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CANADIAN FILICINEÆ.

MACOUN & BURGESS.

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IX.—*Canadian Filicineæ.*

By JOHN MACOUN, M.A., F.L.S., and T. J. W. BURGESS, M.B.

(Read in abstract May 23, 1884.)

Probably no form of growth throughout the vegetable kingdom attracts more general attention than ferns, which, while appealing strongly to the scientific tastes, have an equally powerful claim upon the artistic. Their distribution over the whole surface of the globe, with the exception of the sterile portions of the polar regions, places at least some forms within the reach of everyone, while, grow in what locality they may, there is none to which they do not lend an added charm. Of the home of these beautiful productions of Nature, nowhere can we find a more charming description than that of Mr. F. G. Heath, who, in his introduction to "The Fern World," speaks of it as "A world—apart—of dreamy beauty, of soft vapours and chequered sunbeams. A world—below the glare of noonday—filled with the most delicate and graceful of the forms which Nature's God has made to clothe the earth with a mantle of green. A world where Nature's own sweet music—the silvery music of the streamlet's ripple—falls, gently cadenced, on the ear: or where the stillness of repose is unbroken, even by the hum of insect life. A world sometimes of darkness relieved but by the faintest gleam of light; sometimes of open rocks and streams, where the roar of the torrent echoes over the mountain side, and rushing water reflects the golden colouring of the sun-rays. A fairy world hidden away under the covering of rugged rocks on the sea-shore, beneath moss-covered stones in the river's bed, or in the depths of the primeval forest."

The purpose of the present paper is to place before you a full though succinct account of such of these most interesting plants as are found within the confines of the Dominion.

Twenty years ago there was published "A Synopsis of Canadian Ferns and Filicoid Plants," containing brief descriptions, with the distribution, of all our then known species, since which time, so far as I am aware, no similar work has been undertaken. This valuable paper, by George Lawson, Ph. D., LL.D., which appeared first in the Edinburgh "New Philosophical Journal" (January and April numbers, 1864, Vol. XIX, N. S.), and in the Transactions of the Botanical Society of Edinburgh, (Vol. VIII, pp. 20-50), was reprinted the same year at Montreal, in the "Canadian Naturalist," (N. S., Vol. I, No. 4, August, pp. 262-300.) The number of ferns, including Ophioglossaceæ, recorded in it was fifty, of which eight were considered of doubtful occurrence. Of these eight, three, *Asplenium marinum*, *Asplenium montanum* and *Asplenium Ruta-muraria* do not, as far as yet known, favour us; two, *Schizæa pusilla* and *Woodsia obtusa*, are confined to Nova Scotia, each having been discovered in a single locality only, and within the past few years; while the remaining three, *Aspidium Filix-mas*, *Aspidium fragrans* and *Ophioglossum vulgatum*, are now known in numerous districts. The forty-seven species to which Professor Law-

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son's list is thus curtailed, have been increased to sixty-four. Of the seventeen additions we are indebted to British Columbia, at the time of the publication of the synopsis almost a *terra incognita* as regards its floral treasures, for no less than nine, viz., *Polypodium Scouleri*, *Polypodium falcatum*, *Gymnogramme triangularis*, *Cheilanthes gracillima*, *Pellaea densa*, *Lomaria spicant*, *Phegopteris alpestris*, *Aspidium rigidum*, and *Aspidium munitum*; three, *Cheilanthes lanuginosa*, *Woodsia Oregana* and *Woodsia scopulina* are common to British Columbia and the Northwest Territory; three, *Cystopteris montana*, *Botrychium matricariaefolium* and *Botrychium lanceolatum*, range from Nova Scotia to Lake Superior and north-westward; and two are furnished by the elevation to the rank of species, as *Aspidium Bootii* and *Botrychium simplex*, of plants recognized by Professor Lawson as varieties.

The total of known species of Filices and Ophioglossaceæ in the world at the present day is estimated to be about 3,000, of which the great bulk is tropical, and of this number the North American continent, north of the Mexican boundary, can claim to date only 166. Now, when we consider that nearly 100 of these are natives of the extreme Southern and South-western States, it will be seen that our working botanists have not been idle, and that Canada, considering the boreal nature of her climate, compares most favourably with the neighboring republic in the number of her ferns. To convey some idea of the distribution of our species, two tables have been prepared, the one showing their general range, the other their allotment as regards Canada.

Table I is based on Mr. Redfield's division (Torrey Bulletin, January, 1875,) of North American species into six great classes, viz:—

"I. COSMOPOLITAN.—Widely distributed over the globe in both temperate and tropical regions.

II. BOREAL.—Inhabiting (with a few exceptions) the northern portion of the United States, extending through Canada and British America, some species even reaching Labrador, Greenland and Alaska, and nearly all represented also in the northern portions of the Old World.

III. APPALACHIAN.—Extending throughout the mountain and hilly region of the States east of the Mississippi, often to the coast, and northward into Canada, and in a few instances also inhabiting the Old World.

IV. PACIFIC.—Extending along the western border of the continent at points from Alaska to California, in a few cases appearing also in the Rocky Mountain region.

V. NEW MEXICAN.—Inhabiting the central mountain regions of New Mexico and Colorado, many of the species extending thence into Mexico, and some even to South America, and a few of them also occurring in California.

VI. TROPICAL.—Inhabiting the border of the Gulf of Mexico, most of the species extending into the West Indies and tropical America."

The sixth class, of course, does not concern us, and is only introduced to show the distribution in its entirety, while the fifth presents the solitary and anomalous *Cheilanthes lanuginosa* which, properly New Mexican in its range, extending in the United States from Illinois to Utah, Texas, New Mexico and Arizona, unaccountably reappears in British Columbia and on the eastern base of the Rocky Mountains. The additional class introduced shows which of the species are peculiar to the North American continent.

SPECIES.		<i>Cosmopolitan.</i>	<i>Boreal.</i>	<i>Appalachian.</i>	<i>Pacific.</i>	<i>New Mexican.</i>	<i>Tropical.</i>	<i>Peculiar to N. America.</i>
1	<i>Adiantum pedatum, L.</i>			1				
2	<i>Aspidium acrostichoides, Swz.</i>			1				1
3	<i>Aspidium aculeatum, Swz.</i>		1					
4	<i>Aspidium Boottii, Tuckerman</i>		1					
5	<i>Aspidium cristatum, Swz.</i>			1				
6	<i>Aspidium Filix-mas, Swz.</i>		1					
7	<i>Aspidium fragrans, Swz.</i>		1					
8	<i>Aspidium Goldianum, Hook.</i>			1				1
9	<i>Aspidium Lonchitis, Swz.</i>		1					
10	<i>Aspidium marginale, Swz.</i>			1				1
11	<i>Aspidium munitum, Kauf.</i>				1			1
12	<i>Aspidium Noveboracense, Swz.</i>			1				1
13	<i>Aspidium rigidum, Swz.</i>				1			
14	<i>Aspidium spinulosum, Swz.</i>		1					
15	<i>Aspidium Thelypteris, Swz.</i>			1				
16	<i>Asplenium angustifolium, Mx.</i>			1				1
17	<i>Asplenium ebeneum, Ait.</i>			1				
18	<i>Asplenium Filix-femina, Bernh.</i>	1						
19	<i>Asplenium thelypteroides, Mx.</i>			1				
20	<i>Asplenium Trichomanes, L.</i>	1						
21	<i>Asplenium viride, Hudson.</i>		1					
22	<i>Botrychium lanceolatum, Angs.</i>			1				
23	<i>Botrychium Lunaria, Swz.</i>		1					
24	<i>Botrychium matricariæfolium, A. Br.</i>		1					
25	<i>Botrychium simplex, Hitch.</i>		1					
26	<i>Botrychium ternatum, Swz.</i>			1				
27	<i>Botrychium Virginianum, Swz.</i>			1				
28	<i>Camptosorus rhizophyllus, Link.</i>			1				1
29	<i>Cheilanthes gracillima, D. C. Eaton.</i>				1			1
30	<i>Cheilanthes lanuginosa, Nutt.</i>					1		1
31	<i>Cryptogramme acrostichoides, R. Br.</i>		1					1
32	<i>Cystopteris bulbifera, Bernh.</i>			1				1
<i>Carried Forward</i>		2	11	15	3	1	0	11

SPECIES.		<i>Cosmopolitan.</i>	<i>Boreal.</i>	<i>Appalachian.</i>	<i>Pacific.</i>	<i>New Mexican.</i>	<i>Tropical.</i>	<i>Peculiar to N. America.</i>
<i>Brought forward</i>		2	11	15	3	1	0	11
33	<i>Cystopteris fragilis, Bernh.</i>		1					
34	<i>Cystopteris montana, Bernh.</i>		1					
35	<i>Dicksonia pilosiuscula, Willd.</i>			1				1
36	<i>Gymnogramme triangularis, Kaulf.</i>				1			
37	<i>Lomaria spicant, Desr.</i>				1			
38	<i>Onoclea sensibilis, L.</i>			1				
39	<i>Onoclea Struthiopteris, Hoff.</i>		1					
40	<i>Ophioglossum vulgatum, L.</i>			1				
41	<i>Osmunda cinnamomea, L.</i>			1				
42	<i>Osmunda Claytoniana, L.</i>			1				
43	<i>Osmunda regalis, L.</i>			1				
44	<i>Pellaea atropurpurea, Link.</i>			1				
45	<i>Pellaea densa, Hook.</i>				1			1
46	<i>Pellaea gracilis, Hook.</i>		1					
47	<i>Phegopteris alpestris, Mett.</i>				1			
48	<i>Phegopteris calcarea, Fec.</i>		1					
49	<i>Phegopteris Dryopteris, Fec.</i>		1					
50	<i>Phegopteris hexagonoptera, Fec.</i>			1				1
51	<i>Phegopteris polypodioides, Fec.</i>		1					
52	<i>Polypodium falcatum, Kellogg.</i>				1			1
53	<i>Polypodium Scouleri, Hook. and Grev.</i>				1			1
54	<i>Polypodium vulgare, L.</i>	1						
55	<i>Pteris aquilina, L.</i>	1						
56	<i>Schizæa pusilla, Pursh.</i>			1				1
57	<i>Scolopendrium vulgare, Smith.</i>		1					
58	<i>Woodsia glabella, R. Br.</i>		1					
59	<i>Woodsia hyperborea, R. Br.</i>		1					
60	<i>Woodsia Ilvensis, R. Br.</i>		1					
61	<i>Woodsia obtusa, Torr.</i>			1				
62	<i>Woodsia Oregana, D. C. Eaton.</i>		1					1
63	<i>Woodsia scopulina, D. C. Eaton.</i>				1			1
64	<i>Woodwardia Virginica, Smith.</i>			1				1
		4	23	26	10	1	0	20

Table II divides the Dominion into five botanical areas, and shows what species, with their most distinct varieties, are found in each, viz :

I. Atlantic Provinces and Eastern Quebec.

II. Ontario and Western Quebec.

III. The Great Plains northward to the Arctic Circle, including the greater part of Manitoba.

IV. Rocky Mountains.

V. British Columbia.

	SPECIES.	I.	II.	III.	IV.	V.
1	<i>Adiantum pedatum</i> , <i>L.</i>	1	1	.....	.....	1
2	<i>Aspidium acrostichoides</i> , <i>Suz.</i>	1	1	.....	.....	.....
3	<i>Aspidium aculeatum</i> , <i>Suz.</i>.....	.....	.....	.....	.....	.....
	<i>Var. Braunii</i> , <i>Dell.</i>	1	1	.....	.....	1
	<i>Var. scopulinum</i> , <i>D. C. Eaton</i>	1	.....	.....	.....	.....
4	<i>Aspidium Boottii</i> , <i>Tuckerm.</i>	1	1	.....	.....	.....
5	<i>Aspidium cristatum</i> , <i>Suz.</i>	1	1	1	.....	.....
	<i>Var. Clintonianum</i> , <i>D. C. Eaton</i>.....	.....	1	.....	.....	.....
6	<i>Aspidium Filix-mas</i> , <i>Suz.</i>	1	1	.....	.....	1
7	<i>Aspidium fragrans</i> , <i>Suz.</i>	1	1	1	1	.....
8	<i>Aspidium Goldianum</i> , <i>Hook.</i>	1	1	.....	.....	.....
9	<i>Aspidium Lonchitis</i> , <i>Suz.</i>	1	1	1	1	1
10	<i>Aspidium marginale</i> , <i>Suz.</i>	1	1	1	1	.....
11	<i>Aspidium munitum</i> , <i>Kuntz.</i>.....	.....	.....	.....	.....	1
12	<i>Aspidium Noveboracense</i> , <i>Suz.</i>	1	1	.....	.....	.....
13	<i>Aspidium rigidum</i> , <i>Suz.</i>.....	.....	.....	.....	.....	1
14	<i>Aspidium spinulosum</i> , <i>Suz.</i>	1	1	1	1	1
	<i>Var. intermedium</i> , <i>D. C. Eaton</i>	1	1	1	1	1
	<i>Var. dilatatum</i> , <i>Horn.</i>	1	1	1	1	1
15	<i>Aspidium Thelypteris</i> , <i>Suz.</i>	1	1	1	.....	.....
16	<i>Asplenium angustifolium</i> , <i>Mx.</i>	1	1	.....	.....	.....
17	<i>Asplenium ebeneum</i> , <i>Ait.</i>.....	.....	1	.....	.....	.....
18	<i>Asplenium Filix-femina</i> , <i>Bernh.</i>	1	1	1	1	1
	<i>Var. angustum</i> , <i>D. C. Eaton</i>	1	1	.....	.....	.....
19	<i>Asplenium thelypteroides</i> , <i>Mx.</i>	1	1	.....	.....	.....
20	<i>Asplenium Trichomanes</i> , <i>L.</i>	1	1	1	1	1
	<i>Carried forward</i>	21	22	10	8	11

	SPECIES.	I.	II.	III.	IV.	V.
	<i>Brought forward</i>	21	22	10	8	11
21	<i>Asplenium viride</i> , <i>Hudson</i>	1	1	.....	1	.....
22	<i>Botrychium lanceolatum</i> , <i>Angs</i>	1	.....	.....	.....	.....
23	<i>Botrychium Lunaria</i> , <i>Suz</i>	1	1	1	1	1
24	<i>Botrychium matricariæfolium</i> , <i>A. Br</i>	1	1	.....	.....	.....
25	<i>Botrychium simplex</i> , <i>Hitch</i>	1	1	1	.....	.....
26	<i>Botrychium ternatum</i> , <i>Suz</i>	1	1	1	1	1
	<i>Var. obliquum</i> , <i>Milde</i>	1	1	1	1	.....
	<i>Var. dissectum</i> , <i>Mildc</i>	1	.....	.....	.....	.....
27	<i>Botrychium Virginianum</i> , <i>Suz</i>	1	1	1	1	1
28	<i>Camptosorus rhizophyllus</i> , <i>Link</i>.....	.....	1	1	.....	.....
29	<i>Cheilanthes gracillima</i> , <i>D. C. Eaton</i>.....	.....	.....	.....	.....	1
30	<i>Cheilanthes lanuginosa</i> , <i>Nutt</i>.....	.....	.....	.....	1	1
31	<i>Cryptogramme acrostichoides</i> , <i>R. Br</i>.....	.....	1	1	1	1
32	<i>Cystopteris bulbifera</i> , <i>Bernh</i>	1	1	.....	.....	.....
33	<i>Cystopteris fragilis</i> , <i>Bernh</i>	1	1	1	1	1
34	<i>Cystopteris montana</i> , <i>Bernh</i>	1	1	.....	1	.....
35	<i>Dicksonia pilosiuscula</i> , <i>Willd</i>	1	1	.....	.....	.....
36	<i>Gymnogramme triangularis</i> , <i>Kaulf</i>.....	.....	.....	.....	.....	1
37	<i>Lomaria spicant</i> , <i>Desr</i>.....	.....	.....	.....	.....	1
38	<i>Onoclea sensibilis</i> , <i>L</i>	1	1	1	.....	.....
39	<i>Onoclea Struthiopteris</i> , <i>Hoff</i>	1	1	1	.....	.....
40	<i>Ophioglossum vulgatum</i> , <i>L</i>	1	1	.....	.....	.....
41	<i>Osmunda cinnamomea</i> , <i>L</i>	1	1	.....	.....	.....
42	<i>Osmunda Claytoniana</i> , <i>L</i>	1	1	.....	.....	.....
43	<i>Osmunda regalis</i> , <i>L</i>	1	1	1	.....	.....
44	<i>Pellæa atropurpurea</i> , <i>Link</i>.....	.....	1	1	1	1
45	<i>Pellæa densa</i> , <i>Hook</i>	1	.....	.....	.....	1
46	<i>Pellæa gracilis</i> , <i>Hook</i>	1	1	1	1	1
47	<i>Phegopteris alpestris</i> , <i>Mett</i>.....	.....	.....	.....	.....	1
48	<i>Phegopteris calcarea</i> , <i>Fee</i>	1	1	.....	.....	.....
49	<i>Phegopteris Dryopteris</i> , <i>Fee</i>	1	1	1	1	1
50	<i>Phegopteris hexagonoptera</i> , <i>Fee</i>.....	.....	1	.....	.....	.....
	<i>Carried forward</i>	44	46	24	20	25

	SPECIES.	I.	II.	III.	IV.	V.
	<i>Brought forward</i>	44	46	24	20	25
51	<i>Phegopteris polypodioides</i> , <i>Fee</i>	1	1	1	1	.....
52	<i>Polypodium falcatum</i> , <i>Kellogg</i>.....	.....	.....	.....	.....	1
53	<i>Polypodium Scouleri</i> , <i>Hook. and Grev</i>.....	.....	.....	.....	.....	1
54	<i>Polypodium vulgare</i> , <i>L.</i>	1	1	1	1	1
55	<i>Pteris aquilina</i> , <i>L.</i>	1	1	1	1	.....
	<i>Var. lanuginosa</i> , <i>Bong.</i>.....	.....	.....	.....	.....	1
56	<i>Schizaea pusilla</i> , <i>Pursh</i>	1	.....	.....	.....	.....
57	<i>Scolopendrium vulgare</i> , <i>Smith</i>	1	1	.....	.....	.....
58	<i>Woodsia glabella</i> , <i>R. Br.</i>	1	1	1	1	.....
59	<i>Woodsia hyperborea</i> , <i>R. Br.</i>	1	1	1	.....	.....
60	<i>Woodsia Ilvensis</i> , <i>R. Br.</i>	1	1	1	1	.....
61	<i>Woodsia obtusa</i> , <i>Torr.</i>	1	.....	.....	.....	.....
62	<i>Woodsia Oregana</i> , <i>D. C. Eaton</i>.....	.....	1	1	1	1
63	<i>Woodsia scopulina</i> , <i>D. C. Eaton</i>.....	.....	.....	.....	1	1
64	<i>Woodwardia Virginica</i> , <i>Smith</i>	1	1	.....	.....	.....
	Totals.....	54	55	31	27	31

Throughout the paper the distributions and habitats, as well as the limits of size assigned to the various species are, in most cases, given from personal observation, but are supplemented by facts bearing on these points recorded in standard authors, or communicated by reliable correspondents.

The habitat of ferns is subject to considerable variation. Plants from any cause thrown out of their proper range, and finding themselves in their new abode destitute of their accustomed surroundings, make a desperate effort to accommodate themselves to their new environment, and often fully succeed. Thus the Common Polypody, which has its usual home on rocks, in parts of Ontario lacking such, flourishes freely on dry banks, and the Matricary Grape-Fern, commonly found in wet woods and in moss along streams, has been noted in Nova Scotia on high, dry and open grass lands.

Variations in size depend to so great an extent on the character of the soil and the climatic conditions under which a plant grows, that it becomes a matter of difficulty, or well nigh impossibility, to ascribe any usual height to a species, *e. g.*, *Asplenium Filix-foemina*, which, in low, rich woods reaches a height of two to three or four feet, in exposed mountainous places often does not exceed three to six inches. Information on this head, however, is not without importance to pteridologists, and an endeavour has been made to mention the better known extremes, but without the intention, in any degree, to lay these down as absolutely fixed limits.

Apart from the foregoing there are variations which cannot always be referred to ascertainable causes. Many forms are found differing from the normal type, yet clearly traceable as only forms of it, and, when these are capable of transmitting their peculiarities to subsequent generations, they are styled varieties. In all such cases, however, there is an innate tendency to revert to the original type, and the best systematists endeavour to restrict, as much as possible, the so-called varieties. Notwithstanding this, as it cannot be disputed that the study of forms tends greatly to enlarge our knowledge of the real nature of species, and, as this diversity of form often constitutes one of the great barriers to our feeling sure of a specimen being properly placed, while only recording the most defined and fully recognized forms as distinct varieties, a fair degree of prominence has been given to those minor deviations on which are based the more questionable ones.

Though free use has been made of the best works, both American and European, in the preparation of the specific descriptions, these have, in all cases except those of *Schizaea pusilla* and *Phegopteris alpestris*, been drawn from Canadian specimens, large numbers of which, from widely separated localities, have been submitted to close examination, and carefully compared with American and often foreign plants. In this connection gratitude for valuable assistance—not alone in material supplied for examination, but also in information furnished—must be expressed to various friends, of whom Professor D. C. Eaton of New Haven, Conn.; Professor Lawson and Mr. Peter Jack of Halifax, and Mr. A. H. McKay of Picton, Nova Scotia; Mr. James Fletcher of Ottawa, Mrs. Roy of Owen Sound, and Dr. Millman of London, Ont., have not been the least forward.

The synonymy has been made full enough to include most of the more familiar names, which have at different times been so lavishly applied to many of the species, and pains have been taken to introduce Canadian references, in order to facilitate future researches into the home history of any of the forms. Where any economic value, in either science or the arts, exists, or has existed, in a species, a note of such has been appended.

