPLENIUM ADIANTUM-NIGRUM L. Sp. Pl. 1081. 1753.

Tangmarg, below Gulmarg, 7200 feet, *10,709;* below Titwal, 3000 feet, *17,373;* Titwal to Surkhala, 4000 feet, both in the Kishenganga Valley; below Tragbal, 7000 feet, *19,466,* etc.

Usually from 4000 to 7000 feet in comparatively dry places in the outer valleys. Much more common than *A. Sarelii.*
Distribution: Temperate Asia, Europe, Atlantic Islands, African Mts., etc.

ASPLENIUM FONTANUM (L.) Bernh. Schrad. Jour. Bot. **1799**[1]: 314. 1799. *Polypodium fontanum* L. Sp. Pl. 1089. 1753.

Sonamarg, rock crevices by the Sind River, 8000 feet, *3419;* 10,000 feet, *7229;* Lidderwat, 9000 feet, *8301;* Aru to Nafran, Lidder Vy., 9000 feet, *12,470;* Kishenganga Valley, 3000–7000 feet, *17,408; 17,456; 17,695; 17,838; 19,600;* etc. Alt. 3000–12,000 feet.

Fairly common in rock crevices.
Distribution: Western Himalayas, Europe, Central Asia.

ASPLENIUM VARIANS Wall. Hook. & Grev. Ic. Fil. *pl. 172.* 1830. *Aspidium varians* Wall. Ms. in Herb. Hook.

Pahlgam, 8000–9000 feet, *Duthie 13,466;* Sonamarg, 9200 feet, *6437;* Baltistan, near Skardu, *Thomson,* fide Hope; Near Bagicha, Baltistan, Indus Vy., 8500 feet, *21,002.* Alt. 4000–9000 feet.

Not so common in Kashmir as it becomes farther east. It is not so finely cut as *A. fontanum* and grows in humus rather than in rock crevices.
Distribution: India to China and Japan, Africa, Hawaii.

CETERACH DALHOUSIAE (Hook.) C. Chr. Ind. Fil. 170. 1905. *Asplenium alternans* Wall. List 221, nomen. 1829; Hook. Sp. Fil. **3**: 92. 1860.

Very common at lower levels on the outer ranges especially from 3000 to 7000 feet, growing on banks and walls. Alt. 3000–9000 feet.
Distribution: Himalaya, Ethiopia.

CETERACH OFFICINARUM DC. in Lam. & DC. Fl. Fr. **2**: 566. 1805. *Asplenium Ceterach* L. Sp. Pl. 1080. 1753. *Hemidictyum Ceterach* Bedd. Ferns Brit. Ind. Suppl. 13. 1876.

Mt. behind Dal Lake, 7000 feet, *3284;* Jhelum Valley Road, 4000 feet, *12,120;* Dhanni, 2800 feet, *17,366;* Dhanni to Titwal, 3500 feet, *17,372,* both in Kishenganga Valley; Gilgit, Tanner and Astor Dist, *Duthie* fide Hope. Alt. 3000–8000 feet.

Like *C. Dalhousiae* this is a xerophytic fern of the outer ranges and grows in the same sort of places. The lower surfaces of the fronds are densely covered with scales which are absent in *C. Dalhousiae.*
Distribution: Central Europe, the Mediterranean basin, Western Asia. South Africa, Western Himalaya.

WOODWARDIA RADICANS (L.) Sm. Mém. Ac. Turin **5**: 412. 1793. *Blechnum radicans* L. Mant. 307. 1771.

Basaoli, 5500 feet, *Clarke.* The only specimen reported by Hope. Alt. 3500–7500 feet.

The only place in which I have found it common in Kashmir is in the lower Kishenganga valley from Mugaffarabad to Titwal, Chenab Vy., Ramsu to Banihal. It becomes commoner as one goes east, growing in shady woods along streams. The fronds are long and arching and root from bulbils at the tips of the leaves or along the axis.
Distribution: Atlantic Islands, Mediterranean Basin, North India, South China, Java.