In conclusion of this, perhaps already too lengthy, introduction, and before proceeding to the description of the individual species, a few words as to ferns in general and their mode of development may not be out of place. While in appearance and habit they present an infinite variety, from the sedge-like *Schizaea pusilla* to the stately *Osmunda regalis*, in all, reproduction is carried on through germs (*spores*), which are almost infinitesimal, dust-like bodies, produced asexually. A spore, unlike an ordinary seed, is not a diminutive plant made up of radicle and plumule, but consists of a little, double-coated cell, differing in shape and external appearance in the different genera of ferns. In germination, the outer layer (*exospore*) is burst by the absorption of water, and the inner (*endospore*), which has taken on a process of development by enlargement and cell multiplication, is protruded in the shape of a minute, leaf-like, usually round or heart-shaped, flat patch (*prothallium*), composed entirely of cellular tissue and quite unlike the parent plant. Among the hair-like root fibres, which, springing from the under surface of the prothallium, attach it to the earth, are now produced a number of other cells, but of two distinct kinds, corresponding to the stamens and pistils of flowering plants, and called *antheridia* and *archegonia*. The former are filled with small, ciliate, thread-like bodies (*antherozoids*), analagous to pollen, while the latter, which are bottle-shaped, contain an imperfect germ, consisting of a minute, central cell (*oosphere*). At a certain stage in the process of germination both the antheridia and archegonia burst by the absorption of

water, and the antherozoids escaping, are, by the movement of their ciliæ, brought in contact with the archegonia, through the neck of which they make their way to the oosphere and fertilize it, when, immediately beginning to grow, it gives origin to a very small and simple plant. This young plant at first derives its nourishment from the other cells of the prothallium, which, however, soon withers away, its nursling having established roots of its own. Steadily onward, now, goes the process of development, till at length the young plant begins to assume a likeness to the parent fern. But, having reached this stage, we are still very far from having a perfect plant, for the growth of the fronds is slow, much more so than that of the leaves of flowering plants, and in the great majority of ferns it is generally two or three years before the development is completed. When at length this is accomplished, and the frond is ready to produce fruit, there arise on it (in set places, according to the species of fern) clusters of little, projecting cells. Each of these cells becomes divided into two, one of which either shrivels up and forms a stalk connecting the remaining one with the frond, or entirely withers away; while the second is divided into five cells, four of which surround the fifth. Each of these four is again divided into two, forming an outer and an inner layer of cells. The outer layer next unites to form a case (*sporangium*), while the inner disappears, its place being taken by a fluid in which the fifth cell is left floating. This floating cell continues to grow for a time, when it breaks up into a mass of dust-like bodies,—the new spores. Finally, when the fruit is fully matured, the sporangium splitting, the spores are scattered, and, floating about, at last come to rest in some favourable spot, where they may again begin a fresh cycle of life, such as has just been described.

The following Synopsis of Genera is taken from Professor Eaton's "Ferns of North America" without change, except as regards its limitation to Canadian species, and the transposition of the Orders *Ophioglossaceæ* and *Filices*.

SYNOPSIS OF GENERA.

COHORT FILICINEÆ.

Vascular Cryptogamia having leaves or fronds usually raised on a stalk, rising commonly from a creeping or assurgent or even erect rootstock, and bearing on the back or margins sporangia containing spores of but one kind, which in germination produce a minute cellular prothallus, on which are borne antheridia and archegonia, the latter after fertilization producing a new plantlet. Stems never hollow, nor covered with subulate leaves.

ORDER OPHIOGLOSSACEÆ. Leafy plants; the leaves (fronds) simple or branched, often fern-like, erect in veneration, developed from underground buds formed from one to three years in advance, either within the base of the stalk of the old frond or by the side of it, bearing in special spikes or panicles subcoriaceous, exannulate, bivalvular sporangia, formed from the main tissue of the fruiting segments of the frond. Prothallus underground, destitute of chlorophyll, monœcious.

1. **OPHIOGLOSSUM.** Frond with a posterior simple or forked or palmated sterile segment, and one or more anterior or lateral simple spikes of fructification; the connate sporangia in a row along each side of the spike. Buds exterior to the base of the stalk. Veins reticulated.
2. **BOTRYCHIUM.** Frond with a posterior pinnatifid or compound sterile fern-like segment and an anterior, paniced, fertile segment, the separate sporangia in a double row on the branches of the panicle. Bud enclosed in the base of the stalk. Veins free.

ORDER FILICES. Leafy plants; the leaves or fronds circinate in veneration, rising from a rootstock and bearing reticulated sporangia which are homologous with leaf-hairs, being outgrowths from the epidermis. Prothallus above ground, green, monœcious, in some cases producing new plants from unfertilized archegonia.

nia. The sporangia are usually collected in little masses called *sori*, which are oftenest found on the veins or at the tips of the veins, and are often covered either by a little scale (*indusium*) produced from the epidermal cells, or by a general involucre formed from the recurved margin of the frond or its divisions.

Suborder I. POLYPODIACEÆ. Sporangia globular, or slightly flattened laterally, collected in patches, lines or dots of various shapes, stalked, and provided with a vertical incomplete many-jointed ring which straightens at maturity and discharges the very minute spores, the sporangium opening by a transverse split across the side not occupied by the ring. Terrestrial ferns.

TRIBE I. **Polypodiæ.** Sori round or oblong, placed on the veins or at the ends of the veins; indusium none. Stalk articulated to a slightly prominent knob of the usually elongated creeping rootstock. Veins free or variously reticulated.

1. POLYPODIUM. The only genus of the tribe.

TRIBE II. **Grammitidæ.** Sori more or less elongated, without indusium, superficial, placed on the back of the frond or its divisions, and usually following the veins, or only near the tips of the latter and near the margin. Fronds sometimes scaly or tomentose, or covered beneath with coloured powder.

2. GYMNOGRAMME. Sori much elongated, following the veins, and like them often branched or reticulated.

TRIBE III. **Pteridæ.** Sori close to the margin, sometimes extending partly down the veins, covered, at least when young, by an involucre opening inwards and either consisting of the margin or produced from it.

3. CHEILANTHES. Sori minute, at the ends of the unconnected veins, covered by a usually interrupted involucre. Small ferns, often woolly, chaffy or pulverulent.

4. PELLEA. Sori near the ends of the veins, often confluent. Involucre membranaceous, continuous round the pinnules. Sterile and fertile fronds much alike and smooth; the stalk dark-coloured.

5. CRYPTOGRAMME. Sori extending down the free veins. Involucre very broad, at length flattened out and exposing the now confluent sori. Sterile and fertile fronds unlike, smooth; the stalk light-coloured.

6. PTERIS. Sporangia borne on a continuous vein-like marginal receptacle, which connects the ends of the veins. Involucre continuous round the pinnules. Stalk light-coloured.

7. ADIANTUM. Sporangia borne at the ends of the veins, on the under side of the reflexed margin of the frond. Midvein of the pinnules mostly eccentric or dissipated into forking veinlets. Stalk dark-coloured.

TRIBE IV. **Blechnæ.** Sori more or less elongated, borne on a fruiting veinlet or on a special receptacle parallel to the midrib, either near it or remote from it, and provided with a special usually concave or arched indusium attached to the receptacle outside the sorus and opening along the inner edge.

8. LOMARIA. Sori continuous from the base of the pinna to its apex, the receptacle nearer the margin than the midvein. Fronds in our species once pinnate, the fertile ones with contracted pinnæ.

9. WOODWARDIA. Sori interrupted, forming a chain-like row each side of the midvein. Fronds in our species ample, compound; the veins reticulated.

TRIBE V. **Asplenicæ.** Sori more or less elongated, borne on veins oblique to the midvein, covered by a special usually flattened indusium attached to the fertile veinlet by one edge and free on the other.

10. ASPLENIUM. Sori on the upper side of the fertile veinlets, less commonly on both sides of them. Veins free in our species.

11. SCOLOPENDRIUM. Sori linear, straight, confluent in pairs, borne facing each other on contiguous veins, the two indusia meeting by their free edges over the sporangia, and at length disclosing the latter between them. Fronds simple and veins free in our species.

12. CAMPTOSORUS. Veins reticulated, many of the sori continuous along two or three sides of the areoles, and therefore bent or angled; other sori opposite and facing each other in pairs, and some single on either the upper or lower sides of the veins. Fronds simple, the apex slender and elongated.

TRIBE VI. **Aspidiæ.** Sori round or roundish, on the back, or sometimes at the tip, of the fertile veinlets, naked or provided with a special indusium. Stalk not articulated to the rootstock, the tropical genus *Oleandra* excepted.

* Fertile and sterile fronds nearly alike; receptacle not elevated.

† Indusium none.

13. PHEGOPTERIS. Sori dot-like, minute.

† † Indusium orbicular or reniform.

14. ASPIDIUM. Sori round, borne on the back or at the apex of the veinlets; indusium attached at the centre

or at the basal sinus, free around the margin. Pinnæ not articulated to the rachis. Frond often decom-
pound.

† † † *Indusium fixed across the fertile veinlet at the lower side of the sorus, ovate or roundish, very
delicate. Small ferns.*

15. CYSTOPTERIS. (Character of the subsection.)

* * *Sterile fronds foliaceous, the fertile frond with contracted and pod-like or berry-like divisions.*

16. ONOCLEA. Sporangia on an elevated receptacle, which is half surrounded at the base by an obscure collar-
like indusium.

TRIBE VII. **Woodsia.** Sori round, borne on the veins; indusium fixed beneath the sori, saucer-shaped and
long-ciliate, or at first globose and at length breaking into several segments.

17. WOODSIA. Small ferns with free veins.

TRIBE VIII. **Dicksonia.** Sori roundish, marginal or submarginal. Indusium cup-shaped or two-valved
its outer part composed of a reflexed lobe of the frond, or more or less united with it.

18. DICKSONIA. Indusium in our species small, nearly globular, membranaceous. Frond rather large, elong-
ated, decomposed.

Suborder 2. SCHIZACEÆ. Sporangia variously placed, globose or acorn-shaped, opening longitudinally; the
ring an apical cap of cells radiating from a central point or minute circular space.

19. SCHIZÆA. Sporangia attached basally in two or four rows on the narrow divisions of little pinnate (rarely
digitate) terminal appendages of the simple or dichotomous fronds. Cells of the ring radiating from a
circular space.

Suborder 3. OSMUNDACEÆ. Sporangia naked, globose, short-pedicelled, reticulated, opening into two valves by a
longitudinal slit and having only a vestige of a transverse ring near the apex. Large ferns, the bases of the
stalks dilated into stipuliform appendages.

20. OSMUNDA. Sporangia borne on the thread-like divisions of a separate frond or of a special part of a frond;
the fruit-bearing portion normally destitute of green colouring matter.

ORDER.—**OPHIOGLOSSACEÆ, Lindl.**

Genus I.—**OPHIOGLOSSUM, L., ADDER'S-TONGUE.**

1.—*O. vulgatum, L.*, (Common Adder's-tongue), Michx., Fl. Bor.-Am., II, 275. Pursh,
II, 675. Swartz, Syn. Fil., 169. Gray, Man., 672. Eaton, Ferns of N. A., II, 261.
Underwood, Our Nat. Ferns, etc., 70. Lawson, Can. Nat., I, 293. Macoun's Cat., No.
2341.

This plant, easily overlooked in the grass of low meadows where it is usually found,
is one which once seen, with its long stalked spike rising from the single leaf-like barren
segment, can never be mistaken for anything else. Occasionally it is found in woods, and
sometimes on dry hillsides. In height it ranges from 6 to 12 inches, and though fleshy is
non-evergreen. Root-stock slender, erect or rarely creeping, giving off fleshy horizontal
roots; sterile segment sessile near the middle of the plant, from 1 to 4 inches long, smooth,
entire, oblong-ovate or elliptical in outline, obtuse, and narrowed at the base; fertile spike
usually about an inch in length, apiculate, long-stalked, and much overtopping the sterile
segment.

O. vulgatum as a rule does not vary much, but occasionally the sterile segment is acute,
is perfectly round, or is not exceeded by the fertile, while sometimes a rootstock bears a
second frond, or, according to Prof. Eaton, one of the roots may produce an adventitious
bud and originate a new plant at some little distance from the old one.

Adder's-tongue was formerly extolled as the principal ingredient in an ointment

thought to exert a wonderful effect in the cure of serpent-bites, wounds, burns and scalds. It was also esteemed as an application to the inflamed udders of cows, and is still used in parts of England for this purpose.

Though rare, the Adder's-tongue in Canada has a wide range, extending from Nova Scotia westward to Manitoba. Found in Nova Scotia previous to 1863 by McCulloch, of Dalhousie College, but the exact locality of his specimens not known. Truemanville, Cumberland Co., N. S.—*A. J. Trueman*. Hopeville^{ville} and Cape Enrage, N. B.—*J. Brittain*. Melbourne Tp., Richmond Co., Que.—*Miss McIntosh*. Hemmingford, Que.—*Goode*. Beechwood, near Hemlock Lake, Ottawa, Ont.—*J. Fletcher*. Ferry Point, Belleville, Ont.; Beaver Meadow, between Hooper's Lake and the Hastings Road, Tudor Tp., Hastings Co., Ont.; grassy places along the Trent, McCann's Island, Seymour Tp., Northumberland Co., Ont.; St. Thomas, Elgin Co., Ont.—*Macoun*. Valley of the Humber, Toronto, Ont.—*Burgess*. Mouth of Rainy River, Lake of the Woods.—*G. M. Dawson*.

Genus II.—BOTRYCHIUM, Swz., GRAPE-FERN.

This genus has the following points common to all the species. Rootstock short, nearly erect, with clustered, fleshy roots, producing usually but a single frond each year. Base of the stalk swollen where it encloses the bud, and generally covered with a loose, outer sheath, the withered base of the stalk of the preceding year. All of them occasionally subject to the variation of having the sterile sections transformed into fertile, and *vice versa*, while sometimes, though much more rarely, there is a complete secondary fertile spike springing either from the main stalk or from the axils of the sterile divisions.

§ Base of stalk, which encloses the bud, closed on all sides. Sterile division more or less fleshy.

* Sterile division usually placed at or above the middle of the plant. Fronds never hairy.

† Sterile division once pinnate or pinnatifid, the pinnæ never pinnately lobed.

1.—*B. LUNARIA*, Swz., (Moonwort), ^{*Syn. Fl., 171.*} Hook., Fl. Bor.-Am., II, 265. Gray, Man., 671. Lawson, Can. Nat., I, 293. Macoun's Cat., No. 2336. Watt, Can. Nat., IV, 364. Eaton, Ferns of N. A., I, 29. Underwood, Our Nat. Ferns, etc., 72.

Osmunda Lunaria, L.

The Moonwort is a fleshy but non-evergreen plant, commonly about three to ten inches high, growing on dry, grassy uplands, rocky places or exposed cliffs, and sometimes in rich woods or boggy meadows. Sterile segment closely sessile near the middle of the plant, oblong in outline, obtuse, and simply pinnate; pinnæ crowded, commonly 5–15 in number, semi-lunar from a broad, wedge-shaped base, the sides concave and the outer margin crenate, the terminal division usually two- or three-lobed; fertile segment bi-tripinnate, long stalked, as a rule overtopping, often considerably, the sterile. Bud smooth, with the apex of the sterile segment bent over and outside of the nearly straight fertile one.

Variations in this fern are not uncommon, and cases of forking rootstocks, each of the branches giving rise to a frond, are reported. The sterile segment is occasionally more or

less ovate in outline, and sometimes short-stalked, while the outer margin of the pinnæ may be entire or incised, the latter condition when marked constituting var. *incisum*, Milde. A Rocky Mountain specimen of Prof. Macoun's very closely approaches the form with small, alternate, rounded and distant lobes, collected by Mrs. Rust in Onondaga County, New York, while others from the same locality resemble *B. simplex* in having the sterile segment distinctly petioled. Two plants from Bow River Pass, Rocky Mountains, show the buds bursting for the new growth, which seems to be taking place before the old fronds are withered, and specimens from Cape Rosier, Gaspé, Que., in other respects typical *B. Lunaria*, have the sterile segment scarcely overtopped by the fertile, and placed high up on the plant, much as in *B. matricariæfolium*, the common stalk forming about three-fourths of the total height. Some monstrous forms from Flat Creek, Manitoba, also gathered by Macoun, are very stout and fully a foot high, with the fertile segment much branched, the primary lower branches almost as long as the fertile segment itself, while the sterile segment is stalked and has its lobes, some of the lower of which are converted into branched fertile pinnæ, deeply incised.

In ancient times *B. Lunaria* was credited with mysterious and magical powers for opening locks when put into key-holes, taking the shoes off horses stepping on it, and turning quicksilver into the genuine article, while even to the present day there are firm believers in its powers of healing wounds to which it is applied.

In Canada the Moonwort occurs from Quebec to British Columbia, and northward to within the Arctic Circle. North side of Island of Orleans, Que.—*J. F. Whiteaves*. Rivière du Loup en-bas, Que.—*D. R. McCord*. Exposed cliffs near Cape Rosier, Gaspé, Que.; abundant on the north shore of Lake Superior at the Pic and Nipigon Bay, in meadows at Cape Alexander, twelve miles up the Nipigon River, and at various points on Lake Nipigon, Ont.; very plentiful on the prairie close to the sand hills at Flat Creek, Manitoba; on mountain slopes, Bow River Pass, Rocky Mountains, N. W. Ter.; in a boggy meadow near Fort McLeod, B. C., Lat. 55°.—*Macoun*. Carlton House, on the Saskatchewan, N. W. Ter.—*Richardson*. Echimamish River to Knee Lake, and Churchill River near Hudson Bay, N. W. Ter.—*R. Bell*.

†† Sterile division, in fully developed fronds, mostly bipinnatifid.

2.—*B. MATRICARIFOLIUM*, *A. Br.*, (Matricary Grape-Fern), *Watt*, *Can. Nat.*, IV, 364. *Macoun's Cat.*, No. 2339. *Eaton*, *Ferns of N.A.*, I, 129. *Underwood*, *Our Nat. Ferns*, etc., 72.

B. rutaceum, *Swz.*, *Syn. Fil.*, 171.

B. simplex, *Hook. and Grev.*

B. neglectum, *Wood*.

This is a moderately fleshy, non-evergreen plant, two to twelve inches high, growing commonly in dark, wet woods and along rivulets, but also found on rather dry and grassy, elevated plateaus. Sterile segment petioled, placed above the middle of (usually high up on) the plant, oblong-ovate in outline, and pinnate into 9–11 ovate, or ovate-oblong, obtuse lobes, which are nearly all of one size and toothed or incised; fertile segment bipinnate, and generally short stalked; bud smooth, with the apex of both segments turned down, the sterile segment clasping the fertile one by its side divisions, with its apex overlapping the whole.

The sterile segment is variable in shape, and the fertile in the degree of its division, but varieties based on these differences are, as stated by Prof. Eaton, probably only indicative of stages of development. The plant above described is the common one in America. The simplest form has the sterile segment very small, obovate-cuneate, and slightly 3-5 toothed along the sides, with the fertile a simple spike; while the most fully developed has the sterile segment broadly triangular in outline, the lower pinnæ pinnately divided into obtuse, toothed lobes, and the fertile much branched, its lower branches nearly as long as the central part. In any of the forms the sterile segment is occasionally almost or quite sessile.

With us the western limit of this fern, so far as known, is Lake Superior, but in the United States it has been detected in Unalaska. Pictou, N. S.—*A. H. McKay*. Dry and high grasslands, Cape Blomidon, N. S.—*Macoun* and *Burgess*. Truemanville, Cumberland Co., N. S.—*A. J. Trueman*. Petitcodiac and Titusville, N. B.—*J. Brittain*. Gravelly places on sea cliffs, growing with *B. Lunaria*, Cape Rosier, Gaspé, Que.; woods near Belleville, Ont.; pine woods five miles north of Campbellford, Northumberland Co., Ont.; at the big pool below the railway bridge, Nipigon River, and on islands in Lake Nipigon, Ont.—*Macoun*. King's Mountain, Chelsea, Que., and Casselman, Ont.—*J. Fletcher*.

3.—*B. LANCEOLATUM*, *Angs.*, (Lanceolate Grape-Fern), *Gray, Man.*, 671. *Macoun's Cat.*, No. 2338. *Fowler's N. B. Cat.*, No. 771. *Goode, Can. Nat.*, IX, 300. *Eaton, Ferns of N. A.*, I, 33. *Underwood, Our Nat. Ferns, etc.*, 73.

B. rutaceum, var. *lanceolatum*, *Moore*.

Osmunda lanceolata, *Gmelin*.

This species, which grows from 2 to 9 inches high, is non-evergreen and scarcely fleshy, dwelling along the shaded, mossy banks of streams, and in rich woods and low pastures. Sterile segment closely sessile near the top of the plant, triangular in outline, and pinnate with oblique, lanceolate, acute pinnæ, which are again pinnatifid into similar but smaller segments; fertile segment short stalked, slightly overtopping the sterile, bipinnate, with slender branches; bud smooth with the fertile segment recurved its whole length, the shorter sterile segment reclined upon it.

Like the Matricary Grape-Fern this plant shows a regular gradation of species from the form above described down to the smallest specimens, which have the pinnæ nearly entire and the fertile segment simple. Rarely the sterile segment is only sub-sessile, and occasionally it overtops the fertile.

Young plants of this species are not easily distinguished from those of *B. matricariaefolium*, of which it is by some authorities made only a variety. The points to be most relied upon in the differentiation are, that *B. lanceolatum* fruits later (end of July or beginning of August), is usually smaller and more slender, has the sterile segment sessile and deltoid with lanceolate, acute or sub-acute divisions, and the fertile segment is very short stalked. In addition there are the differences in veneration.

As yet recorded this plant is rare in Canada, and though found in Nova Scotia, New Brunswick and Quebec, is very local in all these provinces. In a field at Truemanville, Cumberland Co., N. S.—*A. J. Trueman*. Shady places in rich soil, Fredericton and Bass River, N. B.—*Fowler*. Magog, Que.—*Goode*.

* * Sterile division placed low down on the plant.

4.—*B. SIMPLEX*, *Hitch.*, (Hitchcock's Moonwort), *Hook.*, *Fl. Bor.-Am.*, II, 265. *Gray*, *Man.*, 671. *Watt*, *Can. Nat.*, IV, 364. *Macoun's Cat.*, No. 2335. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 155. *Eaton*, *Ferns of N. A.*, I, 121. *Underwood*, *Our Nat. Ferns*, etc., 71.

B. virginicum, var. (?) *simplex*, *Gray*, *Man.*, ed. 2nd, p. 602. *Lawson*, *Can. Nat.*, I, 292.

This is a smooth, non-evergreen, fleshy, little plant, 1–7 inches high, growing in meadows, damp rich woods, and on hillsides. Sterile segment petioled, placed below the middle of the plant (usually near its base), ovate in outline, and incised into three to five lobes, which are roundish, obovate, or semi-lunar, with the outer margin entire or obscurely crenulate; fertile segment long-stalked, usually much overtopping the sterile, and once or twice pinnate; bud smooth, with the apex of both sterile and fertile segments erect.

As in *B. lanceolatum* and *B. matricariaefolium*, this species exhibits a regularly graded series of stages of development, and from var. *simplicissimum*, *Lasch*, the simplest form with the sterile segment very small and entire and the fertile simple, through var. *incisum*, *Milde*, the common form and the one above described, and var. *sub-compositum*, *Lasch*, more decidedly pinnatifid with the lowest pair of pinnae remote, slightly incised and petioled, the varying stages can be traced to var. *compositum*, *Lasch*, (the common western form), which is the perfectly matured plant, and has the sterile segment ternate with stalked, pinnately incised divisions, and the fertile segment fully bipinnate. Rarely the sterile segment is placed above the middle of the plant forming var. *fallax*, *Milde*.

The range of this species in Canada is from Nova Scotia to Lake Superior and the Northwest Territory, though in the United States it extends south-westward to California. *Windsor*, *Hants Co.*, N. S.—*How*. *Truemanville*, *Cumberland Co.*, N. S., var. *simplicissimum*.—*A. J. Trueman*. *Petitcodiac* and *Fredericton*, N. B.—*Bailey*. *Dalhousie*, N. B., var. *sub-compositum*.—*J. Fletcher*. *Temiscouata*, Que., near the sea shore.—*Thomas*. *Quebec*, Que.—*Brunet*. *Montreal*, Que.—*D. R. McCord*. *Grenville*, *Argenteuil Co.*, Que. A small island at the east end of *St. Joseph's Island*, *Georgian Bay*, Ont.—*J. Bell*. Very common in the meadows along the *Kaministiquia River*, above *Fort William*, *Lake Superior*, Ont.—*Macoun*. Between *Cumberland House* and *Hudson Bay*, N. W. Ter.—*Drummond*.

5.—*B. TERNATUM*, *Swz.*, (Ternate Grape-Fern), ^{*Syn. Fl.*, 112.} *Hook.* and *Baker*, *Syn. Fil.*, 448. *Watt*, as var. *Americanum*, *Can. Nat.*, IV, 364. *Macoun's Cat.*, No. 2340. *Eaton*, *Ferns of N. A.*, I, 147. *Underwood*. *Our Nat. Ferns*, etc., 73.

B. rutefolium, *A. Braun*.

B. australe, *R. Br.*

B. fumaroides, *Willd.* *Pursh*, II, 655.

B. ternatum, *Swz.*, var. *lunarioides*, *Milde*, *Macoun's Cat.*, No. 2340, var. 1. *Underwood*, *Nat. Ferns*, 101.

B. lunarioides, *Swz.*, *Gray*, *Man.*, 672. *Provancher*, *Flor. Can.*, 722. *Fowler's N. B. Cat.*, No. 773. *Lawson*, *Can. Nat.*, I, 292. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 156.

Osmunda ternata, *Humb.*

Botryapus lunarioides, *Mx.*

This is a half evergreen, very fleshy, smooth or somewhat hairy plant, commonly growing from 4 to 12 inches high, and found in meadows or on hillsides, and in low, rich

woods or sandy woodlands. Sterile segment usually long petioled from near the base of the plant, evergreen, triangular or pentagonal in outline, ternate with the primary divisions stalked, as may also be the secondary or even the tertiary, and pinnately decomposed; ultimate segments, varying from roundish-reniform to obliquely or broadly ovate, entire, crenulate, or toothed; fertile segment long stalked, usually much taller than the sterile, and bi-quadripinnate; bud pilose, with the apex of both segments bent down, with a slight curve inward.

This description includes the following varieties of Eaton's "Ferns of North America," viz., Var. *lunarioides*, which is small and has the barren segment two to four times ternate, and the ultimate segments distinct and roundish-reniform, (found only in South Carolina and the Gulf States); var. *rutafolium*, small, with only the lowest segments distinct, and these obliquely-ovate, (in America found only in Newfoundland, New Brunswick and the neighboring region); var. *australe*, which is large and much decomposed, with the ultimate segments broadly ovate or roundish rhomboid, (found chiefly along the Pacific coast); and sub-var. *intermedium*, (*B. lunarioides* of Gray's Manual), similar but smaller and less decomposed than *australe* (the common form through Canada, except in the extreme east and west.)

Var. *obliquum*, Milde, (*B. obliquum*, Muhl.), has the sterile segment with ovate-lanceolate or lanceolate pinnatifid secondary or tertiary divisions, the terminal lobes of which are long pointed, but the lower ones roundish or obliquely ovate, the margins crenulate or toothed.

Var. *dissectum*, Milde, (*B. dissectum*, Muhl.), has the divisions of the sterile segment compoundly and laciniately cut into small, narrow lobes and teeth, but is otherwise as in the last.

In some specimens collected by Prof. Macoun in dry, rich woods at Fort William, Lake Superior, Ont., and referable to the sub-var. *intermedium*, the sterile segment springs from about the middle of the plant, and is barely overtopped by the fertile.

In its various forms this species has a very wide range, extending quite across our territory from the Atlantic to the Pacific and far northward. The following are some of the localities where it is recorded as found: Cape Porcupine; Boylston, Guysborough Co.; Rawdon, Hants Co.; and other places in Nova Scotia.—*Rev. E. H. Ball*. Bedford and Windsor, N. S.; Rapide de Femme, about six miles below Grand Falls, N. B., var. *rutafolium*.—*P. Jack*. Rather common in New Brunswick.—*Fowler*. Quebec, Que.—*Wm. Sheppard*. Three Rivers, Que.—*Maclagan*. St. Joachim, Que.—*Provancher*. Richmond and Drummond Cos., Que.—*J. A. Bothwell*. Waste places near Prescott Junction, Ont.—*B. Billings*. Hamilton, Ont.—*J. M. Buchan*. Leamington and Blenheim, Ont.—*Burgess*. London, Ont.—*W. Saunders*. Ottawa, Ont.; New Westminster, B. C., both sub-var. *intermedium* and var. *australe*.—*J. Fletcher*. Along the north shore of Lake Superior, at Nipigon River, Red Rock, Fort William, etc.; frequent on the western prairies, especially toward the Saskatchewan; a limestone mountain in Peace River Pass, Rocky Mountains, Lat. 56°.—*Macoun*. Mouth of Rainy River, Lake of the Woods.—*G. M. Dawson*. Var. *obliquum* seems to occur much less commonly than the type. New Germany and Oaklands Lake, Mahone Bay, N. S.—*Rev. E. H. Ball*. Dry, rich woods near ^{the} Hopyard, Belleville, and sandy soil, Rice Lake Plains, Ont.—*Macoun*. London, Ont.—*W. Saunders*. About Hudson Bay, York Factory and on the "Height of Land," in the Rocky Mountains.—*Drummond*. Var.

dissectum is recorded only from Mt. Uniacke, N. S.—*Rev. J. B. Uniacke*; and New Germany, Lunenburg Co., N. S.—*Rev. E. H. Ball*.

§ § Base of stalk which encloses the bud open along one side. Sterile division membranaceous.

6.—*B. VIRGINIANUM*, *Spreng.*, (Virginian Grape-Fern, Rattlesnake-Fern), ^{*Syn. Fil.*, 171.} Hook. and Baker, *Syn. Fil.*, 448. Watt, *Can. Nat.*, IV, 364. Eaton, *Ferns of N. A.*, I, 253. Underwood, *Our Nat. Ferns*, etc., 73.

B. Virginicum, Willd., Gray, *Man.*, 671. Pursh, II, 656. Provancher, *Flor. Can.*, 721. Lawson, *Can. Nat.*, I, 292. Macoun's *Cat.*, No. 2337. Fowler's *N. B. Cat.*, No. 772. Ball, *Trans. N. S. Inst. Nat. Sci.*, IV, 156.

Osmunda Virginiana, L.

Botrypus Virginicus, Mx., *Fl. Bor.-Am.*, II, 274.

This is a beautiful fern, with the leafy portion, when well developed, resembling in general appearance the foliage of some of the umbelliferous plants. It is non-evergreen, smooth or sparsely hairy, usually from 8 inches to 2 feet high, and grows in rich woods, or sometimes in bush clearings. Sterile segment sessile about the middle of the plant or a little above it, broadly triangular, and ternate; primary divisions short-stalked, lateral ones ovate, the terminal triangular, all once or twice pinnate, then once or twice pinnatifid; secondary divisions ovate-lanceolate; ultimate segments oblong, toothed at the apex; fertile segment long stalked, bi-quadrifid: buds pilose, with the fertile segment recurved its whole length, the larger sterile segment reclined upon it.

The fertile spike of this species occasionally forks, and specimens have been reported with the fertile panicle partly transformed into a sterile one. The plant known as var. *gracile*, Hook. and Grev., (*B. gracile*, Pursh), is a very small and delicate form, 4 to 5 inches high, with the fruiting panicle of few capsules and the bud smooth or nearly so. Mr. Davenport, in *Torr. Bull.*, Vol. X, p. 5, states that this form is probably rather the young state of *B. Virginianum* than a true variety, and that its bud being smooth or very nearly so, the vernation of this species will probably prove to be, "bud smooth at first (in the youngest state), finally pubescent, the hairy covering of the mature bud having only gradually been taken on with age." A form of *B. Virginianum*, the common one in places on the north shore of Lake Superior, where it grows in old clearings, is distinguished from the typical plant by its having a much less delicately membranaceous sterile segment, which at the same time is small in proportion to the size of the plant and comparatively little decomposed. With this form the Rocky Mountain and British Columbian specimens agree in the rigidity and thickness of their sterile segments. In a specimen from the Island of Anticosti, Que., the sterile segment is placed at the upper part of the plant, the common stalk forming fully three-fourths of the height.

In Canada this fern is very abundant, stretching northward to near the Arctic Circle, and from the Maritime Provinces westward as far as the wooded country extends in the prairie region, and through the mountains to British Columbia. Not very plentiful in Eastern Quebec, it becomes much more so in the western part of that province, and find its true home in the rich woods of Ontario, where it is one of the commonest of ferns. It is less abundant in the wooded parts of Manitoba and the Northwest but extends far north and again becomes fairly plentiful in British Columbia. Not common in Nova

Scotia; Pictou, Pictou Co.—*A. H. McKay*. Port Mulgrave, Strait of Canso.—*Rev. E. H. Ball*. Cape Blomidon, N. S.—*Lawson*. North Mountain, Annapolis, N. S.—*Macoun* and *Burgess*. Rather common in New Brunswick.—*Fowler*. Rocky woods, Jupiter River, Anticosti, Que.; north shore of Lake Superior, at Red Rock, Nipigon, Thunder Bay, and up the Kaministiquia, Ont.; Fort McLeod, B. C., Lat. 55°, and lower valley of Fraser River, B. C.—*Macoun*. Lower slopes of South Kootanie Pass, Rocky Mountains, Lat. 49°.—*G. M. Dawson*. The var. *gracile* is reported from Truemanville, N. S.—*A. J. Trueman*. Oxford House, N. W. Ter.—*McTavish*.

ORDER.—**FILICES**, *Juss.*

Genus I.—POLYPODIUM, *L.*, POLYPODY.

* Veins free.

1.—*P. VULGARE*, *L.*, (Common Polypody, Rock-Fern), *Mx.*, *Fl. Bor.-Am.*, II, 271. *Pursh*, II, 658. *Gray*, *Man.*, 658. *Lawson*, *Can. Nat.*, I, 268. *Macoun's Cat.*, No. 2284. *Fowler's N. B. Cat.*, No. 744. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 149. *Watt*, *Can. Nat.*, IV, 363. *Eaton*, *Ferns of N. A.*, I, 237. *Underwood*, *Our Nat. Ferns*, etc., 81. *Provancher*, *Flor. Can.*, 713.

P. vulgare, *L.*, var. *Americanum*, *Hook.*, *Fl. Bor.-Am.*, II, 258.

P. Virginianum *L.*

This is an evergreen species, varying in height from 2 to 15 inches, the smooth stipe usually forming somewhat less than one-half the length. It is commonly found upon rocks exposed or shaded, but sometimes upon dry banks, old logs, or in deep, cool woods on growing trees, after the manner of *P. incanum*. Rootstock chaffy, creeping close to the surface; fronds smooth, acuminate, leathery, usually one to three inches broad, ovate to oblong-linear in outline, and divided nearly to the rachis into entire or somewhat serrate, obtuse pinnæ; veins all free; fruit-dots about a line in diameter, placed midway between the midrib and margin of the segments.

The shape and amount of division of the frond and of its pinnæ are subject to considerable change, and in Europe a number of varieties based on such changes have been described. Most of these have been found in America, but only two of them seem worthy of special notice, viz., var. *Cambricum*, found in the Eastern States, but of which no Canadian specimens have been seen, which is likely to occur also within our limits, and will be known by its being bipinnatifid throughout or in its lower half; and var. *occidentale*, which has larger and thinner fronds than the typical form, with acuminate, often sharply serrate, pinnæ. Examples of bifid fronds are sometimes seen in this fern.

As a remedial agent, the roots of *P. vulgare* were formerly esteemed for their purgative properties, and also as a pectoral in asthma, but they are now scarcely ever employed.

The Common Polypody is widely distributed throughout Canada from the Atlantic to the Pacific, extending northward to Nelson and Slave Rivers, and probably to the Arctic Circle. It is especially abundant in all rocky districts, but seems to prefer the heavily-bedded Lower Silurian limestones from the Niagara to the Trenton. Of very general distribution throughout Nova Scotia.—*Rev. E. H. Ball*. Common near St. John,

but rare in northern counties of New Brunswick.—*Fowler*. Grand Falls and Woodstock, N. B.—*P. Jack*. Common in Quebec.—*Provancher, D'Urban, McCord, J. Bell*, etc.; and in Ontario.—*Macoun, Lawson, Billings, Logie, Burgess*, etc. Plentiful in rocky parts of Manitoba.—*Macoun, Dawson, Burgess*. Nelson River, Hudson Bay, N. W. T.—*R. Bell*. Rocky Mountains.—*Macoun*. In British Columbia the common form is var. *occidentale*.—*Macoun* and *Fletcher*; but specimens of the normal type are also found. This plant has been seen growing plentifully on old elm trees, near Belleville, Ont., near Heely Falls, Trent River, Northumberland Co., Ont., and near Amherstburg, Essex Co., Ont.—*Macoun*.

2.—*P. FALCATUM*, *Kellogg*; (Kellogg's Polypody, Hooked Polypody, Liquorice-Fern), *Eaton*, Ferns of N. A., I, 201. Underwood, Our Nat. Ferns, etc., 61.

P. glycyrrhiza, *Eaton*.

It is a species with thin but evergreen fronds, by Hooker regarded as only a form of *P. vulgare*, growing in the crevices of sea cliffs and in trees, and reaching a height of 1½ to 2 feet. Rootstock creeping, elongated, and chaffy especially at the advancing end; stalks commonly a little less than half the length of the fronds, slender, pale straw-colour when dry, and slightly chaffy just at their articulation with the rootstock; fronds broadly lanceolate, 9 to 15 inches long by 4 to 8 wide, long-pointed, smooth, and very deeply pinnatifid; segments numerous, tapering from broad bases into long, acuminate points, sharply serrate, and often falcate; sori medium-sized and nearer the midvein than the margin.

No marked variations are known in this fern, but the edges of the pinnæ are sometimes entire, and again deeply incised. The root has a taste resembling liquorice, and is used as an emollient and expectorant.

With us this species is only found in British Columbia. Abundant on rocks along the coast, between Victoria and Esquimault Harbour, Vancouver Island; frequent in the hollows of living trees in the valley of the Fraser River, especially at the mouth of Harrison River.—*Macoun*.

* * Veins forming ample regular areolæ.

3.—*P. SCOULERI*, *Hook. and Grev.*, (Scouler's Polypody, Leather-leaf Polypody), *Hook. and Baker*, Syn. Fil., 342. *Eaton*, Ferns of N. A., I, 193. Underwood, Our Nat. Ferns, etc., 81.

P. carnosum, *Kellogg*.

P. pachyphyllum, *Eaton*.

This is also an evergreen species, and ranges in height from 3 to 18 inches, growing usually on trees and stumps, but occasionally on the ground. Rootstock stout, creeping, scaly; stalks stout, smooth, generally a little shorter than the fronds; fronds smooth, leathery, fleshy when green, broadly ovate in outline, 2 to 6 inches wide, and divided to the rachis; pinnæ broad, linear-oblong, minutely serrate, and very obtuse, the terminal one distinct; veinlets mostly united to form regular areolæ; fruit-dots, often nearly the fifth of an inch in diameter, placed close to the midrib.

Except in size, *P. Scouleri* seems to present little variation, but some British Columbian specimens examined had some of the pinnæ acutish, and in one case the terminal segment showed a tendency toward bifurcation.

Like *P. falcatum*, this fern is in Canada restricted in its range to British Columbia, specimens collected in which province, at Alberni on the western side of Vancouver Island, by Mr. J. R. Anderson, have been kindly furnished for examination by Mr. Jas. Fletcher, of Ottawa. Vancouver Island and main land west of Coast Range.—*Macoun*.

Genus II.—GYMNOGRAMME, *Desv.*, GOLD-FERN.

1.—GYMNOGRAMME TRIANGULARIS, *Kaulf.*, (California Gold-Fern or Gold-back), Hook., Fl. Bor.-Am., II, 259. *Macoun's Cat.*, No. 2285. Eaton, Ferns of N. A., II, 15. Underwood, Our Nat. Ferns, etc., 82.

This handsome evergreen fern, varying from 5 to 15 inches in height, grows on hill-sides in the crevices of rocks. Rootstock short, creeping, chaffy and covered with old stalk-bases; stalks slender, dark brown, polished, and densely tufted; fronds pinnate, deltoid or pentagonal in outline, measuring from 1½ to 5 inches each way; lower pinnæ much the largest, triangular, and twice parted, with the secondary pinnæ much elongated on the lower side; upper pinnæ lanceolate, and more or less pinnately lobed; upper surface of the fronds smooth or rarely minutely granular, but beneath they are covered with a yellow or white ceraceous powder.

Specimens examined display no variation, except that British Columbian plants are rather more rigid and stunted in growth than those from California. Var. *viscosa*, D.C. Eaton, a Californian form, has the upper surface of the fronds viscid.

Though common enough in the United States, from California to Oregon, this fern in the Dominion grows only in British Columbia, and is of rare occurrence even there. Crevices of rocks on the grassy slopes of Cedar Hill, a few miles from Victoria, Vancouver Island.—*Macoun*. Mt. Finlayson, Vancouver Island.—*A. J. Hill*.

Genus III.—CHEILANTHES, *Swz.*, LIP-FERN.

1.—*C. GRACILLIMA*, *D. C. Eaton*, (Lace-Fern, Graceful Lip-Fern), Hook. and Baker, Syn. Fil., 139. Eaton, Ferns of N. A., II, 247. Underwood, Our Nat. Ferns, etc., 90.

C. vestita, Brackenridge.

An evergreen plant, 3 to 10 inches high, growing in dense beds among rocks. Rootstocks creeping, tangled, chaffy; stalks tufted, dark brown, scaly when young but soon becoming smooth; fronds about half as long as the stalks, linear-oblong in outline, bipinnate or sometimes, from the lobing of some of the pinnules at the base, partly tripinnate; pinnæ numerous, crowded, and composed of about nine oblong-oval pinnules, which are about a line in length and smooth or very nearly so above, but clothed with pale, ferruginous, matted wool beneath; indusia rather broad, yellowish-brown, and formed of the continuously recurved margin of the pinnules.

Among British Columbian specimens supplied by Mr. Fletcher, and found growing with the common form, were some fronds differing from those figured in the "Ferns of North America," in being markedly more slender, with distant pinnæ and smaller and more distant pinnules.

This is another British Columbian species reported only from Mount Finlayson, near Victoria, Vancouver Island.—*J. Fletcher*. Crevices of dry and exposed rocks a few

miles beyond Spence's Bridge, on the Thompson River.—*Macoun*. At Pend d'Oreille River.—*Lyall*.

2.—*C. LANUGINOSA*, *Nutt.*, (Woolly Lip-Fern), *Gray, Man.*, 659. *Hook. and Baker, Syn. Fil.*, 139. *Macoun's Cat.*, No. 2286. *Eaton, Ferns of N. A.*, I, 41. *Underwood, Our Nat. Ferns, etc.*, 90.

C. vestita, *Hook.*, not of *Swartz and Willd.*

C. lanosa, *D. C. Eaton.*

C. gracilis, *Mett.*

Varying in height from 2 to 8 inches, this evergreen fern grows in tufts on exposed rocks, where its short creeping root-stocks form a matted mass. Stalks densely tufted, slender, brownish-black, at first clothed with woolly hairs but at length nearly or even quite smooth; fronds about equal to the stalks in length, ovate-lanceolate in outline, and tri- or rarely bi-pinnate; pinnæ deltoid and rather distant below, but oblong-ovate and crowded above; ultimate segments crowded, round, and not more than half a line in diameter, except the terminal which is obovate and larger, upper surface scantily tomentose but the lower covered with densely matted, whitish-brown, woolly hairs; indusia very narrow and formed of the almost continuous unchanged margins of the pinnules.

Among specimens of this fern from British Columbia was a form with the divisions, from the primary pinnæ down to the ultimate pinnules, rather distant, making the frond in part quadripinnate; final divisions very minute, being less than half the size commonly seen. In some plants the whole frond presented this lax appearance, while in others only the lower pinnæ showed it, the rest of them being as in the typical form. Bifurcation at the apex of the frond is not uncommon in this fern.

The range of this plant in Canada is limited to British Columbia and the eastern base of the Rocky Mountains in the N. W. Territory. Abundant on ledges of rock between Morley and Old Bow Fort on the left bank of Bow River, N. W. T.; crevices of rocks near Limestone Point on the North Thompson River, B. C.—*Macoun*. Rattlesnake Bluff, Black Canyon, above Ashcroft, B. C.—*A. J. Hill*. Alpine woods, Rocky Mountains.—*Drummond*. New Caledonia, Northern British Columbia, and north-west coast.—*Douglas*.

Genus IV.—PELLÆA, *Link*, CLIFF-BRAKE.

* Fronds thin, veins readily seen.

1.—*P. GRACILIS*, *Hook.*, (Slender Cliff-Brake), *Gray, Man.*, 659. *Hook. and Baker, Syn. Fil.*, 145. *Macoun's Cat.*, No. 2288. *Fowler's N. B. Cat.*, No. 747. *Watt, Can. Nat.*, IV, 363. *Eaton, Ferns of N. A.*, II, 65. *Underwood, Our Nat. Ferns, etc.*, 93.

Pteris gracilis, *Mx.*, *Fl. Bor.-Am.*, II, 262. *Pursh*, II, 668. *Swartz, Syn. Fil.*, 99. *Hook.*, *Fl. Bor.-Am.*, II, 264.