GYMNOPTERIS VESTITA (Wall.) Underw. Bull. Torrey Club **29**: 627. 1902. *Grammitis vestita* Wall. List 12, nomen. 1829. *Gymnogramma vestita* Pr. Tent. 218, nomen. 1836. Hook. Ic. *pl. 115.* 1837. *Syngramma vestita* Moore, Ind. Fil. 60. 1857.

I have seen no specimens from Kashmir, but since I have specimens from Hazara on the west and from various places on the east, it has most probably been overlooked. This is one of the few ferns especially sought by European visitors in the Himalayan Hill Stations. It is called mouse ear fern.
Distribution: China, North India.

CRYPTOGRAMMA STELLERI (Gmel.) Prantl, Engl. Jahrb. **3**: 414. 1882. *Pteris Stelleri Gmel. Nov. Comm. Petr.* **12**: 519. *pl. 12, f. 1.* 1768. *Pellaea gracilis* Hook. Sp. Fil. **2**: 138. *pl. 133 B.* 1858. *Pellaea Stelleri* Bak. Syn. Fil. ed. 1. 453. 1868.

Karakorum Mts., Baltistan, *Thomson;* Gurais, Kishenganga Vy., *Duthie;* Gangabal Lakes, 11,000 feet, *18,138;* Mt. Kolohoi, Upper Lidder Vy., 12,000 feet, *13,444;* Chunagund, Ladak, 9000–10,000 feet, *21,059;* Sonamarg, Tulion, Nafran, etc.

A plant of the alpine zone, usually from 9000 to 12,000 feet. One of the few ferns to cross the Himalayas into Baltistan and Ladak.
Distribution: Siberia, Himalaya, North America.

CRYPTOGRAMMA BRUNONIANA Wall. List. 396, nomen. 1829; Hook & Grev. Ic. Fil. *pl. 158.* 1829. *Cryptogramma crispa* of Bedd. Handb. 98. 1883.

Sonamarg, 11,000 feet, *6572;* above Gulmarg, 11,000 feet, *10,416;* ascent from Burzil Pass to Deosai, 13,000 feet, *19,986;* Muzaffarabad, Inayat; Marbal Pass, Clarke, etc. Alt. 10,000–15,000 feet.

Another alpine plant like the last but easily recognized by the dimorphic fronds, the fertile fronds being erect and taller.
Distribution: Himalaya, China, Japan.

CONIOGRAMME FRAXINEA (Don) Diels in E. & P. Nat. Pfl. **1**[4]: 262. 1899. *Diplazium fraxinea* Don, Prodr. Fl. Nepal. 12. 1825. *Gymnogramma javanica* Blume, Enum. 112. 1828. *Syngramma fraxinea* Bedd. Handb. 386. 1883.

Jhelum Valley Road, 4500 feet, *Trotter;* Rattanpir, 7500–8000 feet, *Trotter;* Hajipir Pass, 8000 feet, *13,996;* Kishenganga Valley, 3000 feet, by dripping bank, *17,492.*

The last specimen and *Bliss 57* from the same valley approach *Coniogramme affinis* (Wall.) Hieron, the low level form farther east, as some fronds have only the lowest pinnae divided. High-level Kashmir specimens are much more compound with narrower leaflets.
Distribution: India, China, Japan, Australia, Polynesia, Tropical Africa, Madagascar.

PELLAEA HASTATA (Thunb.) Prantl, Engl. Jahrb. **3**: 418. 1882. *Pteris hastata* Thunb. Prod. Fl. Cap. 172. 1800. *Pteris calomelanos* Sw. Link. Fil. Sp. 61. 1841.

Abbottabad, Hazara, 4500 feet, 14–7–1934, *14,112.*

This fern has hitherto not been reported this far west in India. It has been reported from Simla and since it has now been found to the west of Kashmir it may be expected in the state.
Distribution: Himalaya, Hazara to Kumaon; Yunnan, Ethiopia to the Cape of Good Hope.

PELLAEA NITIDULA (Wall.) Baker, Syn. Fil. 149. 1867. *Pteris nitidula* Wall. List. 89, nomen. 1829. *Cheilanthes nitidula* Hook. Sp. Fil. **2**: 112. 1852.

Poonch; Kishtwar, 5000 feet, *Clarke;* Chittapani Valley, 6000 feet, *Levinge;* Pir Panjal, 6000 feet, and Rattanpir, 8000 feet, *Gammie.* All cited by Hope. Alt. 3000–9000 feet.

A plant of the outer ranges. Superficially like *Cheilanthes subvillosa* but lacks the hairs.
Distribution: Afghan Frontier to Kumaon, Yunnan, West Tibet.

NOTHOLAENA MARANTAE (L.) R. Br. Prodr. Fl. N. Holl. 146. 1810; Jour. de Bot. Appl. Desv. **1**: 92. 1813. *Acrostichum Marantae* L. Sp. Pl. 1071. 1753.

Reported from Kashmir by Clarke and Beddome but without definite data. I have seen no Kashmir specimens, but since it grows near by in Kulu and Chamba, it may grow on the eastern border of the state.
Distribution: Atlantic Islands, Mediterranean Basin, Himalaya, Yunnan.

NOTHOLAENA VELLEA Ait. Jour. de Bot. Desv. Appl. **1**: 93. 1813. *Acrostichum vellea* Ait. Hort. Kew. **3**: 457. 1789.

The only Kashmir specimen I have seen was a sheet of Jerdon's at Kew marked Cashmire. It is a very rare fern in India and only three specimens are in the Dehra Herbarium and two at Gordon College, all from the Punjab Himalaya in the vicinity of Pangi, Kulu, and Chamba.
Distribution: Atlantic Islands and Mediterranean Basin to Afghanistan and the Northwest Himalaya.

CHEILANTHES PTERIDIOIDES (Reich.) C. Chr. Ind. Fil. 178. 1905. *Polypodium pteridioides* Reich. L. Syst. Pl. ed. novis. **4**: 424. 1780. *Polypodium fragrans* L. Mant. 307. 1771, non 1753. *Cheilanthes fragrans* Webb & Berth. Hist. Nat. Canar. 3^2 (3) : 452. 1847.

Jhelum Valley, near Pirni, 5000–6000 feet, *Duthie;* Kishtwar, 3500–5000 feet, *Clarke;* both cited by Hope; Domel, Jhelum Valley Road, 2500 feet, *11,100;* Kishenganga Valley, 3500–6000 feet, *17,413; 17,436; 17,550.*

This is one of the most xerophytic of Kashmir ferns and grows in the drier outer ranges. At Titwal, Kishenganga Valley, it grew in the crevices of the walls of terraced fields near *Asplenium Adiantum-nigrum, Ceterach Dalhousiae,* and *Ceterach officinarum.*
Distribution: Atlantic Islands, Mediterranean Basin, Northwest Himalaya.

CHEILANTHES PERSICA (Bory) Mett. Kuhn, Fil. Afr. 73. 1868. *Nothoiaena persica* Bory, Bél. Voy. Bot. **2**: 23. 1833. *Cheilanthes Szovitzii* Fisch. & Mey. Bull. Soc. Mosc. **6**: 260, nomen. 1833; 241. 1838.

Skardu, Baltistan, 8000 feet, *20,428;* Kiris, Indus Valley Baltistan, 8000 feet, *20,891;* Takht, Srinagar, 6000 feet, *9465;* Rampur, Jhelum Valley, 4000 feet, *12,128;* Martand, Kashmir, 5200 feet, McDonell; Kishtwar, *Clarke.*

This is a fern from the Mediterranean flora which penetrates deep into the Himalayas as far as Gilgit and Baltistan. It is one of the few ferns able to live in the low hills of the north Punjab and Northwest Frontier Province. The species is easily separated from the last by the abundant red woolly hairs from the sori which cover the lower surfaces of the pinnules.
Distribution: Mediterranean Basin to the Northwest Himalaya.

CHEILANTHES SUBVILLOSA Hook. Sp. Fil. **2**: 87. *pl. 98B.* 1852.

Chittapani Valley, 9000 feet, and Rattan Pir, 8000 feet, *Trotter.* Alt. 7000–10,000 feet.