Pteris Stelleri, *Gmelin.*

Pteris minuta, *Turcz.*

Allosorus gracilis, *Presl. Gray*, *Man.*, ed. 2nd, 591.

A. Stelleri, *Ruprecht, Lawson, Can. Nat.*, I, 272.

A. crispus, var. *Stelleri*, *Milde.*

Cheilanthes gracilis, *Kaulf.*

Pellaea gracilis is a very delicate, non-evergreen, little fern, 3 to 10 inches high, with fronds in general appearance a good deal like those of *Cryptogramme acrostichoides*, growing in the crevices of damp, shaded, calcareous rocks. The fertile and sterile fronds are somewhat unlike,—the former, which are the tallest, having distinct, linear-oblong, almost entire ultimate segments, of which the terminal are much the longest, while in the latter they are decurrent, ovate or obovate, and cut or toothed. Root-stock slender, creeping, nearly naked; stalks slender, $1\frac{1}{2}$ to 6 inches long, brownish or pale-straw coloured, somewhat polished and sparingly chaffy at the base; fronds (including both fertile and sterile) smooth, ovate or ovate-oblong in outline, very delicate, and bi-tripinnatifid; veins mostly only once forked; indusia broad, remaining rolled over the sori until they are ripe.

In some specimens of this fern from Owen Sound, Ont., the ultimate segments of the fertile fronds are almost narrowly linear, while in some from Ottawa, Ont., they are ovate, and the terminal ones but very little the longer.

This fern occurs in British America from Labrador to British Columbia, though it is by no means a very common species. Morris ^{Rock} Falls, Restigouche, and Grand Falls, St. John, N. B.—Fowler. Woodstock, N. B.—P. Jack. On crystalline limestone, near the Lake of Three Mountains, River Rouge, Que.—W. S. M. D'Urban. Cacouna, Que.—J. W. Dawson. Rivière du Loup, en bas, Que.—Dr. Thomas. Crevices of limestone rocks near Hemlock Lake, Ottawa, Ont.—J. Fletcher. Lakefield, Ont.—Mrs. Traill. Canada (Goldie), to the Saskatchewan (Drummond), in Hook., Fl. Bor.-Am. Crevices of rocks near L'Anse à Fallon, Cape Rosier, and Ste. Anne des Monts River, Gaspé, Que.; limestone rocks along the River Moira, near Belleville, Ont.; crevices of rocks, Foster's Flats, below the Whirlpool, Niagara Falls, Ont.; along the Kaministiquia River, below the Kakabeka Falls, Ont., and on ledges at the falls; under the cliffs at Red Rock and near Nipigon Station, on the Canada Pacific Railway, Ont.; crevices of the Huronian slates seventeen miles from Michipicotin, on the Magpie River Road, Ont.; Peace River Pass, Rocky Mountains, N. W. T.—Macoun.

* * Fronds leathery, veins obscure.

2.—P. ATROPURPUREA, Link, (Clayton's Cliff-Brake), Gray, Man., 660. Lawson, Can. Nat., I, 272. Hook. and Baker, Syn. Fil., 147. Macoun's Cat., No. 2289. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., II, 61. Underwood, Our Nat. Ferns, etc., 93.

Pteris atropurpurea, L. Pursh, II, 668.

Platyloma atropurpurea, J. Smith.

Allosorus atropurpurea, Kunze. Gray, Man., ed. 2nd, 591.

This evergreen species grows from 2 to 18 inches high and on dry, though shaded, rocks, which are generally calcareous. Rootstock short and chaffy; stalks clustered, wiry, dark purple, polished, and with usually more or less chaffy hairs on them; fronds commonly 1 to 12 inches long, ovate or oblong-lanceolate in outline, leathery, and pinnate, or near the base, bipinnate; fertile pinnules and simple pinnæ usually acutish and oblong-linear or linear (sometimes two inches long), while the sterile are obtuse and oval or oval-oblong (about half an inch long); at the base, the pinnules, of which the terminal are the longest, may be truncate, slightly cordate, or auricled on one or both sides; veins mostly twice forked; indusia rather broad, but not fully covering the sori.

Forking pinnules and fronds of this fern are not very rare, and sometimes the auricles at the base of a pinnule are as long as the pinnule itself. A form from near Ashcroft, B.

C., has some of the pinnæ pinnatifid at the base into roundish or semi-lunate lobes, which are shorter than the bases of the pinnæ from which they have been cut off, and this form of pinna is irregularly scattered over the frond, several undivided ones separating sets of divided ones.

P. atropurpurea is a widely distributed but very local fern, occurring in Canada from Ontario westward to British Columbia and northward to Great Bear Lake. Neighbourhood of Hamilton, Ont.—*Judge Logie*. Limestone rocks, Elora, Ont.—*C. McPherson*. Crevices of rocks at the Whirlpool and Foster's Flats, Niagara Falls, Ont.; abundant at various places in crevices of dry limestone rocks around Owen Sound and Colpoy's Bay, Ont.; limestone cliffs, Clearwater River, north of Methy Portage, Lat. 57°, N. W. Ter.; canyon near Buffalo Head Mountain, Rocky Mountains; crevices of dry rocks between Spence's Bridge and Cache Creek, B. C.—*Macoun*. Rattlesnake Bluff, Black Canyon, above Ashcroft, B. C.—*A. J. Hill*. Canada to Bear Lake and the Rocky Mountains.—*Richardson and Drummond*.

3.—*P. DENSA*, *Hook.*, (Oregon Cliff-Brake, Close-set Pellæa), *Hook. and Baker*, *Syn. Fil.*, 149. *Macoun's Cat.*, No. 2290. *Eaton*, *Ferns of N. A.*, I, 77. *Underwood*, *Our Nat. Ferns*, etc., 94.

Onychium densum, *Brackenridge*.

This fern is evergreen, and found in clefts of rocks, usually at considerable elevation, varying from 4 to 12 inches in height. Rootstocks slender, tangled, and chaffy; stalks densely tufted, wiry, slender, chestnut-brown, and dull or but slightly polished; fronds forming usually only about one-fourth of the height of the plant, smooth, ovate or triangular-oblong in outline, leathery, and tripinnate, with the pinnæ and pinnules densely crowded; ultimate segments linear, nearly sessile, very acute or mucronate, those of the fertile fronds entire with recurved edges, and those of the sterile (very rarely seen) broader and sharply serrate; veins mostly simple; indusia distinct, but very thin and delicate.

Strangely enough, this plant is, in Canada, restricted to almost the two extremes of our vast territory, viz., Quebec and British Columbia. Found by Prof. Allen on Mount Albert, Shickshock Mountains, Gaspé, Que., in 1881, growing exposed to the sun on the steep walls of ravines, at 2,000 to 3,000 feet elevation.—*Eaton*. Mount Finlayson, Vancouver Island, B. C.—*J. R. Anderson*. Abundant on cliffs along the Fraser River, above Yale, and within the Cascade Mountains, B. C., notably at Chinaman's Bluff.—*Macoun*.

Genus V.—CRYPTOGRAMME, *R. Br.*, ROCK-BRAKE.

1.—*C. ACROSTICHOIDES*, *R. Br.*, (American Rock-Brake, Parsley-Fern), *Hook.*, *Fl. Bor.-Am.*, II, 264. *Lawson*, *Can. Nat.*, I, 273. *Watt*, *Can. Nat.*, IV, 363. *Eaton*, *Ferns of N. A.*, II, 99. *Underwood*, *Our Nat. Ferns*, etc., 92.

C. crispa, forma Americana, *Hook.*

Allosorus acrostichoides, *Spreng.*, *Gray*, *Man.*, 660. *Macoun's Cat.*, No. 2287.

A. crispus, *Kaulf.*

A. crispus, var. *acrostichoides*, *Milde.*

Gymnogramme acrostichoides, *Presl.*

Phorobolus acrostichoides, Fec.

The Rock-Brake grows from 4 to 12 inches high, and forms dense tufts among rocks and in their crevices. It is a handsome species, with evergreen barren fronds. Rootstocks creeping and chaffy; stalks numerous and straw-coloured, bearing fronds of two kinds; sterile fronds ovate in general outline, dark green, smooth, leathery, short-stalked, bi-quadripinnatifid, with ovate or obovate, toothed ultimate segments; fertile fronds more lanceolate in general outline, thinner, yellowish, long-stalked (standing nearly twice as high as the sterile), less compound, with narrow linear or linear-oblong segments; indusia formed of the edges of the segments, which are so far reflexed as to meet at the midrib and thus give them a pod-like appearance.

Occasionally, in this fern, the upper part of a fertile frond is sterile, and Mr. Davenport, in the "Botanical Gazette," has reported specimens with the lower pinnæ sterile. Some sterile fronds from British Columbia show the ultimate segments lanceolate or almost linear-lanceolate, and very regularly and sharply serrate, while in others the fertile pinnules are remarkably long and narrow, the basal ones in some cases measuring nearly one inch in length by only half a line in width.

With us this plant is found from Lake Huron west to British Columbia, extending northward to within the Arctic Circle. McLeod's Harbour, Manitoulin Islands, Ont.—*J. Bell*. Cumberland House to Great Bear Lake, N. W. Ter.—*Richardson*. Between Echimiash River and Oxford House, and around Cross Lake and Nelson River, near Hudson Bay, N. W. Ter.—*R. Bell*. Stony places in the Rocky Mountains, but rare, to the sources of the Columbia River, B. C. (*Drummond*), thence to the Grand Rapids of the Columbia (*Douglas*), in Hook., Fl. Bor.-Am. Rocks along the Arctic coast, from Mackenzie River to Baffin Bay.—*Hook.*, Arc. Pl. Kicking Horse Pass, Rocky Mts., N. W. Ter.; common in the Cascade range, and along the Fraser River, B. C.—*Macoun*. Yale, B. C.—*J. Fletcher*. Wigwam River, Kootanie Valley, Rocky Mountains.—*G. M. Dawson*.

Genus VI.—PTERIS, *L.*, BRAKE OR BRACKEN.

1.—*P. AQUILINA*, *L.*, (Common Brake or Bracken, Eagle-Fern), *Mx.*, Fl. Bor.-Am., II, 262. Swartz, Syn. Fil., 100. Gray, Man., 658. Provancher, Flor. Can., 715. Lawson, Can. Nat., I, 270. Hook. and Baker, Syn. Fil., 162. Macoun's Cat., No. 2291. Fowler's N. B. Cat., No. 746. Ball, Trans. N. S. Ins. Nat. Sci., IV, 149. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., I, 263. Underwood, Our Nat. Ferns, etc., 88.

Allosorus aquilinus, Presl.

This is the coarsest and one of the commonest of our native ferns, growing from 1 to 5 feet high. It is non-evergreen, though in sheltered situations it stands a good deal of frost, and, while commonest on dry, sunny hillsides, is also found in thickets and even in wet, thick woods. Rootstock black, widely creeping at usually a considerable depth underground, producing only one frond each year, but having the scattered, woody remains of the stalks of several previous years attached; stalks light-brown, rigid, naked, the part between the rootstock and the point where they emerge from the ground swollen and darkened; fronds dull green, leathery, triangular in general outline, varying from a foot, or even considerably less, to three feet in length by nearly as much in breadth, upper surface smooth, the lower slightly pubescent, bi-tripinnate; principal primary

pinnæ long-stalked; secondary pinnæ (even the largest) nearly sessile, entire, pinnatifid or pinnate; ultimate segments oblong or oblong-linear, and obtuse; veins free and much forked; indusia delicately ciliate and nearly always more or less double.

Sometimes the divisions of the secondary pinnæ are entire (var. *integerrima* of Lawson in Can. Nat., Vol. I, p. 271), and sometimes they are hastate, or yet again their lobes may be entirely separate, thus making the frond quadripinnate. A young, barren state, occasionally developing into a large plant while retaining its youthful characters, has at different times been a puzzle to pteridologists, and forms var. *decipiens* of the same author. Specimens with bifid pinnæ or pinnules, or even both, have been found at various times. The var. *caudata*, Hook., (*P. caudata*, L.), is by Eaton confined to the Gulf States,—the forms found in Canada and the Northern States, and published as such, being wrongly so-called. This form has the fronds glabrous on both sides, and the pinnules and segments very narrow, the terminal ones much elongated.

Var. *lanuginosa*, Bong., (*P. lanuginosa*, Bory), confined to the western coast, has fronds decidedly pubescent or silky-tomentose beneath, but is otherwise about the same as the typical plant. Mr. Fletcher found, near New Westminster, B. Columbia, specimens of this fern growing in swampy thickets over eight feet high, though on dry ground it was about the usual size.

No other fern possesses as much economic value as *P. aquilina*. The young fronds and rootstocks have been used as food by the inhabitants of different countries, and the dried fronds, chopped up with hay or straw, are in Wales given as fodder to horses. The ashes, which contain a large amount of alkali, have been used by glass-makers, and in Switzerland the potash is extracted for commercial purposes. The plant has also been employed for thatching, as a fuel, and as a packing material for fruits, while in medicine the root is by some considered extremely valuable as a vermifuge.

The Bracken, growing principally on sand or sandy loam, is found from the Atlantic to the Pacific. Very common in Nova Scotia.—*A. H. McKay*. Growing everywhere in New Brunswick.—*Fowler*. Jupiter River, Island of Anticosti, Que.—*Macoun*. Common everywhere in Quebec.—*D. R. McCord*. Common in Ontario and in parts of Manitoba.—*Macoun*, *Burgess*, etc. Saskatchewan plains, N. W. Ter.—*Drummond* and *Macoun*. Rocky Mountains.—*Macoun*. Very common, var. *lanuginosa*, on Vancouver Island and the main land, British Columbia.—*Macoun* and *Fletcher*.

GENUS VII.—ADIANTUM, L., MAIDENHAIR.

1.—*A. PEDATUM*, L., (American Maidenhair), Swartz, Syn. Fil., 121. Mx., Fl. Bor.-Am., II, 263. Pursh, II., 670. Gray, Man., 658. Hook. and Baker, Syn. Fil., 125. Provancher, Flor. Can., 714. Lawson, Can. Nat., I, 270. Macoun's Cat., No. 2292. Fowler's N. B. Cat., No. 745. Ball, Trans. N. S. Ins. Nat. Sci., IV, 149. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., I, 135. Underwood, Our Nat. Ferns, etc., 87.

A. Americanum, Cornutus.

A. boreale, Presl.

The Maidenhair, probably the most beautiful of all our ferns, is a non-evergreen species, which attains a height of 6 inches to 2 feet, accordingly as grown in dry, somewhat exposed situations, or in low, rich woods (its proper home). Rootstock elongated, creeping, scaly,

about as thick as a goose-quill; stalks erect, slender, dark brown, polished, and dichotomously forked, the recurved branches bearing four to sixteen pinnæ on their outer side, and forming fronds crescentic or nearly circular in outline; pinnules numerous, smooth, springing alternately from the rachis by short stalks, (the terminal one of each pinna cuneate in shape, the lowest two or three triangular, and the intermediate ones oblong), apparently one-sided from their lower slightly-curved margin being entire, while the upper is cleft into lobes; lobes in sterile fronds toothed, but in fertile reflexed and altered to form the indusia.

Specimens of this fern are occasionally seen with the pinnules much more deeply incised than usual, and others with most of them triangular, a combination of these two forms making the var. *triangulare* of McCord, in *Can. Nat.*, Vol. I, p. 355. In some plants collected in the Shickshock Mountains, Quebec, at an elevation of 4,000 feet, the primary branches show little tendency to recurvation, making the general outline of the frond triangular, while, by a sudden bending inward on themselves of the ends of the branches, the larger pinnæ appear to be on the outside of the fronds, and some of them are given the appearance of being branched. A somewhat similar abnormality is seen in specimens from Lakefield, Ont., which have the two branches curved inward instead of outward, apparently making the stipe terminate in a circular primary rachis, from which spring the pinnules.

In medicine the leaves of *A. pedatum* have been used for their expectorant properties in coughs, asthma and chronic catarrh, and have also at times been extensively substituted for the true Maidenhair (*A. Capillus-Veneris*) employed in France to manufacture a pectoral syrup, known as "*Sirope de Capillaire*."

In Canada the Maidenhair, though very local in its distribution outside of Ontario, where it is particularly abundant, occurs from Nova Scotia to British Columbia. Newport, Hants Co., N. S.—*Rev. E. H. Ball*. Upper Restigouche and Upper St. John, N. B.—*Fowler*. Archibald's Mill, Upper Musquodoboit, Halifax Co., N. S.; near Woodstock, N. B.—*P. Jack*. Common in Quebec, especially in the western part. Quebec, Que.—*Hon. Wm. Sheppard*. St. Joachim and Isle St. Paul, Montreal, Que.—*Provancher*. River Rouge, Que.—*W. S. M. D'Urban*. Very common throughout Ontario.—*Lawson, Macoun, Burgess*, etc. On the plateau of Mt. Albert, near a small lake, Shickshock Mountains, Gaspé, Que.; Vancouver Island, Yale and other places in British Columbia.—*Macoun*. Mt. Finlayson, near Victoria, B. C., a deeply lacinate form growing with the common one.—*J. Fletcher*. Queen Charlotte Islands, B. C., specimens over two feet high.—*G. M. Dawson*.

Genus VIII.—LOMARIA, *Willd.*, DEER-FERN.

1.—*L. SPICANT*, *Desv.*, (Oregon Deer-Fern, Roman-Fern, Hard-Fern, Spiked-Fern), *Hook. and Baker*, *Syn. Fil.*, 178. *Macoun's Cat.*, No. 2293. *Eaton*, *Ferns of N. A.*, I, 249. *Underwood*, *Our Nat. Ferns*, etc., 95.

L. borealis, *Link.*

Osmunda spicant, *L.*

Onoclea spicant, *Hoff.*

Blechnum spicant, *Smith.*

B. boreale, *Swartz*, ^{*Syn. Fl.*, 115.} *Pursh*, II, 669.

This is a species with dimorphous fronds, growing 1 to 3 feet high, and found on the ground, generally in rich, cool woods. Rootstock short, thick, and very chaffy; sterile fronds erect, smooth, leathery, very short-stalked, narrowly-lanceolate, tapering to both ends, and pinnatifid to the rachis into oblong or linear-oblong, upwardly curved, entire or obscurely crenulate, generally obtuse segments, the lower of which gradually grow shorter and shorter until they appear like little distinct auricles along the stalk; fertile fronds nearly similar in general outline, but long-stalked (greatly overtopping the sterile), and pinnate into fewer and more distinct segments, which are much narrower and somewhat longer than those of the barren fronds; veins free in the sterile fronds, but forming a series of areolæ on each side of the midrib in the fertile; indusia placed close to, but distinct from, the margins of the segments; sori, when ripe, nearly covering the backs of the pinnæ.

This is a somewhat variable fern, and in Europe a great many varieties, chiefly founded on differences in the degree of divisions of the fronds and tothing of the pinnæ, have been described. Var. *serratum*, Wolleston, has the margins of the pinnæ strongly and doubly serrate, and a very peculiar form found in British Columbia, with the lower half of the fronds sterile and the fructification broken into short sori, formed *Blechnum doodioides*, Hooker. A specimen from New Westminster, B. C., shows the lower fourth of a fertile frond sterile, but otherwise as in the typical plant. Forking fronds and pinnæ are not very uncommon in this fern.

The Deer-Fern, which extends along the Pacific from California to Alaska, is in Canada confined to the coast of British Columbia west of the coast range of mountains, where, however, it is abundant. Nootka, Vancouver Island.—*Mertens*. New Westminster.—*J. Fletcher*. Yale.—*Macoun*. Drew's Harbour and on Queen Charlotte Islands.—*G. M. Dawson*. Observatory Inlet.—*Scouler*. Pitt River.—*A. J. Hill*.

Genus IX.—WOODWARDIA, *Smith*, CHAIN-FERN.

1.—*W. VIRGINICA*, *Smith*, (Virginia Chain-Fern), *Swartz*, *Syn. Fil.*, 117. *Pursh*, II, 670. *Gray*, *Man.*, 660. *Lawson*, *Can. Nat.*, I, 278. *Hook. and Baker*, *Syn. Fil.*, 188. *Macoun's Cat.*, No. 2318. *Ball*, *Trans. N. S. Ins. Nat. Sci.*, IV, 149. *Eaton*, *Ferns of N. A.*, II, 45. *Underwood*, *Our Nat. Ferns*, etc., 96.

W. Banisteriana, *Mx.*, *Fl. Bor.-Am.*, II, 263.

W. thelypteroides, *Pursh*, II, 670.

W. Chamissoi, *Brackenridge*.

Blechnum Virginicum, *L.*

Doodia Virginica, *Presl.*

A handsome, non-evergreen fern found growing in swamps, and attaining a height of 2 to 3 feet, or in the South even 5 feet. Rootstock fleshy, 3 to 5 lines thick, extensively creeping, and chaffy at the advancing end; stalks, forming about one-half the height of the plant, erect, stout, and blackened for some distance above their origin, which blackness gradually changes to a dull brown above; fronds rather leathery, oblong-lanceolate in general outline, short pointed at the apex, and pinnate; pinnæ numerous, sessile, linear-lanceolate, and pinnatifid nearly to the rachis into oblong, minutely serrulate segments; veins forming a single row of narrow areolæ, which emit free veinlets, along the

midribs of both pinnæ and segments; sori oblong, one to each areole, and sunk in shallow cavities in the frond, which cavities are covered by the lid-like indusia.

W. Virginica is but very slightly variable and possesses no economic value. A specimen from Stony Lake, Ont., from the greater laxity of its parts, is more delicate in appearance than usual, and has the pinnules obliquely triangular, about as broad as long, acutish, and almost entire.

This is rather a rare plant and one not known to range west of Lake Huron. North West Arm and Dartmouth, Halifax Co., N. S.—*Rev. E. H. Ball*. Roadside between Caledonia and Liverpool, Queen's Co., and between Liverpool and Jordan River, Shelbourne Co., N. S.—*P. Jack*. Near Gaspé Basin, Que.—*M. J. Eden*. Near Heck's Mills, ten miles from Prescott, Augusta Tp., Ont.—*B. Billings*. Peat swamps of the Mer Bleu near Ottawa, Ont.—*J. Fletcher*. Along the Canada Atlantic Railway, near Eastmann's Springs, Russell Co., Ont.; very abundant five miles north of Colborne village, Ont.; common in marshes at west end of Gull Lake, Addington Co., Ont.—*Macoun*. Near Millgrove, Wentworth Co., Ont.—*Logie*. Lake Island, Lake Joseph, Muskoka, Ont.—*Burgess*.