Few specimens from Kashmir are in collections. It should be looked for on the southern slopes of the Pir Panjal Range. It can easily be separated from *Pellaea nitidula,* which it resembles, by the hairs on the lower surface of the veins.
Distribution: Northwest Himalaya from Hazara to Sikkim.

CHEILANTHES ALBOMARGINATA Clarke, Trans. Linn. Soc. II. **1**: 456. *pl. 52.* 1880. *Cheilanthes farinosa* var. *albomarginata* Bedd. Handb. Suppl. 22. 1892.

Although this is a very common fern east of Kashmir the only one who seems to have found it within the state was Clarke, who found it at Basaoli at 5000 feet.
Distribution: Himalaya, South India.

CHEILANTHES DALHOUSIAE Hook. Sp. Fil. **2**: 80. *pl. 78B.* 1852. *Cheilanthes farinosa* var. *Dalhousiae* Bedd. Handb. 93. 1883.

Clarke reports this from Kashmir but without data and Hope does not mention any Kashmir specimens. I have only found it near the Indus River in the vicinity of Bagicha, Baltistan, at about 8500 feet, *20,961* and *21,003* in Aug. 1940.

Although this plant has been referred to *C. farinosa* it is without white powder at all stages. The involucres are deeply crenulate, toothed or lacerate.
Distribution: Himalaya, Hazara to Sikkim.

CHEILANTHES FARINOSA (Forsk.) Kaulf. Enum. 212. 1824. *Pteris farinosa* Forsk. Fl. Aegypt.-Arab. 187. 1775.

Jhelum Valley, between Domel and Chakota, *MacLeod;* Kaman Goshi, 3000 feet and Tawi Valley, 4000 feet, *Gammie,* the only specimens reported by Hope.

I found this near Domel at 2000 feet in Aug. 1931. It becomes common east of Kashmir and as it is not rare in Abbottabad, Hazara and grows in Rawalpindi Dist. it probably grows on the south slopes of the Pir Panjal Range.
Distribution: India, China, Japan, Africa, Tropical America, Fiji.

ONYCHIUM LUCIDUM (Don) Spr. Syst. **4**: 66. 1827. *Leptostegia lucida* Don. Prodr. Fl. Nepal 14. 1825. *Onychium contiguum* Hope, Jour. Bombay Nat. Hist. Soc. **13**: 444. 1901. *Onychium japonicum* var. *multisecta* F. Henderson ex Clarke, Trans. Linn. Soc. II. **1**: 459. 1880. *Onychium japonicum* var. *lucidum* Christ.

Rattan Pir, 8000 feet, *Trotter;* Pir Panjal, 8000 feet, *Gammie;* cited by Hope; Aliabad Pass, Pir Panjal Range, 7000–8000 feet, *13,991.* I have also found it on the Batot Pass at about 6000 feet.

Distribution: North India, China.

ADIANTUM CAUDATUM L. Mant. 308. 1771.

This is perhaps the commonest fern in the foothill zone of the Northwest Himalaya and begins at the edge of the plains and ascends to about 5000 feet, rarely to 6000 feet. It penetrates into Kashmir by the Jhelum Valley and the Tawi Valley of Jumu. It is no doubt common in Poonch and the outer spurs of the Pir Panjal Range but I have seen no specimens. It roots freely at the tips.

ADIANTUM CAPILLUS-VENERIS L. Sp. Pl. 1096. 1753.

One of the commonest ferns in North India and one of the two or three ferns which are found in the plains of the Punjab. It is common in wells and wet banks in the plains and in the hills it frequents waterfalls and springs. It occasionally penetrates deep into the Himalayas. I found one poor specimen in Baltistan, and *Koelz 2821* was collected at 12,500 feet in the Kangi Nullah, Ladak.
Distribution: Europe, Africa, temperate Asia, Polynesia, Central America, etc.

ADIANTUM VENUSTUM Don, Prodr. Fl. Nepal 17. 1825.

This is probably the commonest forest fern between 6000 and 9000 feet and it may be found from 4000 to 12,000 feet.
Distribution: Afganistan, North India.

ADIANTUM PEDATUM L. Sp. Pl. 1095. 1753.

Ashdari, Padar, Kishtwar, 8000 feet, *2901;* Tragbal, 9000 feet; Aru, Lidder Valley, 8500 feet; Sharda to Kel, Kishenganga Valley, 6500 feet, *17,803;* Gulmarg, 8500 feet, *Martin.* Alt. 6500–10,000 feet.

Not rare; but the "stag-horn fern" is not found every day. It needs deeper shade and richer, damper humus than is required by *A. venustum*.
Distribution: Japan, China, Japan, North America.

PTERIS VITTATA L. Sp. Pl. 1074. 1753. *Pteris longifolia* L. and many authors, in part.

One of the commonest ferns in the foothill zone and up to 5000 feet in the outer hills. Found even in the plains by running water; and the commonest potted fern in the Punjab. This fern has usually been called *P. longifolia* in India, but according to Carl Christensen this name belongs to a tropical American fern.
Distribution: More tropical parts of Europe, Africa, Asia, Australia, and Polynesia.

PTERIS QUADRIAURITA Retz. Obs. **6**: 38. 1791. *Pteris biaurita* var. *quadriaurita* C. Chr. Ind. Fil. 605. 1906.

Rattanpir, 7500–8000 feet, *Trotter*.

This fern becomes very common farther east.
Distribution: India, Ceylon.

PTERIS CRETICA L. Mant. 130. 1767.

This is another very common fern in the drier, outer ranges at altitudes of from 3000 to 7000 feet. The difference between the fertile and sterile fronds is striking. The pinnae of the sterile fronds are wider and have spinulose margins.
Distribution: Atlantic Islands and Mediterranean Basin to the Philippines and New Zealand; West Indies, Brazil, etc.

PTERIS EXCELSA Gaud. Freyc. Voy. Bot. 388. 1827.

The only Kashmir record is a doubtful one. Hope states that a sterile specimen of Gammie's from Rattanpir referred to *P. quadriaurita* might be a sterile specimen of *P. excelsa*. Since *Inayat 20,432* from the Siran Valley, Hazara, comes from west of Kashmir, and this is a common fern eastward, it is most probable that it will be found on the Pir Panjal Range.
Distribution: North India and Malaya to Fiji and Hawaii.

PTERIDIUM AQUILINUM (L.) Kuhn; v. Deck. Reisen **3**[3]: Bot. 11. 1879. *Pteris aquilina* L. Sp. Pl. 1075. 1753.

Common on sunny grassy hillsides or forest openings from about 6000 to 9000 feet. In the Kishenganga Valley it begins as low as 3000 feet in grassy openings in the *Pinus longifolia* forest and continues in suitable places to above 9000 feet on the Kamri, Burzil, and Rajdhiangan Passes, where it enters the *Artemisia maritima* zone. It may grow to be six feet tall.

Tryon (Rhodora **43**: 22. 1941) refers the Indian material to var. *Wightianum* (Ag.) Tryon. He cites my *4761* and *6492* as being more glabrous than most specimens of the variety.
Distribution: Temperate and tropical regions of the world.

POLYPODIUM MICRORHIZOMA Clarke, Baker Syn. Fil. 511. 1874. *Goniophlebium microrhizoma* Bedd. Ferns Brit. Ind. Suppl. 21. *pl. 384*. 1876.

Beddome in his handbook gives the distribution "Kashmir to Bhotan." I have collected it in Dalhousie a few miles to the east but have seen no Kashmir specimens.
Distribution: Himalaya, Yunnan.

POLYPODIUM LACHNOPUS Wall. List 310, nomen. 1829; Hook. Ic. *pl. 952.* 1854. *Goniophlebium lachnopus* J. Sm. Hook. Gen. Fil. ad *pl. 51.* 1840.

Clark and Beddome both mention this as a Kashmir plant but I cannot find any specimens. I have many specimens but the nearest are from Simla and Kulu. This fern is often mixed with the last but can be recognized by the abundant, dark, long pointed ramentae clothing the creeping rhizome. Both this and the last are usually epiphytes.
Distribution: Himalaya.