Genus X.—ASPLENIUM, L., SPLEENWORT.

§ Indusia straight or nearly so, attached to the upper side of the vein, rarely a few of them double.

* Fronds once pinnate.

† Small ferns with a green rachis.

1.—*A. VIRIDE*, *Hudson*, (Green Spleenwort), *Swartz*, *Syn. Fil.*, 80. *Hook.*, *Fl. Bor.-Am.*, II, 262. *Hook. and Baker*, *Syn. Fil.*, 195. *Lawson*, *Can. Nat.*, I, 275. *Macoun's Cat.*, No. 2294. *Fowler's N. B. Cat.*, No. 748. *Goode*, *Can. Nat.*, IX, 300. *Eaton*, *Ferns of N. A.*, I, 275. *Underwood*, *Our Nat. Ferns*, etc., 98.

A. Trichomanes, L.

A. intermedium, Presl.

The Green Spleenwort is a delicately herbaceous, though evergreen, little fern, from 2½ to 10 inches high, growing in tufts in the clefts of shaded rocks. Rootstock short, creeping, and scaly; stalks slender, naked, reddish-brown at the base, but soon changing into a green which is continued through the rachis; fronds 1½ to 6 inches long by about ½ inch wide, linear-lanceolate in outline, and pinnate; pinnæ short-stalked, roundish-ovate or rhomboidal, more or less cuneate at the base, entire on the lower margin, crenate or incised on the outsides; sori few and approximate to the midvein; indusia very delicate.

This fern is subject to slight variation in the shape and tothing of the pinnæ, and in England a branched form, var. *multifidum*, Moore, is not infrequent in places. Specimens from near St. John, N. B., agree with, except that they are even more robust than, var. *robustum* of J. B. Goode in *Can. Nat.*, Vol. IX, p. 300; but except for their sturdiness seem in no way specially noteworthy. Other specimens from the same locality show fronds with the pinnæ remarkably distant.

The range of this species westward is given by Eaton as New Brunswick to the Rocky Mountains and British Columbia, while northward in the Rocky Mountains, according to Drummond, it extends to Lat. 56°. Very rare, *Tytagouche Falls*, Gloucester

Co., and Green Head, St. John Co., N. B.—*Fowler*. Becoming common about St. John, N. B., in moist shady clefts of limestone rocks.—*G. U. Hay*. Near Tadousac and at the Falls of Rivière du Loup, Que.—*D. A. Watt*. In a deep gorge on the road from Gaspé Basin to Fox River, and near Grand Etang, Que.; on sea cliffs at Mont Louis and at the Falls of Ste. Anne des Monts River, Que.; base of Mount Albert, Que.; between Owen Sound and Sydenham Falls, Ont., and on both sides of the Falls on the perpendicular sides of narrow rents in the heavily bedded limestone, the crevices often not more than two feet wide although fifty feet deep; abundant on debris under limestone cliffs within the Bow River Pass, Rocky Mountains, N.W.T.; on a limestone mountain, in Peace River Pass, Rocky Mountains, Lat. 56°.—*Macoun*.

† † Small ferns with a dark rachis.

2.—*A. TRICHOMANES*, L., (Maidenhair-Spleenwort, Dwarf-Spleenwort), Mx., Fl. Bor.-Am., II, 264. Swartz, Syn. Fil., 80. Gray, Man., 661. Hook. and Baker, Syn. Fil., 196. Provancher, Flor. Can., 715. Lawson, Can. Nat., I, 274. Macoun's Cat., No. 2295. Ball, Trans. N. S. Inst. Nat. Sci., IV, 150. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., I, 271. Underwood, Our Nat. Ferns, etc., 98.

A. melanocaulon, Willd. Pursh, II, 666.

This fern, which grows in the crevices of generally shaded and moist rocks, is an evergreen, and varies from 3 to 9 inches in height. Rootstock short and scaly; stalks densely clustered, shining and black, which colour is continued through the rachis; fronds 2 to 7 inches long by about a third of an inch, or rather more, wide, linear in outline, somewhat rigid, and pinnate; pinnæ numerous, almost sessile, roundish-oval or oblong, obliquely wedge truncate at the base, entire or crenate, and articulated to the rachis, which persists long after they have fallen off; sori few and rather distant from the midvein; indusia delicate.

Like *A. viride*, this plant is somewhat variable in the characters of its pinnæ, which in var. *delicatulum* of Lawson in Can. Nat., Vol. I, p. 274, are small and distant, while in var. *incisum*, Moore, which has been collected in Vermont and may be looked for in Eastern Canada, they are incisedly lobed with the lobes often crenate or serrate. The latter variety is the common form in California. Specimens with forking fronds are sometimes found.

The leaves of *A. Trichomanes*, which are slightly mucilaginous and astringent, have been used to prepare pectorals for chronic coughs, and as a substitute for *Adiantum Capillus-Veneris* in the making of "*Sirop de Capillaire*."

This species may be said to be nowhere abundant with us, though generally distributed from the Atlantic to the Pacific. Hartley Water-fall, Pirate Harbour, Strait of Canso, and on Gold River, near Chester, Lunenburg, N. S.—*Rev. E. H. Ball*. The "Look-Out," Cape Blomidon, N. S.—*Lawson*. Near Three-mile House, Halifax, N. S.—*Sommers*. Montreal, Que.—*Maclagan*. Chatham Tp., Argenteuil Co., Que.—*D. R. McCord*. Jupiter River, Island of Anticosti, Que.; Mont Louis and up the Ste. Anne des Monts River, Gaspé, Que.; Shannonville, near Belleville, Ont.; crevices of Laurentian rocks in the northern parts of Peterborough and Victoria Cos., Ont.; Red Rock, Lake Superior, and westward to the Lake of the Woods; Clearwater River, near Methy Portage, N.W.T., Lat. 57°; along Peace River, within the Rocky Mountains, and in Bow River Pass, Rocky Mountains.—*Macoun*. Great Shuswap Lake and Cascade Mountains, near Yale, B.C.—

G. M. Dawson. Ottawa, Ont.—*J. Fletcher.* Lake Medad, near Hamilton, Ont.—*Logie.* Rocks just below the Falls and near the Whirlpool, Niagara River, Ont.—*Burgess.* East coast of Hudson Bay—*R. Bell.*

3.—*A. EBENEUM*, *Ait.*, (Ebony-Spleenwort), Swartz, Syn. Fil., 79. Torrey, Fl. N. Y., II, 492. Gray, Man., 661. Provancher, Flor. Can., 716. Lawson, Can. Nat., I, 276. Macoun's Cat., No. 2297. Eaton, Ferns of N. A., I, 21. Underwood, Our Nat. Ferns, etc., 98.

A. polypodioides, Swartz, Syn. Fil., 79.

A. trichomanoides, Michx., Fl. Bor.-Am., II, 265.

Acrostichum platyneuron, L.

A slender, elegant, evergreen little plant, 6 to 20 inches high, growing on shaded rocks, or in open rocky woods. Rootstock short, creeping, covered with old stalk-bases; stalks short, dark brown or almost black, and polished, as is the rachis; fronds smooth, erect, $\frac{1}{2}$ to $1\frac{1}{2}$ inches broad, linear-lanceolate in outline, and pinnate; pinnæ numerous, sessile, mostly alternate, serrate, oblong or lanceolate (often somewhat scythe shaped), dilated or auricled usually on the upper but sometimes on both sides of the base, and horizontal, or the lower gradually becoming shorter and deflexed; sori numerous and approximate to the midvein; indusia very delicate.

In this spleenwort, also, forking fronds, as well as slight variations in the shape and toothing of the pinnæ, are at times met with, and a form with large fronds and incised pinnæ is var. *serratum*, Miller.

The number of localities known in Canada for this fern are but few and confined to the Province of Ontario. Rocky woods, Brockville, Ont.—*B. Billings.* Crevices of Laurentian rocks a little to the north of Shamonville Station on the Grand Trunk Railway, nine miles east of Belleville, Ont.; Gibson Mountain, a mass of metamorphic rock, four miles south of Belleville, Prince Edward Co., Ont.—*Macoun.* Point Albino, Lake Erie, Ont.—*D. F. Day.*

† † † Tall ferns with a green rachis and linear-lanceolate, acute pinnæ.

4.—*A. ANGUSTIFOLIUM*, *Mx.*, (Narrow-leaved Spleenwort, Swamp-Spleenwort), Swartz, Syn. Fil., 76. Pursh, II, 666. Gray, Man., 662. Lawson, Can. Nat., I, 275. Macoun's Cat., No. 2298. Eaton, Ferns of N. A., II, 73. Underwood, Our Nat. Ferns, etc., 99.

A. pycnocarpon, Spreng.

This fern is found in low, rich woods, commonly varying from $\frac{1}{2}$ to 3 feet high. The barren and fertile fronds are somewhat unlike and are very sensitive to frost. Rootstock smooth, creeping, and covered with old stalk-bases; stalks erect, smooth, green when fresh but brownish when dry, and dark coloured like the rootstock close to the base; fronds 1 to 2 feet long by 4 to 8 inches wide, lanceolate or lanceolate-oblong in outline, sometimes much contracted at the base, smooth, and pinnate; pinnæ numerous, short-stalked, linear-lanceolate, acuminate, and entire or crenulate, those of the fertile fronds, which are taller than the sterile, being narrower and rounded instead of subcordate at the base as in the sterile; sori crowded, slightly curved, linear, and placed obliquely to the midrib; indusia firm.

Little variation is seen in this species, but occasionally the pinnæ are slightly serrate

instead of crenulate, and cases where the fronds are forked at the summit are not very uncommon. Fronds sterile in general appearance are frequently found bearing a few fruit-dots on some of the pinnæ

The Swamp-Spleenwort, which in Canada is limited in its distribution to Quebec and Ontario, is rare in the former Province, but very common in the south-western part of the latter. Nun's Island, Montreal, Que.—*S. H. Parsons*. Open woods, the Mountain, Montreal, Que.—*D. R. McCord*. Abundant in McKay's Woods, Ottawa, Ont.; frequent in rich woods in Ameliasburg, Prince Edward Co., and in rich soil in low woods along Cold Creek, Brighton, Northumberland Co., Ont.; very common in woods west of Collingwood and around Owen Sound, Ont.—*Macoun*. Low woods up the Don Valley, Toronto; cedar swamps and rich woods, London, Ont.—*Burgess*. Rich woods, Amherstburg, Ont.—*Maclagan*.

* * Fronds more than once pinnate or pinnatifid.

5.—*A. THELYPTEROIDES*, *Mx.*, (Silvery-Spleenwort), Swartz, Syn. Fil., 82. Pursh, II, 667, Gray, Man., 662. Hook. and Baker, Syn. Fil., 226. Provancher, Flor. Can., 716. Lawson, Can. Nat., I, 276. Macoun's Cat., No. 2299. Fowler's N. B. Cat., No. 749. Ball, Trans. N. S. Inst. Nat. Sci., IV, 150. Eaton, Ferns of N. A., II, 33. Underwood, Our Nat. Ferns, etc., 100.

A. acrostichoides, Swartz, Syn. Fil., 82.

Athyrium thelypteroides, Desv., Watt, Can. Nat., IV, 363.

Diplazium thelypteroides, Presl.

It is a rather pale-green, handsome, non-evergreen fern, commonly $1\frac{1}{2}$ to $3\frac{1}{2}$ feet high, growing in deep, rich woods. Rootstock smooth, creeping, covered with old stalk-bases, and very like that of *A. angustifolium*; stalks erect, tufted, chaffy when young, but smooth or nearly so when mature; fronds 1 to $2\frac{1}{2}$ feet long by 6 to 10 inches wide, lanceolate or lanceolate-oblong in general outline, sometimes much contracted at the base, often somewhat hairy on the veins, and pinnate; pinnæ linear-lanceolate from an almost sessile base, acuminate, and deeply pinnatifid; segments oblong, obtuse, and minutely toothed, the teeth often obscured by the edges having a tendency to turn under; sori crowded, oblong, slightly curved, the lowest one of a segment often double; indusia firm, and, when young, shining and silvery, giving from their abundance the same general hue to the whole under surface of the frond.

As a rule this fern is not variable, but a form occurs in which the segments are crowded and deeply serrated, var. *serratum*, Lawson, Can. Nat., Vol. I, p. 277.

It is not a very common species eastward, but is very abundant in most sections of Ontario, and finds its present known western limit about Current River, Lake Superior. Windsor, N. S.—*How*. Halifax, N. S.—*Dr. Lindsay*. Mt. Dalhousie, N. S.—*A. H. McKay*. Strait of Canso; Boylston, Guysborough Co.; and Rawdon, Hants Co., N. S.—*Rev. E. H. Ball*. Wentworth Station, Cumberland Co., and North Mountains, Kings Co., N. S.—*P. Jack*. Scarce in New Brunswick.—*Fowler*. Near Grand Falls and at Woodstock, N. B.—*P. Jack*. Quebec, Que.—*Hon. Wm. Sheppard*. Montreal, Waterloo, Lennoxville, and in Argenteuil Co., Que.—*D. R. McCord*. Richmond and Drummond Cos., Que.—*J. A. Bothwell*. Very common in Ontario.—*Macoun, Logie, Burgess*, etc. Along the Canada Pacific

Railway, north of Lakes Huron and Superior, Ont.—*J. Fletcher*. Current River, Lake Superior.—*Macoun*.

§ § Indusia curved, often crossing the veins, and attached to both sides of them.

6.—*A. FILIX-FŒMINA*, *Bernh.*, (Lady-Fern, Common Spleenwort, Female-Fern), *Gray*, *Man.*, 662. *Hook. and Baker*, *Syn. Fil.*, 227. *Provancher*, *Flor. Can.*, 716. *Macoun's Cat.*, No. 2279. *Fowler's N. B. Cat.*, No. 750. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 150. *Eaton*, *Ferns of N. A.*, II, 225. *Underwood*, *Our Nat. Ferns*, etc., 100.

A. athyrium, *Spreng.*

Polypodium Filix-foemina, *L.*

Athyrium Filix-foemina, *Roth.*, *Lawson*, *Can. Nat.*, I, 277. *Watt*, *Can. Nat.*, IV, 363.

Athyrium asplenioides, *Desv.*

Aspidium Filix-foemina, *Swartz*, *Linn. Fl.*, 59

Aspidium asplenioides, *Swartz*, ^{*Syn. Fil.*, 86} *Pursh*, II, 664.

Nephrodium Filix-foemina, *Mx.*, *Fl. Bor.-Am.*, II, 268.

Nephrodium asplenioides, *Mx.*, *Fl. Bor.-Am.*, II, 268.

The Lady-Fern is a common and most polymorphous non-evergreen species, which grows in dense tufts in moist fields and woods, where it reaches a height of 1½ to 4 feet. Rootstock resembles those of *Asplenium angustifolium* and *thelypteroides* in being creeping and covered with old stalk-bases, but is stouter; stalks smooth, erect, slightly chaffy at the base, green or almost red in the fresh plant, but stramineous or brown when dried; fronds light-green, broadly oblong-ovate in outline, 1 to 3 feet long by 6 to 12 inches wide, occasionally much narrowed at the base, bipinnate; pinnæ numerous, short-stalked, and lanceolate; pinnules oblong-lanceolate, pointed, more or less pinnately incised or serrate, and distinct or confluent on the narrowly winged secondary rachis; sori short, placed near the midvein, at length confluent over nearly the whole under surface of the fronds, to which they give a dark brown colour; indusia almost straight or variously curved, delicate, and usually lacerate-ciliate.

Probably no other fern is more variable than this, Mr. Moore having described nearly seventy varieties as occurring in Great Britain, all of which there is no reason should not be found with us, as indeed many of them have been. The following are the leading forms: *Var. angustum*, which is so distinct as to have merited description as a species being alone retained as a good variety. *Var. exilè*, *D. C. Eaton*, is a depauperate form, with fronds only 3 to 6 inches long, and pinnate, with the pinnæ deeply cut into segments, which are few toothed at the ends. *Var. latifolium*, *Hook.*, has oblong-lanceolate, nearly bipinnate fronds, 2 to 3 feet long, having the pinnæ oblong-linear with a narrowly-winged secondary rachis, and pinnules broadly ovate, foliaceous, obtuse, and often doubly serrate. *Var. cyclosorum*, *Ruprecht*, has the fronds very large, often five feet high, and bipinnate; the long pinnules pinnatifid almost to their midvein; sori roundish, and indusium very short. *Var. molle*, *Moore*, is small, with ovate-lanceolate, almost bi-pinnate fronds, the lower pair of pinnæ distant, and the sori distinct. *Var. laciniatum*, *Lowe*, has small fronds and irregular lacinated segments. *Var. rigidum*, *Lawson*, has small, rigid fronds and the sori confined to the lower part of each pinnule, while *var. cristatum*, *Wolleston*, has multifid apices of fronds and pinnæ.

Var. *angustum*, D. C. Eaton, (*Aspidium angustum*, Willd., *Asplenium Filix-foemina* var. *Michauxii*, Mett.), has narrow, rigid, nearly bipinnate fronds, 1 to 3 feet long, with the pinnæ narrow and obliquely ascending or curved upward; pinnules crenate or serrate, and sori short and abundant. Var. *rhoeticum*, of the Davenport Catalogue, and of Lawson, in the "Canadian Naturalist," is covered by this form.

The rootstock of *A. Filix-foemina* possesses anthelmintic properties similar to those of the Male-fern, but in a somewhat lessened degree.

This is one of our most widely diffused ferns, being common in most parts of British America, from the Atlantic to northern British Columbia. In the northern woods it is particularly luxuriant, and does not produce the contracted forms seen at the south, where the atmosphere is less charged with moisture. Quite common and widely distributed throughout Nova Scotia.—*Rev. E. H. Ball*. A very common and variable fern in New Brunswick.—*Fowler*. Very common in Quebec and Ontario.—*Lawson, McCord, Macoun*, etc. Common in wooded parts of Manitoba and the Northwest Territory, in the Rocky Mountains and in British Columbia.—*Macoun*. Throughout Canada to the Saskatchewan and Alpine woods of the Rocky Mountains.—*Drummond*. The var. *angustum*, though less common, is not extremely rare, especially in Ontario. Salt Mountain, Whycocomagh, N. S.—*Macoun* and *Burgess*. Farmersville and Delta, Ont.—*Lawson*. Ottawa, Ont.—*J. Fletcher*. Belleville, Ont.—*Macoun*. London, Ont.—*Burgess*.

[NOTE.—The crediting of *Asplenium marinum*, L., to New Brunswick, in Hooker's "Flora Boreali-Americana," on the authority of E. N. Kendall, is now known to have been a mistake, and by Eaton, in "Ferns of North America," it is excluded as a North American species.]

Genus XI.—SCOLOPENDRIUM, *Smith*, HART'S-TONGUE.

1.—*S. VULGARE*, *Smith*, (Common Hart's-Tongue, Caterpillar-Fern), *Gray*, *Man.*, 662. *Hook. and Baker*, *Syn. Fil.*, 246. *Lawson*, *Can. Nat.*, I, 278. *Macoun's Cat.*, No. 2319. *Eaton*, *Ferns of N. A.*, I, 247. *Underwood*, *Our Nat. Ferns*, etc., 100.

S. officinarum, *Swartz*, ^{*Can. Fil.*, 87.} *Pursh*, II, 667.

Asplenium scolopendrium, L.

An evergreen and rare American fern, 7 to 24 inches high, found growing in tufts in wet, shaded ravines on the debris of limestone rocks. Rootstock chaffy, short and erect, or long and inclined, with adherent stalks, which are also very chaffy; fronds bright-green, supported on usually short stalks, 6 to 18 inches long by $\frac{3}{4}$ to 2 inches wide, oblong-ligulate in outline, from an auricled heart-shaped base, simple with entire or undulate margins, obtuse or acute at the apex; sori linear, placed almost at right angles to the mid-vein, in pairs, side by side, one on the lower side of one veinlet, the other on the upper side of the next veinlet below, thus appearing to have a double indusium opening along the middle.

Variations in this fern are very common in Europe, but none of them, with the exception of forking fronds; an approach to var. *multifidum*, *Moore*, have, so far as known, been found within our limits.

The leaves of *S. vulgare* have been employed as astringents in hemorrhages and fluxes, as solvents for renal calculi and as applications to burns, but their properties are feeble, and they have fallen into disuse.

One of the rarest of American ferns, being found in the United States only in central New York and Tennessee, and in Canada at two widely separated points in New Brunswick and Ontario. Very rare, near Woodstock, N. B., 1881.—*Jas. Sutton*. Abundant on debris under the cliffs at Sydenham Falls and other localities around Owen Sound, Ont.—*Mrs. Roy*.

Genus XII.—CAMPTOSORUS, *Link*, WALKING-LEAF.

1.—*C. RHIZOPHYLLUS*, *Link*, (Common Walking-Leaf), Gray, Man., 663. Lawson, Can. Nat., I, 279. Macoun's Cat., No. 2391. Eaton, Ferns of N. A., I, 55. Underwood, Our Nat. Ferns, etc., 100.

Asplenium rhizophyllum, L., Provancher, Flor. Can., 715.

Scolopendrium rhizophyllum, Hook.

Antigramma rhizophylla, J. Smith.

An evergreen species, 5 to 17 inches high, growing in tufts on shaded, mossy limestone, rarely sandstone or granitic, rocks. Rootstock short, creeping, and covered with old stalk-bases; stalks slender, herbaceous, dark brown near the base but green above, and narrowly winged; fronds leathery, smooth, decumbent, lanceolate from a cordate and auricled or hastate base, tapering above into a long and very slender prolongation, which often roots and gives rise to new fronds, and these in turn to others, so that two or three generations may be connected together; in size they measure from 4 to 12 inches long by $\frac{1}{2}$ to 1 inch wide just above the auricles, and their margins are entire or undulate; veins with free apices along the margins of the fronds, are reticulated near the midrib, and have the linear sori variously situated on either side of them.

The variation in this fern is considerable, especially as regards the size and shape of the auricles, which are sometimes almost absent, at others prolonged to the extent of even several inches, occasionally rooting at their tips, and yet again so separated from the base of the frond as to make it appear three-cleft. Forking fronds are not rare, the bifurcation generally taking place at the tip, but sometimes from near the auricles. Mr. Arthur, in the 'Botanical Gazette,' Vol. VIII, p. 199, has described a form which he calls var. *intermedium*. It is distinguished by the absence in the stipe of a thread of dark sclerenchyma characteristic of the normal form, while the fronds, which are thinner and narrower and have acute bases without proper auricles, are more simply veined. Specimens much resembling this form have been found by Mr. Fletcher at Ottawa, Ont. Fronds with irregularly incised margins have also been noticed from time to time.