POLYPODIUM ARGUTUM Wall. List 308, nomen. 1829; Hook. Sp. Fil. **5**: 32. 1863. *Goniophlebium argutum* Hook. Gen. Fil. ad *pl. 51.* 1840.

This is another epiphyte which according to Beddome in his Handbook, p. 324, grows from Kashmir to Bhotan. I have seen no specimens.
Distribution: Simla Hills to Sikkim.

POLYPODIUM MEMBRANACEUM Don, Prodr. Fl. Nepal 2. 1825. *Pleopeltis membranacea* Moore, Ind. Fil. 191. 1860.

Jumu, Tawi Valley, 4000–5000 feet, *Trotter; Gammie,* 4000 feet.

Like the three previous ferns this becomes common as soon as the monsoon is sufficient to make epiphytes possible.
Distribution: Eastern Kashmir to the Philippines, and Celebes, Ceylon.

POLYPODIUM STRACHEYI (Ching) C. Chr. Ind. Fil. Suppl. **3**: 159. 1934. *Phymatodes Stracheyi* Ching, Contr. Inst. Bot. Nat. Acad. Peiping **2**: 83. 1933. *Polypodium Stewartii* Clarke, Trans. Linn. Soc. II. **1**: 563. 1880; non *Pleopeltis Stewartii* Bedd. 1867.

Pahlgam in rock crevices, 10,000 feet, Aug. 8, 1927, *9276.*

New to Kashmir. Previously the westernmost station of this plant was the Sach Pass in Chamba.

POLYPODIUM LORIFORME Wall. List 271, nomen. 1829; Mett. Abf. Senckenb. Ges. Frankfurt **2**: 92. *pl. 1. f. 50.* 1857. *Polypodium lineare* var. *steniste* Clarke, Trans. Linn. Soc. II. **1**: 559. 1880. *Polypodium lineare* var. *loriforme* Takeda, Notes Bot. Gard. Edinb. **8**: 272. 1915. ? *Lepisorus loriformis* Ching, Bull. Fan. Mem. Inst. **4**: 81. 1933.

Liddarwat, 9000 feet, *8278;* Pahlgam, *8323*; Ferozepur Nullah, near Gulmarg, 7500 feet, Sonamarg, *13,453.*

I have puzzled over these specimens; *8323* may be different. In it the lower side of the frond is completely covered by the large sori. This is not the case in the other specimens but it may be a matter of age. The leaves are thicker than those of *P. clathratum* and when dry the veins are still invisible. The leaves of *P. clathratum* seem thin when dried, they are greener in color, and the veins are visible, though the freshly picked fronds are fairly thick and take a long time to dry. *P. excavatum* Bory, with which it

has sometimes been confused, is thin-leaved even when fresh and dries quickly. It is usually an epiphyte and I have not found it in Kashmir. Clarke does not mention clathrate scales in *P. loriforme*, but they are present. I suspect that the Chinese and Japanese material of Ching and Takeda may be different.
Distribution: North India, South China?

POLYPODIUM CLATHRATUM Clarke, Trans. Linn. Soc. II. **1**: 559. *pl. 82. f. 1.* 1880. *Pleopeltis clathrata* Bedd. Handb. 348. 1883.

Pahlgam, *5950;* Lidderwat, above Pahlgam 9000 feet, *8253;* Sonamarg, 9500 feet; 10,000 feet, *13,455;* Aru to Nafran, Lidder Valley, 9000 feet, *12,469;* Nittar Valley, Gilgit Dist, in 1892, *Duthie.* Alt. 9000–12,000 feet.

This is a fairly common rock plant at high levels in Kashmir in the shade of forest trees. The clathrate scales remain on the rhizome after they have fallen from the old sori. The leaves dry very slowly. They are usually much narrower and somewhat shorter in length than in *P. excavatum* which it sometimes resembles superficially. *P. excavatum* is usually an epiphyte and the leaves die at the close of the monsoon, while *P. clathratum* has evergreen leaves, like *P. loriforme.*
Distribution: North India, North China. Afghanistan.

CYCLOPHORUS POROSUS (Wall.) Pr. Epim. 130. 1849. *Polypodium porosus* Wall. List 266, nomen. 1829; Mett. Pol. 128. n. 259. 1857. *Niphobolus porosus* Br. Tent. 202. 1836. *Niphobolus fissus* of Bedd. Ferns Brit. Ind. Correct. 2. 1870.

"From Kashmir to Bhotan, very common." Clarke. In my experience this fern grows from Kulu and Chamba eastward and I have seen no Kashmir specimens. Some botanists use the name *Pyrrosia* for this genus.
Distribution: North India, China.

SCHIZAEACEAE

LYGODIUM JAPONICUM (Thunb.) Sw. Schrad. Jour. **1800**[2]: 106. 1801. *Ophioglossum japonicum* Thunb. Fl. Jap. 328. 1784.

"Near Domel, Jhelum Valley, in great profusion," *MacLeod;* Poonch Valley, 3000 feet, *Winterbottom;* Tawi Valley, 3500 feet, *Gammie.* Alt. 2500–5000 feet.

Apparently very local. I have found it at Mansera in Hazara and in Chamba but the only *Lygodium* I have found in Kashmir was a sterile plant from Ramban on the Jumu to Srinagar Road.
Distribution: India, China, Japan; tropical Asia and Australia.

OSMUNDACEAE

OSMUNDA CLAYTONIANA L. Sp. Pl. 1066. 1753.

Common in large patches on open hillsides and in open places in the forest from 8000 to 11,000 feet. Has been reported at 6000 feet.
Distribution: Himalaya, China, North America.

SALVINIACEAE

SALVINIA NATANS (L.) All. Fl. Pedem. **2**: 289. 1785. *Marsilia natans* L. Sp. Pl. 1099. 1753.

Very common in the lakes and canals in the Valley of Kashmir at about 5000 feet.
Distribution: India, Central China, Europe.

MARSILIACEAE

MARSILIA MINUTA L. Mant. 308. 1771 (excluding β). *Marsilia erosa* Willd. Sp. Pl. **5**: 540. 1810.

Very common in rice fields and shallow water from the plains to about 6000 feet. The leaves which form in a dry period are smaller and are often erose at the tip.
Distribution: India, Java, Philippines.

OPHIOGLOSSACEAE

OPHIOGLOSSUM VULGATUM L. Sp. Pl. 1062. 1753.

Cited for Kashmir by Clausen, Mem. Torrey Club **19**: 127. 1938.

I have an *Ophioglossum* from Pahlgam, in grass, 7500 feet, which probably belongs here.
Distribution: North America; Europe to India, Japan, Kamtchatka.

BOTRYCHIUM LUNARIA (L.) Sw. Schrad. Jour. **1800**[2]: 110. 1801. *Osmunda lunaria* L. Sp. Pl. 1064. 1753.

Western Tibet, Falconer and Karakorum Mts., *Clarke*, cited by Clarke; Mt. Apharwat, above Gulmarg, 11,000 feet, in rocks, *8587;* Pahlgam, in forest, 7500 feet, *9232.*

Distribution: Colder portions of both northern and southern hemispheres.

BOTRYCHIUM VIRGINIANUM (L.) Sw. Schrad. Jour. **1800**[2]: 111. 1801. *Osmunda virginiana* L. Sp. Pl. 1064. 1753.

Lolab Valley, *R. C. Wroughton*, U. S. Nat. Herb. cited by Clausen; Canon Stokoe, Chaplain of Srinagar, has a specimen from Pahlgam, Lidder Valley. Hope states that *Inayat 20,388* from the Kaghan Valley, Hazara is typical *B. virginianum.*

There has been a great deal of discussion about the presence or absence of *B. virginianum* in India. Clarke maintained that there was only one species and he called it *B. virginianum.* Beddome in his Handbook, p. 471, mentions only one form which he calls *B. virginianum* var. *lanuginosum.* Probably Clarke had only *B. lanuginosum,* which is the common Himalayan plant east of Kashmir. The only note I have of the presence of *B. virginianum* east of Kashmir is the statement of Trotter that McDonell found it in Chamba. Clausen places the Kashmir specimen in subsp. *typicum.*
Distribution: North America, Europe, India, China, Japan.