Except in a few localities in Ontario, rather a rare Canadian fern. Sorel, Que.—*Lady Dalhousie*. Montreal Mountain, Que.—*Provancher*. L'Abord-à-Plouffe, on the River Jesus, rear of the Island of Montreal, Que.—*D. R. McCord*. Isolated rocks in a shady pasture, Hemmingford, Que.—*J. B. Goode*. Limestone rocks, west of Hull, and in a ravine near King's Mere, Chelsea, Que.—*J. Fletcher*. Rocky woods a mile north-west of Oxford Station, on the Ottawa & Prescott Railroad, Ont.—*B. Billings*. Crevices of limestone rocks at the railway bridge, Shannonville, and on boulders beyond the Big Spring, on the Marmora Road, Hastings Co., Ont.; very abundant on broken masses of rocks at Foster's Flats, below the Whirlpool, Niagara Falls, Ont.; in great profusion at Owen Sound, Ont., on boulders and ledges under the cliffs on both sides of the Bay, and at Sydenham Falls.—

Macoun. Mountain side west from Hamilton, Ont.; also at Ancaster and Lake Medad.—*Judge Logie*. Canada (*Goldie*), to the Saskatchewan (*Drummond*), in Hook., Fl. Bor.-Am.

Genus XIII.—PHEGOPTERIS, *Fee*, BEECH-FERN.

* Fronds triangular; rachis winged.

1.—*P. POLYPODIOIDES*, *Fee*, (Common Beech-Fern, Beech-Polypod, Mountain Polypod), *Gray*, Man., 663. *Macoun's* Cat., No. 2302. *Fowler's* N. B. Cat., No. 751. *Ball*, Trans. N. S. Inst. Nat. Sci., IV, 150. *Eaton*, Ferns of N. A., II, 217. *Underwood*, Our Nat. Ferns, etc., 101.

Ph. vulgaris, *Mett.*

Ph. connectile, *Watt*, Can. Nat., IV, 363.

Polypodium Phegopteris, *L.*, *Swartz*, Syn. Fil., 40. *Hook.*, Fl. Bor.-Am., II, 208. *Provancher*, Flor. Can., 713. *Lawson*, Can. Nat., I, 269. *Hook. and Baker*, Syn. Fil., 308.

Polypodium connectile, *Mx.*, Fl. Bor.-Am., II, 271. *Pursh*, II, 659.

Polystichum Phegopteris, *Roth.*

A non-evergreen plant, from 6 to 20 inches high, found in damp, especially rocky, woods and on hillsides, seeming most at home in an atmosphere surcharged with moisture. Rootstock slender and extensively creeping; stalks usually longer than the fronds, slender, erect, darkened close to the base but green above, stramineous when dry, and somewhat hairy, especially toward the top; fronds acuminate, longer than broad (3 to 8 by 2 to 6 inches) pinnatifid, hairy on both surfaces, but especially beneath, with scattered scales intermixed; pinnæ sessile, linear-lanceolate, acuminate, deeply pinnatifid, the lowest pair separated from the others and turned obliquely downward and forward; ultimate segments oblong, obtuse, entire or crenulate, the basal ones decurrent and adnate to the main rachis, on which they form irregular wings; sori borne near the margin of the segments.

This seems to be one of the least variable of our ferns. The apices of the fronds or some of the pinnæ are occasionally forked, and specimens are seen remarkably pubescent and scaly along the midribs.

The Beech-Polypod is commonest in the Eastern Provinces, whence it ranges to west of Lake Superior, and, according to *Richardson*, to the Saskatchewan, appearing again in the Rocky Mountains. It is also known in places to extend high northward, being found in Greenland south of the Arctic Circle, and on the west coast in Alaska and Unalaska. Common and generally distributed throughout Nova Scotia.—*Rev. E. H. Ball*. Common in New Brunswick.—*Fowler*. Common in Quebec.—*D'Urban*, *Brunet*, *Thomas*, *Bothwell*, etc. Very luxuriant on the Island of Anticosti and shore of the lower St. Lawrence, Que.; abundant around Lake Superior, but uncommon about Lake Nipigon, Ont.; along Lake Manitoba and the Porcupine Mountains, Man., but rather scarce.—*Macoun*. Not common in Eastern Ontario, and in the south-western peninsula seems to be replaced by *P. hexagonoptera*.—*Macoun* and *Burgess*. Prescott, Grenville Co., and Osgoode Station, Russell Co., Ont.—*B. Billings*. Ottawa, Ont., and along the Canada Pacific Railway north of Lakes Huron and Superior.—*J. Fletcher*. Near the sources of the Columbia on Portage River, Rocky Mountains, Lat. 52°.—*Drummond*.

2.—*P. HEXAGONOPTERA*, *Fee*, (Hexagon Beech-Fern), Gray, Man., 663. Macoun's Cat., No. 2304. Eaton, Ferns of N. A., II, 147. Underwood, Our Nat. Ferns, etc., 101.

Polypodium hexagonopterum, Mx., Fl. Bor.-Am., II, 271. Pursh, II, 659. Swartz, Syn. Fil., 40. Lawson, Can. Nat., I, 268. Hook. and Baker, Syn. Fil., 309.

Polypodium Phegopteris, var. *majus*, Hook.

This species, which often closely resembles *P. polypodioides*, is non-evergreen, grows from 1 to 2½ feet high, and inhabits rich, open woods. Rootstock slender, extensively creeping, the newer part moderately chaffy; stalks usually exceeding the fronds, slender, erect, scattered, dark-coloured and scaly close to the base but green and naked above, pale straw-colour when dry; fronds acuminate, 5 to 12 inches long and as broad or broader, pinnatifid, slightly hairy on both surfaces, often finely glandular beneath, where also are a few scales along the midveins; pinnæ sessile, lanceolate, acuminate, and deeply pinnatifid, the lowest pair in living plants turned obliquely forward but not deflexed; ultimate segments oblong and obtuse, the middle ones of the lower pinnæ elongated (often much so) and lobed, the rest entire or crenate, while the basal ones are decurrent and adnate to the main rachis, the polygonal wings of which they form; some of the sori usually remote from the margin of the segments.

Non-typical specimens of this fern are often very difficult to separate from *P. polypodioides*. As a rule it is more southern in its range, is much larger, and has somewhat thicker and more chaffy rootstocks, while its fronds, which are thinner, usually less hairy and scaly, and nearly always as broad as or broader than long, have the lower pair of pinnæ longer and broader than the pair next above. The lower pinnæ too are much broader in the middle than at the base, and the segments are more toothed.

The variations of this species seem to be confined to forking of the fronds and pinnæ, and a greater or less amount of pubescence. Occasionally specimens are seen with the wing interrupted between the first and second pairs of pinnæ.

Rare in Quebec and Eastern Ontario, but fairly abundant in parts of Central Ontario. Quebec, Que.—*Hon. Wm. Sheppard*. Waterloo and Sorel, Que.—*Lady Dalhousie*. Nun's Island, Montreal, Que.—*S. H. Parsons*. Mirwin's Woods, near Prescott, Ont., rare.—*B. Billings*. Amongst boulders in a piece of rocky woods two miles from Campbellford, Northumberland Co., Ont.; thickets and hillsides, Port Stanley, Lake Erie, Ont.—*Macoun*. Chippewa, Ont.—*Maclagan*. Rich woods, London, St. Thomas and Windsor, Ont.—*Burgess*. Parry Sound, Muskoka District, Ont.—*Judge Logie*.

** Fronds triangular but ternate with the three divisions stalked; rachis wingless.

3.—*P. DRYOPTERIS*, *Fee*, (Oak-Fern, Ternate-Polypod), Gray, Man., 663. Macoun's Cat., No. 2303. Fowler's N. B. Cat., No. 752. Ball, Trans. N. S. Inst. Nat. Sci., IV, 150. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., I, 157. Underwood, Our Nat. Ferns, etc., 101.

Polypodium Dryopteris, L., Swartz, Syn. Fil., 41. Hook. and Baker, Syn. Fil., 309. Provancher, Flor. Can., 713. Lawson, Can. Nat., I, 269.

Polypodium calcareum, Pursh, II, 659.

Nephrodium Dryopteris, Mx., Fl. Bor.-Am., II, 270.

Polystichum Dryopteris, Roth.

The Oak-Fern is a beautiful, non-evergreen plant, growing from 6 to 24 inches high,

in dry or rocky woods. Rootstock very slender, widely creeping, slightly chaffy on its newer parts and especially toward the advancing end, giving off but few rootlets; stalks usually exceeding the fronds and sometimes very much so, scattered, erect, very slender, brittle, dark-colored and chaffy near the base but smooth and green above, stramineous when dry; fronds light green, very thin and delicate in texture, smooth, 3 to 12 inches long by about the same or even a little greater breadth, ternate into stalked, widely spreading, triangular, pinnate divisions; middle division the broadest and symmetrical, while the lateral have the pinnæ on the lower side the longest, often very markedly so; pinnæ sessile and pinnatifid, or even on the middle division bi-pinnatifid; ultimate segments entire or toothed; sori near the margin.

Like the rest of the genus, *P. Dryopteris* is subject to but little variation. Stouter, taller, and more rigid forms, which are not uncommon, are described as var. *erectum* by Lawson in Can. Nat., Vol. I, p. 269.

Common in all or nearly all rocky woodlands from Nova Scotia to British Columbia, and extending northward to the Arctic Circle. Not one of the commonest ferns, but to be met with in most localities in Nova Scotia.—*Rev. E. H. Ball*. Common in New Brunswick.—*Fowler*. Common in Quebec.—*MacLagan, D'Urban, Provancher, Macoun*, etc. Common in rocky parts of Ontario.—*Billings, Macoun, Burgess*, etc. Along the Canada Pacific Railway north of Lakes Huron and Superior.—*J. Fletcher*. Common along Lakes Manitoba and Winnipegosis, and in the Riding, Duck, and Porcupine Mountains, Man.; Rocky Mountains, specimens over 12 inches wide.—*Macoun*. Echimamish River to Oxford House, N. W. Ter.—*R. Bell*. Rocky Mountains and Great Bear Lake, lat. 66°.—*Hook.*, in Fl. Br.-Am. British Columbia.—*G. M. Dawson*.

4.—*P. CALCAREA*, *Fee*, (Limestone Beech-Fern, Limestone Polypod), Eaton, Ferns of N. A., II, 277. Underwood, Our Nat. Ferns, etc., 102.

Ph. Robertiana, A. Braun.

Ph. Dryopteris, *Fee*, var. *Robertianum*, Davenport.

Polypodium Robertianum, Hoff., Lawson, Can. Nat., I, 270.

Polypodium calcareum, Smith.

Polypodium Dryopteris, var. *calcareum*, Gray, Man., ed. 2nd, 590.

This, being a more rigid, is a somewhat less graceful plant than *P. Dryopteris*. It is a non-evergreen species, from 10 to 20 inches high, found growing on limestone rocks. Rootstock slender, widely creeping, slightly chaffy especially at and toward the advancing end; stalks scattered, slender, glandular, chaffy and darkened near the base; fronds herbaceous but rigid, minutely glandular, 4 to 8 inches long by nearly the same width, ternate into stalked, pinnate divisions, the lateral of which have the inferior pinnæ somewhat longer than the superior; pinnæ sessile and pinnately lobed or divided; ultimate segments oblong, obtuse, crenately toothed, or, in very large specimens, again lobed; sori copious and submarginal.

This fern is closely related to *P. Dryopteris*, but is distinguished by its glandular stalks and fronds, its greater rigidity, and by its having smaller inferior pinnæ on its lateral divisions.

Though long attributed to America, the Limestone Polypod was not clearly known as a native until a few years ago, when it was collected on slaty rocks in eastern Minne-

sota. Abundant on ledges of limestone about two miles up the left bank of the Beesie River, Island of Anticosti, Que., very typical specimens, 1883.—*Macoun*. Recorded by Mr. McCord in *Can. Nat.*, Vol. I, p. 355, as found at Sorel, Que., by Lady Dalhousie. Lake of the Woods, Manitoba, collected by G. M. Dawson in 1873, but catalogued as *P. Dryopteris*. About one hundred miles north-east of Lake of the Woods, near Lonely Lake, (Lake Seul), Ont.—*R. Bell*.

[NOTE.—This fern has been placed as a distinct species in deference to the opinions of Milde, Eaton and other distinguished pteridologists, but from personal observation of the typical plant, as well as a number of specimens which seem to connect it with *P. Dryopteris*, one is led to the same opinion as that expressed by Mr. Davenport, who, agreeing with Hooker and Baker, ranks it, in the supplement to the Davenport Herbarium Catalogue, only as a variety (*Robertianum*) of *Dryopteris*.]

* * * Fronds oblong-lanceolate; rachis not winged.

5.—*P. ALPESTRIS*, *Mett.*, (Alpine Beech-Fern), *Eaton, Ferns of N. A.*, I, 171. Underwood, *Our Nat. Ferns*, etc., 101.

Polypodium alpestre, Hoppe, *Hook. and Baker, Syn. Fil.*, 311.

Polypodium rhoeticum, L.

Aspidium alpestre, Swartz, *Syn. Fil.*, 421.

Aspidium rhoeticum, Swartz, *Syn. Fil.*, 59.

Asplenium alpestre, *Mett.*

This species differs greatly from the rest of its genus, and has a strong general resemblance to *Asplenium Filix-foemina*, from which, however, it is easily distinguished by the absence of indusia. It is non-evergreen, and grows in tufts, reaching a height of 16 to 34 inches. Rootstock short, erect or oblique, thickened with old stalk-bases; stalks 4 to 10 inches long, black and slightly chaffy at the base but pale brown and smooth above; fronds 1 to 2 feet long by 3 to 6 inches wide, acuminate, membranaceous, smooth, pinnate; pinnæ deltoid-lanceolate in outline, twice parted; pinnules oblong-lanceolate with sharply toothed ultimate segments; sori copious and submarginal.

No Canadian specimens of this plant have been obtainable for examination, but in a list of Kew specimens it is reported as having been found in the Cascade Mountains of British Columbia, about Lat. 49°, by Dr. Lyall.

Genus XIV.—ASPIDIUM, *Swartz*, SHIELD-FERN, WOOD-FERN.

§ Indusium kidney-shaped or round, with a narrow sinus.

* Fronds thinly membranaceous, decaying in autumn; stalks and slender, creeping rootstocks nearly naked. Veins simple or once forked.

1.—*A. NOVEBORACENSE*, *Swz.*, (New York Shield-Fern), ^{*Syn. Fil.*, 55.} *Pursh*, II, 661. *Gray, Man.*, 664. *Macoun's Cat.*, No. 2315. *Fowler's N. B. Cat.*, No. 754. *Ball, Trans. N. S. Inst. Nat. Sci.*, IV, 151. *Eaton, Ferns of N. A.*, I, 49. Underwood, *Our Nat. Ferns*, etc., 104.

A. thelypterioides, *Swartz, Syn. Fil.*, 57.

A. thelypteris, *Hook.*

A. thelypteris, var. *Noveboracense*, *Willd, Provancher, Flor. Can.*, 718.

Lastrea Noveboracensis, Presl, Lawson, Can. Nat., I, 284.

Polystichum Noveboracense, Watt, Can. Nat., IV, 363.

Polypodium Noveboracense, L.

Nephrodium Noveboracense, Desv.

Nephrodium thelypteroides, Mx., Fl. Bor.-Am., II, 267.

Dryopteris Noveboracensis, Gr.

A light green, very delicate fern, withering at the slightest frost, which usually grows in grassy swamps and moist woods or thickets, where it reaches a height of $1\frac{1}{2}$ to $2\frac{1}{2}$ feet. Rootstock rather slender, creeping just beneath the surface of the ground; stalks few, generally approximated, slender, brownish-yellow, naked except when very young, about a third the length of the fronds; fronds erect, lanceolate, tapering both ways from the middle, 1 to 2 feet long by 3 to 6 inches wide, acuminate, ciliate and finely hairy along the midribs and veins, pinnate; pinnæ sessile, lanceolate, acuminate, deeply pinnatifid, the lowest two or more pairs gradually shorter and deflexed until the lowest are often mere auricles; segments flat, oblong, obtuse, entire; veins mostly simple; sori small, distinct, marginal; indusia glandular.

Occasionally specimens present themselves in which the segments are slightly toothed, the basal ones being sometimes enlarged and more deeply divided, while forking fronds are not extremely rare. A var. *suaveolens*, D. C. Eaton, is found in New York, but has not been noticed as yet in Canada. It is sweet scented in drying and has the fronds narrower and more rigid with the under surface sprinkled with minute glands.

This fern is in Canada most common in the Maritime Provinces and finds its western limit in Ontario. Common in swamps and moist places in Nova Scotia.—*Rev. E. H. Ball*. Common in New Brunswick.—*Fowler*. Quebec, Waterloo, Montreal, Que.—*Hon. Wm. Sheppard*. Richmond and Drummond Cos., Que.—*J. A. Bothwell*. Mount Belœil, Que.—*Maclagan*. Ottawa, Ont.—*J. Fletcher*. Prescott, Ont., common.—*B. Billings*. Kingston and Lakefield, Ont.—*Mrs. Traill*. Abundant in pine woods, Seymour, Northumberland Co., Ont.—*Macoun*. Hamilton, Ont.—*Judge Logie*. Toronto, London, Windsor, and Port Cockburn, Muskoka District, Ont.—*Burgess*. Owen Sound, Ont.—*Mrs. Roy*. Gore Bay, Manitoulin Islands, Ont.—*J. Bell*.

2.—A. THELYPTERIS, *Swartz*, (Marsh Shield-Fern, Marsh-Fern, Snuffbox-Fern), Syn. Fil., 50. Gray, Man., 664. Provancher, Flor. Can., 718. Pursh., II, 661. Macoun's Cat., No. 2314. Fowler's N. B. Cat., No. 753. Ball, Trans. N. S. Inst. Nat. Sci., IV, 151. Eaton, Ferns of N. A., I, 233. Underwood, Our Nat. Ferns, etc., 105.

Lastrea Thelypteris, Presl, Lawson, Can. Nat., I, 283.

Acrostichum Thelypteris, L.

Polypodium Thelypteris, L.

Polystichum Thelypteris, Roth., Watt, Can. Nat., IV, 363.

Nephrodium Thelypteris, Desv.

Dryopteris Thelypteris, Gr.

This plant, common in marshes and wet places, but sometimes seen on dry ground, is very like the preceding species, and though more rigid is also very sensitive to frost. It varies in height from $1\frac{1}{2}$ to 4 feet, and has the fertile fronds the tallest and longest

stalked with narrower segments. Rootstock slender, wide-spreading, black; stalks scattered, slender, blackish at the base but brownish-yellow above, naked except when very young, and usually as long as or even longer than the fronds; fronds erect, oblong-lanceolate, but little narrowed at the base, 9 inches to 2 feet long by 3 to 6 inches wide, short pointed, slightly pubescent along the midribs and veins, and pinnate; pinnæ short-stalked, linear-lanceolate, acute or acuminate, mostly horizontal, and deeply pinnatifid; segments oblong-ovate, obtuse, and entire, the fertile ones with their margins revolute often making them appear acute; veins mostly forked; sori small, often confluent, placed midway between the midrib and margin or nearer the midrib; indusia generally naked.

Specimens of the Marsh-Fern are sometimes met with having the lower pinnæ reduced and seemingly intermediate between this species and *A. Noveboracense* the var. *intermedia* of Lawson in Can. Nat., Vol. I, p. 284, and such specimens are often difficult to place. The most obvious distinguishing characters in *A. Noveboracense* are: (1) stalk much shorter than frond; (2) frond acuminate and much contracted at the base; (3) pinnæ closely sessile; (4) lobes flat; (5) veins mostly simple; (6) sori marginal and distinct. The degree of pubescence and thickness of the fronds in this fern are also subject to considerable variation, extremes in the direction of these characters constituting var. *pubescens* of Prof. Lawson, while those in the reverse direction form var. *glabra*. Occasionally plants are found with some of the segments crenate or toothed, and still more rarely fronds are seen which are bipinnate with pinnatifid divisions. Forking fronds, too, are seen in this fern from time to time.

A very common fern in cedar, tamarack, and other swamps, extending, according to Eaton, westward to Lake Winnipeg, which is also probably about its northern limit. Quite common in swamps in Nova Scotia—*Rev. E. H. Ball*. Rather common in wet marshy places in New Brunswick.—*Fowler*. Common in Quebec.—*McCord, Provancher, Maclagan, Parsons*, etc. Abundant in Eastern and Central Ontario.—*Macoun, Fletcher, Billings, Maclagan, Logie, Burgess*, etc. Muskoka and Parry Sound, Ont.—*Burgess*. Near Red River Settlement, Man.—*McTavish*.

* * Fronds firmly membranaceous, often evergreen; stalks and thickened rootstocks chaffy; veins forking freely.

† Fronds large, pinnate with pinnatifid pinnæ; indusia large, thinish, flat, and persistent.

3.—*A. CRISTATUM*, *Swartz*, (Crested Wood-Fern), Syn. Fil., 52. Gray, Man., 665. *Provancher*, Flor. Can., 718. *Macoun's Cat.*, No. 2309. *Fowler's N. B. Cat.*, No. 757. *Ball*, Trans. N. S. Inst. Nat. Sci., IV, 153. *Eaton*, Ferns of N. A., II, 153. *Underwood*, Our Nat. Ferns, etc., 106.

A. Lancastricense, *Spreng*.

Lastrea cristata, *Presl*, *Lawson*, Can. Nat. I, 282.

Polypodium cristatum, *L.*

Polystichum cristatum, *Roth.*, *Watt*, Can. Nat., IV, 363.

Nephrodium cristatum, *Mx.*

A nearly evergreen species found in low woods and swamps, sometimes in dry places, growing from 1 to 3 feet high. The fertile and sterile fronds are somewhat unlike.

the latter as well as their stalks being the shorter and more decidedly evergreen. Rootstock stout, creeping, chaffy, and covered with old stalk-bases; stalks shorter than the fronds, chaffy especially near the base; fronds erect, smooth (or with a little chaff on the rachis), linear-oblong or lanceolate, 9 inches to 2 feet long by 3 to 7 inches wide, and pinnate; pinnæ triangular-oblong or the lowest nearly triangular, mostly very short-stalked, and deeply pinnatifid; pinnules oblong, very obtuse, finely serrate or cut-toothed; sori large, often confluent, placed as near the midvein as the margin; indusia smooth.