EQUISETACEAE

EQUISETUM ARVENSE L. Sp. Pl. 1516. 1753.

Very common in Kashmir. In the Kishenganga Valley I have seen the young fertile stems push up as soon as the snow melted. It is found at Ganderbal in the main valley and penetrates to Dras and Ladak. Alt. 5000–12,000 feet.
Distribution: North America, Europe, North and Central Asia.

EQUISETUM DEBILE Roxb. Vauch. Monog. Prel. 376. 1822.

Srinagar, 5200 feet, *13,458;* below Sharda, Kishenganga Valley, in sand, 6000 feet. *17,730;* Rupal Nullah, Astor Dist., 8000 feet, *18,884* (possibly *E. ramosissimum*).

Distribution: India, Ceylon, Malaya, Polynesia.

EQUISETUM RAMOSISSIMUM Desf. Fl. Atlant. **2**: 398.

Very common, penetrating into the inner valleys of Ladak and Baltistan. It is found from the plains to 9000 feet. Not very different from *E. debile* but more scabrous, the cones usually single, not approximated, the secondary cones more nearly sessile and the basal branches from the main stem ascending rather than at right angles to it.

Distribution: Widespread in the northern hemisphere.

LYCOPODIACEAE

LYCOPODIUM SELAGO L. Sp. Pl. 1102. 1753.

Sonamarg, 13,000 feet, among dwarf rhododendrons, *7336* (f. *angustinum* Christ, det. Nessel); above Gulmarg, 12,000–13,000 feet, *8609;* Burzil, 10,000 feet, *Koelz 9410;* Gilgit, 12,000 feet, *Duthie?*

Distribution: North America, Europe, North Asia.

SELAGINELLACEAE

SELAGINELLA SANGUINOLENTA (L.) Spring, Monog. Lycopod. **2**: 57. 1849. *Lycopodium sanguinolentum* L. Sp. Pl. 1104. 1753.

Sonamarg, 8–8–1928, 10,000 feet, *9458,* det. Alston.

Distribution: North India.

SELAGINELLA JACQUEMONTII Spring, Monog. Lycopod. **2**: 194. 1849.

In determining *6660, 7173,* and *7368,* Alston refers this species to *L. sanguinolenta* as a variety. Baker and Hieronymus, on the other hand, in their monographs made *S. Jacquemontii* a synonym of *S. borealis* Spring. The species or variety is common in the Kishenganga Valley on cliffs from 3000 to about 8000 feet, *17,381, 17,458, 17,833, 17,888a,* and *17,878* all seem to belong here.

Distribution: North India.

SELAGINELLA AITCHISONI Hieron. in E. & P. Nat. Pfl. **1**[4]: 674. 1901.

Pahlgam, *5959;* Sonamarg, *6791;* Baltal, *7464.* Alt. 7000–11,000 feet.

All det. by Alston. He refers this form to *S. sanguinolenta* as a variety and the new combination will probably be published in his monograph in due course.

Distribution: North India.

REJECTED SPECIES

DRYOPTERIS BRUNNEA (Wall.) C. Chr. Ind. 255. 1905. *Polypodium brunnea* Wall. List 333, nomen. 1829. *Phegopteris distans* Mett. Pheg. Asp. 16 n. 23. 1858. *Polypodium distans* Don. Prodr. Fl. Nepal 2. 1925.

Specimens referred to this are probably *D. laterepens.*

DIPLAZIUM MAXIMUM (Don) C. Chr. Ind. Fil. 235. 1905. *Asplenium maximum* Don, Prodr. Fl. Nepal 8. 1825. *Asplenium latifolium* Don, Prodr. Fl. Nepal 8. 1825. *Athyrium maximum* Copel. Bish. Mus. Bull. 59, 54. 1929.

Clarke reports this fern from Kashmir under the name of *Asplenium latifolium.* He gives no data and I do not think that it grows in the state. Hope thought that he had *Diplazium polypodioides,* to which this is related.

Distribution: Tropical Asia, Polynesia, Australia.