Occasionally fronds are seen broadest in the upper third, giving them an oblanceolate appearance; and a form found at London, Ont., differs in having the sori small (about half the size commonly seen) and being less coriaceous in texture.

Var. *Clintonianum*, D. C. Eaton, is distinguished chiefly by its greater size and more numerous pinnæ and segments. Fronds $2\frac{1}{2}$ to 4 feet long by 8 to 12 inches wide; pinnæ oblong-lanceolate, broadest at the base, deeply pinnatifid; segments serrate or cut-toothed, or the basal ones sometimes pinnately lobed; sori near the midvein. This, which is probably the form referred to by D. R. McCord in Can. Nat., Vol. I, p. 358, is sometimes mistaken for *A. Goldianum*, but differs in having the fertile fronds narrower, and all the pinnæ broadest at the base instead of in the middle.

A. cristatum is found in the Eastern Provinces, and passes westward through the wooded country, without a break, to the Rocky Mountains, while northward it is known to extend as far as Great Slave Lake. Common in Nova Scotia.—*Ball* and *McKay*. Not very common in New Brunswick.—*Fowler*. Not uncommon in Quebec.—*D'Urban*, *Provancher*, *J. Bell*, *McCord*, etc. Local but not rare in Ontario.—*Macoun*, *Maclagan*, *Billings*, *Fletcher*, *Burgess*, etc. Porcupine Mountains, Man.—*Macoun*. Saskatchewan, N. W. Ter.—*Richardson*. Lake Winnipeg and Slave River, N. W. Ter.—*Eaton*. Var. *Clintonianum*. A form, probably this, found in Chatham Tp., Argenteuil Co., Que.—*D. R. McCord*. Border of woods, Alva Farm, Knowlton, Que., and Dow's Swamp, Ottawa, Ont.—*J. Fletcher*. Black ash swamps, Belleville, Ont.—*Macoun*. Swamps, London, Ont.—*Burgess*. Owen Sound, Ont.—*Mrs. Roy*.

4.—*A. GOLDIANUM*, *Hook.*, (Goldie's Wood-Fern), *Gray*, *Man.*, 666. *Provancher*, *Flor. Can.*, 718. *Macoun's Cat.*, No. 2317. *Eaton*, *Ferns of N. A.*, I, 305. *Underwood*, *Our Nat. Ferns*, etc., 106.

A. Filix-mas, *Pursh*.

Lastrea Goldiana, *Presl*, *Lawson*, *Can. Nat.*, I, 282.

Nephrodium Goldianum, *Hook.* and *Grev*.

Dryopteris Goldiana, *Gr*.

One of our largest and most stately ferns, growing in low, rich woods and deep, rocky ravines, and varying from $1\frac{1}{2}$ to 4 feet high, or even higher. The fronds stand in a crown, the sterile generally somewhat the smaller, and, though firm in texture, are non-evergreen. Rootstock stout, creeping or ascending, chaffy, and covered with old stalk-bases; stalks stout, shorter than the fronds, green when fresh but straw-colour when dry, and chaffy; fronds erect, broadly ovate or the fertile oblong-ovate in outline, 9 inches to 3 feet long by 6 to 15 inches wide, smooth except for a little chaff on the rachis, bright green above but paler beneath, and pinnate; pinnæ oblong-lanceolate, the lower ones usually broadest in the middle, and very deeply pinnatifid; segments oblong-linear, generally somewhat

scythe-shaped, almost entire, or crenate, or serrate with appressed teeth; sori large, generally distinct, and placed very near the midvein; indusia smooth, often with the sides of the sinus overlapping, thus making them appear round and entire.

This fern presents no marked variations, differences in the degree of serration of the segments alone constituting the vars, *serrata* and *integerrima* of Prof. Lawson, in Can. Nat., Vol. I, p. 283.

Very rare in the extreme eastern part of our territory, and, though found in low, rich woods throughout the greater part of Ontario, as far west as Georgian Bay, it is not at all common even there. Near Woodstock, N. B.—*P. Jack*. Richmond and Drummond Cos., Que.—*J. A. Bothwell*. The Mountain, Montreal, Que.—*D. R. McCord*. Abundant among gneiss rocks near Hamilton's Farm, River Rouge, Que.—*W. S. M. D'Urban*. Nun's Island, Montreal, Que.—*S. H. Parsons*. Ottawa, Ont.—*J. Fletcher*. Farmersville and banks of river to westward of Brockville, Ont., in crevices of Laurentian rocks.—*Lawson*. Woods, Belleville, Castleton and Brighton, Ont.—*Macoun*. Woodstock, Ont.—*Millman*. Rich woods, London, Ont.—*Burgess*. Amherstburgh, Ont.—*Maclagan*.

† † Fronds large, twice pinnate near the base, but the upper pinnules confluent; indusia rather large, firm, convex and persistent.

5.—*A. FILIX-MAS*, Swartz, (Male-Fern), Syn. Fil., 65. Gray, Man., 666. Macoun's Cat., No. 2310. Fowler's N. B. Cat., No. 757a. Ball, Trans. N. S. Inst. Nat. Sci., IV, 153. Goode, Can. Nat., IX, 297. Eaton, Ferns of N. A., I, 311. Underwood, Our Nat. Ferns, etc., 106.

Lastrea Filix-mas, Presl, Lawson, Can. Nat., I, 282.

Polystichum Filix-mas, Roth., Watt, Can. Nat., IV, 363.

Nephrodium Filix-mas, Richard.

Polypodium Filix-mas, L.

Dryopteris Filix-mas, Schott.

A very handsome species, with the fronds rising in a circle to a height of 1 to 4 feet. It is found in rocky woods or on open, rocky hillsides, and, though non-evergreen, stands considerable frost. Rootstock stout, ascending or upright, chaffy, and covered with old stalk-bases; stalks stout, 2 or 3 inches to 1 foot long, straw-coloured, and very chaffy; fronds broadly to rather narrowly oblong-lanceolate, 9 inches to 3 feet long, acuminate, smooth except for the chaffy scales of the rachis and midribs, dark green above but paler beneath, and pinnate; pinnæ lanceolate, tapering from base to apex, acuminate, and pinnatifid almost or rarely quite to the midrib; segments crowded, oblong, obtuse, not very deeply toothed, the basal ones sometimes incisely lobed; sori rather large, nearer the midvein than the margin, generally absent from the apex of the segments; indusia smooth.

This fern, in addition to being somewhat variable as regards its degree of scaliness, presents a var. *incisum*, Mett., which differs from the typical plant in having the fronds very large and scantily chaffy; pinnæ much broader at the base; segments larger, more distant, ovate-lanceolate, acutish, and pinnately incised, with toothed lobes along the sides; indusia more delicate and less persistent.

The roots of *A. Filix-mas* have strong anthelmintic properties, and in Siberia they are used as a flavoring ingredient in brewing ale. The Norwegians use the unfolded fronds as greens, and in other places the whole plant, which abounds in alkali, is used in the manufacture of soap.

In Canada this fern is not common, and, as far as yet known, is confined to restricted areas of Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia. First noted in Nova Scotia at Whyecomagh, Cape Breton.—*Lindsay*. Aspey Bay, Lake Ainslie and Cape Mabou Mountains, Cape Breton, N. S.—*A. H. McKay*. Keswick Ridge, N. B.—*J. Moser*. Abundant and very luxuriant along the Gaspé coast, Que., at Fox River.—*Macoun*. Among loose rock under the limestone cliff at the rear of Royston Park, Owen Sound, Ont., and about ten miles up the Georgian Bay, under the same range of cliff.—*Mrs. Roy*, British Columbia.—*Ljall*.

6.—*A. RIGIDUM*, *Swartz*, (Rigid Wood-Fern), *Syn. Fil.* p. 53.

Polypodium rigidum, *Hoff.*

Polypodium fragrans, *L.*

Polystichum strigosum, *Roth.*

Polystichum rigidum, *D C.*

Nephrodium rigidum, *Desv.*

Lastrea rigida, *Presl.*

This is a handsome species, though rather stiff-looking (whence its name), somewhat fragrant, nearly evergreen, of a dull green color. In height it varies from 1 to 2 feet, and is found growing in crown-life tufts among rocks on mountain sides. Rootstock short, thick, very chaffy, and covered with old stalk-bases; stalks forming $\frac{1}{3}$ to $\frac{1}{2}$ the length of the plant, rigidly erect, very chaffy especially at the base, greenish straw-colour when dry; fronds smooth except for some scattered chaff along the rachises, green above but paler and often more or less glandular beneath, lanceolate, ovate-lanceolate or somewhat elongated-triangular in outline, leathery in texture, and bipinnate; pinnæ oblong-lanceolate or the lowest triangular-lanceolate, and pinnate; pinnules oblong, conspicuously veiny and doubly serrate, with spinulose teeth; sori large, nearer the midvein than the margin; indusia firm, convex with a very narrow sinus, bearing short-stalked glands on their edges.

But few specimens of this fern have been obtainable for examination, and those presented little variation, except that in the largest of the specimens, which measured only 4 inches wide by about 19 inches long, many of the pinnules were deeply pinnatifid into doubly serrate lobes, a character also seen in some of the lower and basal pinnules of medium-sized specimens. According to Prof. D. C. Eaton, his var. *argutum* presents no points of specific difference from the typical *rigidum*, except that its fronds are larger and broader.

All the Canadian specimens of this fern seen were furnished by Mr. Fletcher, of Ottawa, and were collected by Mr. J. J. Cowley, of Victoria, Vancouver Island, B. C., some of them from the immediate vicinity of that city, others from Mount Finlayson, on the same island.

7.—*A. MARGINALE*, *Swartz*, (Evergreen Wood-Fern, Marginal Shield-Fern), *Syn. Fil.*, 50. *Hook.*, *Fl. Bor.-Am.*, II, 160. *Pursh*, II, 662. *Gray*, *Man.*, 666. *Provancher*, *Flor. Can.*, 718. *Macoun's Cat.*, No. 2308. *Fowler's N. B. Cat.*, No. 758. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 153. *Eaton*, *Ferns of N. A.*, II, 69. *Underwood*, *Our Nat. Ferns*, etc., 107.

Polypodium marginale, *L.*

Lastrea marginalis, *Presl*, *Lawson*, *Can. Nat.*, I, 281.

Polystichum marginale, Watt, Can. Nat., IV, 363.

Nephrodium marginale, Michx., Fl. Bor.-Am., II, 267.

Dryopteris marginalis, Gray.

A large and conspicuous evergreen fern, growing on wooded banks, and especially common on rocky, wooded hillsides. It varies in height from 8 or 9 inches to 3 feet, and grows in circular tufts. Rootstock stout, ascending, chaffy, covered with old stalk-bases; stalks shorter than the fronds, chaffy, brownish when fresh but stramineous when dry; fronds smooth except for the scattered chaff on the rachis and midribs, paler on the under surface, leathery, ovate-lanceolate or ovate-oblong in outline, 6 inches to 2 feet long, pinnate; pinnæ almost sessile, lanceolate or lanceolate-acuminate, broadest just above the base, pinnate or pinnatifid; segments oblong, obtuse, often somewhat scythe-shaped, entire or crenately toothed; sori rather large, placed close to the margins of the segments; indusia smooth, often lead-coloured.

In general size, outline and amount of division, as well as the size, shape and proximity of its divisions, this fern is quite variable, and a number of forms have been described. Elongated, acutish, deeply lobed pinnules, with a sub-cordate base, constitute var. *elegans* of Robinson, while very large fronds, (3½ feet long), bipinnate with all the pinnules pinnatifid, is var. *Traille* of Lawson. Forking fronds are sometimes found, and occasionally others are seen broadest at the base, or having the pinnæ and their divisions overlapping each other. Small plants, 5 to 6 inches high, with only the lowest pinnæ pinnatifid, the others merely lobed (a young state of the species), are not uncommon.

Abundant in ravines and on rocky slopes from the Maritime Provinces to the Lake of the Woods, thence more sparingly, and only in places, to the Rocky Mountains. Very generally distributed throughout the Province of Nova Scotia, and to be met with on most rocky banks.—*Rev. E. H. Ball*. Rather common in New Brunswick.—*Fowler*. Common in Quebec.—*Provancher*, *McCord*, *Sheppard*, *Bothwell*, etc. Very common in Ontario.—*Lawson*, *Macoun*, *Billings*, *Logie*, *Burgess*, etc. Lakefield, Ont., var. *Traille*.—*Mrs. Traill*. Common in the Muskoka District of Ontario, and on the Dawson Road, Man.—*Burgess*. Split Rock Portage, on the Nipigon River, Ont., and in Peace River Pass, Rocky Mountains, Lat. 56°.—*Macoun*. The Saskatchewan.—*Drummond*.

† † † Fronds large, fully twice pinnate; indusia rather small, thinnish, flat, and at length shrivelled or deciduous.

8.—A. SPINULOSUM, *Swartz*, (Spinulose Wood-Fern, Common Wood-Fern), Syn. Fil., 50. Hook., Fl. Bor.-Am., II, 261. Gray, Man., 664. *Provancher*, Flor. Can., 719. *Macoun's* Cat., No. 2316. *Fowler's* N. B. Cat., No. 756. *Ball*, Trans. N. S. Inst. Nat. Sci., IV, 151. *Eaton*, Ferns of N. A., II, 163. *Underwood*, Our Nat. Ferns, etc., 107.

Lastrea spinulosa, Presl.

Nephrodium spinulosum, Desv.

This species is partially evergreen, especially the barren fronds, and is one of our very commonest and most variable ferns. It has fertile and sterile fronds alike, forming a crown, and finds its home in thick, especially damp, woods, where it reaches a height of 1½ to 2 feet. Of the typical form, var. *vulgare*, D. C. Eaton, the following are the characters: Rootstock stout, creeping or ascending, chaffy and covered with old stalk-bases; stalks rather slender, darkened at the base but green above, chaffy (especially when

young) with pale brown scales; fronds bright green, erect, narrowly oblong-ovate, usually 12 to 15 inches long by 4 to 7 inches wide, smooth, and bipinnate; pinnæ short-stalked, oblique to the rachis, elongated triangular, the lowest pair broadly triangular with the inferior pinnules twice, or nearly twice, as long as the superior, the basal ones longest of all; pinnules also obliquely set, connected by a very narrow wing, oblong, sub-acute, incised or pinnatifid; lobes spinulosely toothed, especially at the apex; indusia smooth, and without marginal glands.

Innumerable varieties and forms of this plant have been recorded and described, all of which, however, are either monstrosities or can, without much straining, be referred either to the typical form or the vars. *intermedium* and *dilatatum*.

Var. *intermedium*, D. C. Eaton, (*A. intermedium*, Willd., *A. Americanum*, Davenport, *Lastrea intermedia*, Presl.), has the scales few and tawny; fronds dark green, oblong-ovate, broader and often larger than in the typical plant, twice or often thrice pinnate, under surface minutely glandular; pinnæ spreading, oblong-lanceolate, the lowest pair somewhat triangular with the inferior pinnules moderately elongated, but the basal ones a little shorter than the next; pinnules also spreading, ovate-oblong, acutish, pinnatifid or pinnate; ultimate segments oblong-ovate, obtuse, and spinulosely toothed on both sides and apex; margin and often the surface of the indusia covered with stalked glands.

Var. *dilatatum*, Horneman, (*A. dilatatum*, Swz., *Lastrea dilatata*, Presl, *Nephrodium dilatatum*, Desv.), has the scales large and brown, often with a darker centre; fronds very dark green, broadly ovate or triangular-ovate, usually much exceeding, especially in breadth, the other forms, thrice pinnate; pinnæ spreading, broadly triangular with the inferior pinnules much longer than the superior, the basal ones on the lower side longer than the next but on the upper side usually shorter than those next them; pinnules lance-oblong and deeply pinnatifid; ultimate segments oblong and toothed; indusia smooth. A dwarf state of this variety is var. *dumetorum*, which fruits freely when 5 to 8 inches high, and has compact bipinnate fronds, with the inferior basal pinnules but little elongated.

Numerous other sub-varieties of *A. spinulosum* have been noted, including var. *obliquum*, which is a rather rigid, more than usually chaffy form of the typical plant, with pinnæ and pinnules obliquely set, and var. *recurvatum*, which shows a recurved convex growth of the frond, pinnæ and pinnules. A British Columbian plant from Vancouver Island is much laxer than common, and has the pinnæ, pinnules and segments more distant, tapering and acuminate; the pinnules, too, are narrower throughout, and the whole fern is more rigid than is usually seen. Occasionally specimens are found with glands scattered over the upper as well as the under surface of the fronds, and bifurcating and crested forms occur both in the species proper and in its varieties.

Under its various forms this species crosses the continent, and is known to range northward to Alaska and beyond the Peace and Churchill Rivers. Occurring in the wooded districts of all the Provinces, in some places, notably the Island of Anticosti, Eastern Quebec, and to the west of Lake Superior, it forms almost the whole undergrowth. The typical plant is probably the least common form with us, but has been seen in Nova Scotia, New Brunswick, Quebec, Ontario, and, according to Prof. Eaton, about Lake Superior and westward to British Columbia. Vars. *intermedium* and *dilatatum* also extend from the Atlantic through the Rocky Mountains to the Pacific, but while the former, which loves drier woods than the normal form, is *par excellence* the usual form in Eastern

and Central Ontario, the latter, which is not common in Ontario except about Lake Superior, prevails most extensively in the Eastern Provinces and British Columbia.

9.—*A. BOOTTII*, *Tuckerman*, (Bootts' Wood-Fern), *Eaton, Ferns of N. A.*, II, 175. *Underwood, Our Nat. Ferns, etc.*, 107.

A. spinulosum, var. *Boottii*, *Gray, Man.*, 665. *Macoun's Cat.*, No. 2316, var. 1.

A. cristatum, var. *uliginosum*, *Milde*.

Lastrea uliginosa, *Newman*.

Dryopteris rigida, *Gray*.

This fern, by some authorities regarded as a hybrid of *A. spinulosum* with *A. cristatum*, is found in swamps and wet places in woods and thickets. It is partially evergreen, especially the barren fronds, and, growing in a crown, attains a height of $1\frac{3}{4}$ to 3 feet. The sterile and fertile fronds are somewhat unlike, the former being shorter, somewhat less compound, and generally produced a little later in the season. A third set of fronds is produced in summer, intermediate in size and with broader, blunter pinnules, which may be either barren or fertile. Rootstock stout, creeping or ascending, chaffy, and covered with old stalk-bases; stalks shorter than the fronds, stout, chaffy especially when young with large, pale brown scales; fronds erect, deep green, firmly membranaceous, elongated-oblong or elongated-lanceolate in outline, 1 to 2 feet long, smooth above but slightly chaffy with sometimes a few stalked glands below, nearly bipinnate; pinnæ very short-stalked, the upper lanceolate from a broad base, the lower triangular-lanceolate and broadest at the very base, with the inferior basal pinnules but little if any longer than the superior; pinnules broadly oblong, obtuse, the lower pinnatifid, the upper merely serrate with short, spinulose teeth; indusia minutely glandular.

Our recorded stations for this fern are very few, but a more careful search would probably prove it to be less extremely rare. Bellahill, thirteen miles from Halifax, and near Sackville Church, two and a half miles further up the old Windsor Road, N. S.—*P. Jack*. Swamp near the G. T. Ry. station at Belleville, Ont., growing in the immediate vicinity of *A. cristatum* var. *Clintonianum* and *A. spinulosum*.—*Macoun*. Vicinity of Hamilton, Ont.—*Logie*.

† † † † Fronds small; bipinnate with small crowded pinnules; indusia very large and persistent.

10.—*A. FRAGRANS*, *Swartz*, (Fragrant Wood-Fern), *Syn. Fil.*, 51. *Hook., Fl. Bor.-Am.*, 410. *Gray, Man.*, 664. *Macoun's Cat.*, No. 2307. *Fowler's N. B. Cat.*, No. 755. *Ball, Trans. N. S. Inst. Nat. Sci.*, IV, 151. *Eaton, Ferns of N. A.*, I, 175. *Underwood, Our Nat. Ferns, etc.*, 105.

Polystichum fragrans, *Ledeb., Watt, Can. Nat.*, IV, 363.

Lastrea fragrans, *Moore, Lawson, Can. Nat.*, I, 283.

Polypodium fragrans, *L.*

Nephrodium fragrans, *Rich.*

Dryopteris fragrans, *Schott.*

A low, lance shaped, evergreen fern, 4 to 14 inches high, with a pleasant aromatic odour resembling that of strawberries, the odour remaining even in the dried fronds and becoming much more obvious when they are soaked in water. It grows in the crevices

of shaded cliffs and on mossy rocks, especially near cascades. Rootstock stout, ascending or erect, very chaffy; stalks usually very short, green or greenish straw-color, clustered, very chaffy, the chaffiness extending along the rachis and midribs of the fronds; fronds mixed with old and shrivelled ones, rigid, erect, lanceolate, 3 to 12 inches long by $\frac{1}{2}$ to $2\frac{1}{2}$ inches wide, glandular on both surfaces but especially so beneath, bipinnate; pinnæ linear-oblong and pinnately parted; pinnules oblong, obtuse, toothed or nearly entire, almost hidden beneath by the overlapping indusia, which are toothed and glandular round the margin.

This species is subject to slight variations in the shape of its general outline as well as of its pinnæ and in the degree of chaffiness, slenderer and less scaly forms constituting var. β . Hooker.

A few economic properties are attributed to it, being used in Northern Asia as an anti-scorbutic and in Mongolia as a substitute for tea.

The range of the Fragrant Wood-Fern is from Nova Scotia to the Rocky Mountains, and from the boundary between us and the United States to the Arctic Circle. HARTLEY Water-Fall, Pirate Harbour, Strait of Canso, N. S.—*Rev. E. H. Ball*. Clefs of rocks at the Railway Tunnel at Restigouche, N. B.—*Fowler*. Dalhousie, N. B.—*J. Fletcher*. Saguenay River, Que.—*D. A. Watt*. Hemmingford, Que.—*Goode*. Perpendicular rocks at the Falls of Ste. Anne des Monts River and along the Telegraph Road, Gaspé, Que.; Pie Island, and along cliffs on the shore of Thunder Bay above that island, McKay's Mountain, Thunder Cape, and Red Rock Station, C. P. Ry., north shore of Lake Superior, Ont.; very abundant on trap cliffs on the upper part of Nipigon River and all round Lake Nipigon, being the common fern in that region, often with fronds over a foot long; Dawson Road, Man.; Peace River Pass in the Rocky Mountains, above Hudson's Hope in the Canyon, Lat. $56^{\circ} 12'$.—*Macoun*. C. P. Ry. north of Lake Superior, a form approaching var. β . Hooker.—*J. Fletcher*. East coast of Hudson Bay, Cape Chudleigh and Cape Prince of Wales, Hudson Strait, 1884.—*R. Bell*. Great Bear Lake, N. W. Ter.—*Hooker*. The Saskatchewan to the Arctic Sea and islands.—*Richardson* and *Sir E. Parry*.

§ § Indusia round and entire, fixed by the depressed centre. Pinnæ and pinnules usually auricled on the upper side at the base.

* Fronds simply pinnate.

† Stalks short.

11.—A. LONCHITIS, *Swartz*, (Holly-Fern), Syn. Fil., 43. Gray, Man., 666. Hook. and Baker, Syn. Fil., 250. Macoun's Cat., No. 2305. Eaton, Ferns of N. A., I, 161. Underwood, Our Nat. Ferns, etc., 103.

Polypodium Lonchitis, L.

Polystichum Lonchitis, Roth, Lawson, Can. Nat., I, 285. Watt, Can. Nat., IV, 363.

The Holly-Fern is a handsome evergreen species, growing in tufts in shaded rocky places, usually on the debris of calcareous rocks, and attaining a height of 5 or 6 inches to over 2 feet. Rootstock stout, ascending, very chaffy, and covered with old stalk-bases; stalks chaffy, 1 to 3 inches long; fronds dark-green, rigid, leathery, linear-lanceolate, 4 or 5 inches to 2 feet long by 1 to $2\frac{1}{2}$ inches wide, acute or acuminate, narrowed at the base,

smooth above but chaffy below; pinnæ very numerous, crowded and often overlapping, broadly lanceolate-falcate or the lower triangular, strongly auricled on the upper side wedge-truncate on the lower, spinulose-serrate with pointless teeth between the serrations; sori confined to the upper part of the frond, placed about half way between the midvein and margin, following the outline of the auricles as well as of the pinnæ.

This fern shows but little tendency to variation, the only noticeable differences being in the size of the fronds and their coarser or finer serration. Occasionally, too, fronds are seen oblanceolate in outline, while from Europe they are reported as sometimes forking at the apex, which teratological variation would probably also be found here if sought for.

Found in North-eastern Nova Scotia, this fern is not seen again until it reappears in Central Ontario, on leaving which it is again absent until the Rocky Mountains are reached, although in the north it is reported in Hooker's Arctic Plants as being found on rocks along the Arctic coast from the Mackenzie River to Baffin Bay. In considerable abundance near Aspey Bay, Cape Breton, N. S.—*A. H. McKay*. Found sparingly at Foster's Flats, below the Whirlpool, Niagara Falls, Ont.; very common on rocky ground, especially under cliffs, throughout the Bruce Peninsula, and around Owen Sound, Ont.; on the mountain slopes of Bow River Pass, Rocky Mountains, N. W. Ter., and in Peace River Pass, Rocky Mountains, Lat. 56°; Cascade Mountains, above Yale, B. C.—*Macoun*. Kootanie Pass, Rocky Mountains, about Lat. 49°, at 6,500 feet elevation.—*G. M. Dawson*. Rocky Mountains, Lat. 52°–56°.—*Drummond*.

† † Stalks at least several inches long.

12.—*A. ACROSTICHOIDES*, *Swartz*, (Christmas-Fern, Chaffy Shield-Fern), *Syn. Fil.*, 44. *Gray*, *Man.*, 666. *Hook. and Baker*, *Syn. Fil.*, 250. *Pursh*, II, 661. *Provancher*, *Flor. Can.*, 718. *Macoun's Cat.*, No. 2313. *Fowler's N. B. Cat.*, No. 759. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 153. *Eaton*, *Ferns of N. A.*, I, 257. *Underwood*, *Our Nat. Ferns*, etc., 102.

Polystichum acrostichoides, *Schott*, *Lawson*, *Can. Nat.* I, 285. *Watt*, *Can. Nat.* IV, 363.

Nephrodium acrostichoides, *Mx.*, *Fl. Bor.-Am.*, II, 267.

A narrowly lanceolate fern with dark shining evergreen foliage, growing about 9 or 10 inches to 2½ feet high in tufts in woods and on wooded hillsides, and especially favoring rocky soil. The sterile and fertile fronds are somewhat dissimilar, the latter being generally rather taller and more erect, with the upper fruit-bearing pinnæ contracted and smaller. Rootstock creeping and covered with old stalk-bases; stalks green above but brown at the base, chaffy especially below; fronds leathery, lanceolate from a scarcely narrowed base, 6 inches to 2 feet long by 3 to 5 inches wide, smooth above but more or less chaffy below, pinnate; pinnæ linear-lanceolate, the upper often more or less falcate, short-stalked, abruptly narrowed at the lower side of the base and auricled above, serrulate with appressed bristle-pointed teeth; sori placed near the midvein, confluent, when ripe covering the entire under surface including the auricles of most of the fruiting pinnæ.

Fronds with the pinnæ incised-serrate are not very uncommon, and occasionally this is carried so far that the pinnæ are almost pinnatifid, making a form that stands intermediate between the typical plant and var. *incisum*, *Gray*. The latter has the pinnæ cut lobed, those of the fertile fronds being nearly or quite all fruit-bearing, with the sori generally covering the upper pinnæ, but confined to the tips of the lower ones. Specimens with forking fronds and pinnæ have also been reported.

The Christmas-Fern is found from Nova Scotia to the Bruce Peninsula of Ontario, which seems to be about the western limit of its range in Canada. Quite common in Nova Scotia.—*Rev. E. H. Ball*. Common near St. John, N. B., but only a single tuft noticed in the northern counties near Molus River, Kent Co.—*Fowler*. Woodstock, N. B.—*P. Jack*. Common in Quebec.—*Provancher, D'Urban, Maclagan, Bothwell, Sheppard, etc.* Very abundant in Eastern and Central Ontario.—*Macoun, Lawson, Fletcher, Logie, Burgess, etc.* The var. *incisum* is reported from Montreal, Que.—*D. R. McCord*. Owen Sound, Ont.—*Macoun*. London, Ont.—*Burgess*.

13.—*A. MUNITUM*, *Kaulf.* (Chamisso's Shield-Fern), *Hook., Fl. Bor.-Am. II, 261.* *Macoun's Cat. No. 2306.* *Eaton, Ferns of N. A., I, 187.* *Underwood, Our Nat. Ferns, etc., 103.*

Polystichum munitum, *Presl.*

Nephrodium Plumula, *Presl.*

It is an evergreen species, growing among rocks and in forests, commonly from 1 to 5 feet high, and is one of the finest of North American ferns. Rootstock stout, ascending, covered with old stalk-bases; stalks stout, usually forming about one-fourth or a little less of the height of the plant, very chaffy with brown scales; fronds standing in a crown, leathery, lanceolate (tapering very slightly toward the base), 1 to 4 feet long by 4 to 8 inches wide, acuminate, bright green above but paler beneath, where also they are chaffy especially on the rachis, pinnate; pinnæ numerous, wide-spreading, nearly sessile, linear-acuminate, very sharply and often doubly serrate with incurved, aculeate teeth, auricled on the upper side, obliquely truncate on the lower, all or only the upper ones fertile, none of them contracted; sori abundant, nearer the margin than the midrib, following the outlines of the auricles as well as of the pinnæ proper.

A form of this fern, corresponding to var. *incisum* of *A. acrostichoides*, is var. *inciso-serratum*, *D. C. Eaton*. It has large fronds and pinnæ lanceolate-acuminate from a very conspicuously auricled base, incised a quarter or a third of the way down to the midvein, the divisions serrated, veins much branched and sori scattered. This is the only marked variation occurring with us, but two California forms are vars. *nudatum* and *imbricans* of *D. C. Eaton*. A specimen from crevices of rocks, Vancouver Island, is rather noticeable for its extremely narrow fronds, which are over a foot in length but do not exceed two inches in width.

The rhizomes and uncoiled fronds of *A. munitum* are said to be sometimes cooked and eaten by the Western Indians.

In Canada this fern is confined to British Columbia. North-west America.—*Menzies*. Nootka, Vancouver Island.—*Mertens*. Very abundant around Victoria, Vancouver Island, both the typical form and var. *inciso-serratum*; common in rocky woods up the Fraser River to far above Yale, within the mountains.—*Macoun*. Damp thickets, New Westminster.—*J. Fletcher*.

* * Fronds bipinnate, or nearly so.

14.—*A. ACULEATUM*, *Swartz.* (Prickly Shield-Fern), *Syn. Fil., 53.* *Hook. and Baker, Syn. Fil., 252.* *Eaton, Ferns of N. A., II, 123.* *Underwood, Our Nat. Ferns, etc., 103.*

The species in North America is a Californian plant, finding its representatives within Canadian territory in the vars. *Braunii* and *scopulinum*.

Var. *Braunii*, Doell, (Braun's Prickly Shield-Fern), Gray, Man., 667. Macoun's Cat., No. 2312. Fowler's N. B. Cat., No. 760. Ball, Trans. N. S. Inst. Nat. Sci., IV, 154. Eaton, Ferns of N. A., II, 124. Underwood, Our Nat. Ferns, etc., 104.

Polystichum angulare, Presl, var. *Braunii*, Lawson, Can. Nat., I, 285.

Polystichum aculeatum, Moore, var. *Braunii*, Watt, Can. Nat., IV, 363.

Aspidium Braunii, Spenner.

Aspidium aculeatum, Pursh, II, 662. Provancher, Fl. Can., 719.

This is a fine evergreen species, 1 to 2½ feet high, with a prickly aspect, growing in the crevices of moist, shaded rocks and in rocky woods. Rootstock stout, erect, closely covered with old stalk-bases; stalks very short and chaffy; fronds growing in a crown, elliptical-lanceolate in outline, tapering to both ends, covered with long, soft hairs and chaff, bipinnate; pinnæ numerous, oblong-lanceolate, the lower short and almost obtuse, the upper very acute; pinnules mostly distinct, very short-stalked, ovate or oblong, truncate and almost rectangular at the base, generally more or less auricled, sharply serrate with incurved teeth. Occasionally fronds of this variety are seen which are oblong-lanceolate in outline and but little narrowed at the base.

Var. *scopulinum*, D. C. Eaton, (Ferns of N. A., II, 125), is also an evergreen, and grows in the crevices of rocks. Stalks short; fronds narrowly lanceolate, 3 to 10 or 11 inches long by ½ to 1½ inches wide, deciduously chaffy, pinnate; pinnæ numerous, ovate or ovate-oblong, rather obtuse, pinnately lobed at the base, but serrate with pointed and barely aculeate teeth above. By some good authorities this variety is placed under *Aspidium mohrioides*, but Prof. Eaton, while saying it is almost as much like this species as *A. aculeatum*, prefers to leave it with the latter, as it has the lobes of the pinnæ somewhat aculeate.

Vars. *Californicum*, D. C. Eaton, *angulare*, Braun, and *proliferum*, Wolleston, are Californian forms, the latter two being also well known in Europe.

With us the range of Var. *Braunii* is restricted to the Provinces of Nova Scotia, New Brunswick and Quebec in the east, and British Columbia in the west. Rare, even where local, in Nova Scotia; occurring at Marble Mountain, Bras d'Or Lake; Sherman's Mountain, Port Mulgrave, Strait of Canso; Ehler's Water-Fall, near Guysborough, and hills above Mabou, Cape Breton.—*Rev. E. H. Ball*. Near Lake Ainslie, Cape Breton, N. S.—*A. H. McKay*. Near Baddeck, and at River Inhabitants, Cape Breton, N. S.—*P. Jack*. Pirate Harbour, Strait of Canso, N. S.—*Macoun* and *Burgess*. Cape Blomidon, N. S.—*Lawson*. Sugar Loaf, Restigouche and Odell's Grove, Fredericton, N. B.—*Fowler*. St. Francis River, Andover, N. B.—*G. U. Hay*. Plentiful in rocky woods along the Gaspé coast, Que., generally near the shore and often within the spray of the waves.—*Macoun*. Quebec, Que.—*Hon. Wm. Sheppard*. Temiscouata, Que., not common.—*Thomas*. Abundant on gneiss rocks and damp logs, valley of the River Rouge, Argenteuil Co., Que.—*W. S. M. D'Urban*. Portage and sources of the Columbia River, west side of the Rocky Mountains, Lat. 52°.—*Drummond*. Nootka, Vancouver Island, B. C.—*Hænke*. Having been found in Washington Territory, U. S., var. *scopulinum* may be looked for in Southern British Columbia, but as yet the only place it is known to exist in Canada is Mount Albert, Shick-shock Mountains, Gaspé, Que., having been found by Professor Allan in July, 1881, and by Professor Macoun in August, 1882. In the case of the latter, it was collected on the summit of the mountain, at an altitude of 4,000 feet, and close to a quantity of still unthawed winter snow.

Genus XV.—CYSTOPTERIS, *Bernh.*, BLADDER-FERN.

* Fronds ovate-lanceolate, bi-tripinnate.

1.—*C. FRAGILIS*, *Bernh.*, (Brittle-Fern), Gray, Man., 667. Provancher, Flor. Can., 719. Lawson, Can. Nat., I, 286. Hook. and Baker, Syn. Fil., 103. Macoun's Cat., No 2322. Goode, Can. Nat., IX, 299. Fowler's N. B. Cat., No. 762. Ball, Trans. N. S. Inst. Nat. Sci., IV, 154. Eaton, Ferns of N. A., II, 49. Underwood, Our Nat. Ferns, etc., 108.

C. tenuis, Desv.

Polypodium fragile, L.

Aspidium tenue, Swartz, Syn. Fil., 58. Pursh, II, 665.

Aspidium fragile, Swartz, Syn. Fil., 58.

Nephrodium tenue, Mx., Fl. Bor.-Am., II, 269.

Cyathea fragilis, Smith.

Cystea fragilis, Smith, Watt, Can. Nat., IV, 363.

This is a slender, common, and variable species, most at home in crevices of moist shaded rocks and among stones, but also found in rich woods and sometimes in open wet places. Its usual height is about 8 to 16 inches, though occasionally, in favored localities, it reaches even as much as 2 feet, while in mountainous districts, depauperated forms not exceeding 2 to 4 inches occur. It is non-evergreen, being very sensitive to frost. Root-stock elongated, creeping, covered with old stalk-bases, and very chaffy toward the apex; stalks slender, clustered, very brittle, straw-color or brown shading to green in the rachis, darkest at the base where also they are sparingly chaffy; fronds mostly reclining, oblong-lanceolate or ovate-lanceolate, commonly 4 to 8 inches long by 1 to 3 wide, thin, smooth, bipinnate; pinnæ ovate-lanceolate or somewhat triangular, pointed; pinnules decurrent along the narrowly winged secondary rachis, ovate-oblong, somewhat acutely toothed or shallowly incised and toothed; sori small, roundish, usually distinct; veinlets mostly running out to the teeth of the lobes; indusia acute at the free end.

This fern is extremely variable, and the same roots will at different times or even the same time produce fronds that might be referred to different ones of the numerous so-called varieties, of which the following are perhaps the best known:—Var. *dentata*, Hook., with narrow scarcely bipinnate fronds, less pointed pinnæ, and obtuse merely bluntly toothed ovate pinnules. Var. *angustata*, Smith, with broad and often nearly tripinnate fronds, acute pinnæ, and acute lanceolate pinnules, which have sharp toothed, sharply pointed lobes. Var. *laciniata*, Davenport, with narrow and little more than pinnate fronds and ovate pinnæ, the lobes of which are irregularly lacinate with narrow teeth. Var. *McKayii*, Lawson, a common form in America, differing from the ordinary European plant (also found with us), which has broad, leafy, approximate pinnæ, in having the pinnæ very far apart and narrowly lanceolate; pinnules oblong, always more or less cuneate at the base, and rounded at the apex; sori few and scattered; plant when growing with a hard, bare look and a bluish-green colour. A very peculiar form found at Whycocomagh, N. S., falls under var. *multifida*, Wolleston. It resembles var. *angustata* in general appearance, but has the ends of the fronds as well as most of the pinnæ and some of the pinnules forked or showing a tendency thereto. Another form, in some respects approaching var. *Dickieana*, Sim., from near Michipicotin on the north shore of Lake Superior, is broadly triangular-lanceolate in outline, and has the pinnules overlapping one another, those of the lowest pinnæ remark-

ably broadly triangular, the basal ones measuring an inch in breadth and length. Specimens collected at London, Ont., have branched rootstocks nearly a foot long, while others, gathered in the Rocky Mountains and British Columbia, have the sori confluent and covering every particle of the under surface of the fronds, so as to give them a dark brown appearance.

This is one of the most universally distributed of ferns, appearing in almost every part of our whole territory from east to west and from north to south, growing even on the prairie wherever moisture sufficient for it to grow can be obtained near rock.

2.—*C. BULBIFERA*, *Bernh.* (Bulblet Cystopteris), Gray, *Man.*, 667. *Provancher*, *Fl. Can.*, 719. *Lawson*, *Can. Nat.*, I, 287. *Hook.*, and *Baker*, *Syn. Fil.*, 103. *Macoun's Cat.*, No. 2324. *Fowler's N. B. Cat.*, No. 761. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 154. *Goode*, *Can. Nat.*, IX, 299. *Eaton*, *Ferns of N. A.*, II, 55. *Underwood*, *Our Nat. Ferns*, etc., 108.

Polypodium bulbiferum, L.

Aspidium bulbiferum, Swartz, *Syn. Fil.*, 59. *Pursh*, II, 665.

Aspidium atomarium, Muhl.

Nephrodium bulbiferum, Michx., *Fl.*, *Bor.-Am.*, II, 268.

Cystea bulbifera, Smith, *Watt*, *Can. Nat.*, IV, 363.

A tall, slender, tufted fern, generally producing on its under side fleshy bulblets, which fall to the ground and form new plants which reach maturity in the second year. It is found in wet places among rocks, or in low rich woods, attaining a height of 1½ to 3 feet, and withers with the early frosts of autumn. Rootstock short, covered with old stalk-bases, and sparingly chaffy at its apex; stalks slender, rather brittle, clustered, much shorter than the fronds, when fresh dark-brown close to the base and green above (sometimes brown throughout), but when dry pale straw-colour; fronds mostly reclined, elongated, tapering from base to slender apex, usually 1½ to 2 feet or even more in length by 3 to 5 inches wide at the base, thin, very minutely glandular in the living plant, often bearing bulblets, which are commonest at the base of the pinnae and toward the apex of the fronds, bipinnate; pinnae ovate-oblong, pointed; pinnules oblong, obtuse, pinnatifid or toothed, the lower ones distinct, but the rest decurrent along the narrowly-winged, secondary rachis; veinlets mostly running out to the teeth of the lobes; indusia truncate at the free end.

Professor Lawson proposes a var. *horizontalis* for a shorter form of this fern, with triangular-lanceolate fronds, broad at the base and not more than three or four times longer than broad, pinnae horizontal. The same writer also proposes a var. *flagelliformis*, which, however, seems to differ in no respect from the typical form of the species. Depauperate forms, but bearing bulblets, collected on exposed cliffs in Gaspé, Que., by Mr. Goode, are only 2¼ to 2¾ inches long including stalks.

Found in Nova Scotia and New Brunswick, but not common, and extending westward to the Lake of the Woods, Manitoba. Rare in Nova Scotia; Hartley's Water-Fall, Pirate Harbour, Strait of Canso.—*Rev. E. H. Ball*. Aspey Bay, Cape Breton, N. S.—*A. H. McKay*. Growing with *Adiantum pedatum* at Newport, Hants Co., N. S.; Grand Falls, N. B.—*P. Jack*. Restigouche and St. John, N. B.—*Fowler*. On damp limestone rocks up Jupiter River, Island of Anticosti, Que.—*Macoun*. Common in Quebec.—*Provancher*, *D'Urban*, *Bell*, *Maclagan*, *McCord*, etc. Very abundant throughout Ontario, as far west as the Bruce

Peninsula.—*Lawson, Billings, Macoun, Logie, Burgess*, etc. Manitoulin Islands, Ont.—*J. Bell*. Lake of the Woods.—*Dawson*. North-West Angle, Lake of the Woods, Man.—*Burgess*.

* * Fronds deltoid or pentagonal, ter-quadrifid.

3.—C. MONTANA, *Bernh.*, (Mountain Cystopteris), *Hook.*, Fl. Bor.-Am., II, 260. *Hook. and Baker*, Syn. Fil., 104. *Macoun's Cat.*, No. 2323. *Eaton*, Ferns of N. A., II, 53. Underwood, Our Nat. Ferns, etc., 108.

Polypodium montanum, Lamarck.

Aspidium montanum, Swartz, Syn. Fil., 61.

Cyathea montana, Smith.

Cysteu montana, Lamarck, Watt, Can. Nat., IV, 363.

This is one of our rarest, and a very beautiful species of fern, differing markedly from the rest of the genus. It is a delicate plant, reaches a height of 8 or 9 to 16 inches, and grows along creeks in very deeply shaded woods. Rootstock long, slender, creeping, scaly near the apex; stalks usually much longer than the fronds, scattered, slender, brown at the base but green above, very sparingly chaffy; fronds deltoid or pentagonal-ovate in outline, 3 to 6 inches long by about the same breadth, smooth except for some small scales along the rachis and midribs, ter-quadrifid with the rachises, even to the primary, all narrowly-winged; pinnae pointed, the lowest unequally deltoid-ovate and much larger than those above, which become gradually simply lanceolate; pinnules ovate-oblong, inferior ones of the lowest pinnae very much longer than the upper, divided into secondary pinnules, which in turn are pinnately incised almost, or even quite, to the rachis into oblong, sharply-toothed lobes; veinlets generally ending at the indentations between the teeth; indusia irregularly toothed toward the apex.

Except in size, this fern does not seem to be subject to much variation. Specimens have been seen with the inferior basal pinnules of the lowest pair of pinnae almost as large as the pinnae from which they sprang, and in others the lowest pair of pinnae were very (over 2 inches) distant.

One of the very rarest of our native ferns. Labrador.—*Butler*. In a deep ravine, in which flowed a small brook, on the northern face of Mount Albert, Shickshock Mountains, Gaspé, Que.; in a cedar swamp near the silver mine north of Current River, Lake Superior, Ont.; abundant in Kicking Horse Pass, Rocky Mountains, N. W. Terr.—*Macoun*. By streams in shady alpine woods in the Rocky Mountains, Lat. 52°-56°.—*Drummond*.

Genus XVI.—ONOCLEA, L., ONOCLEA.

1.—O. SENSIBILIS, L., (Sensitive Fern), Mx., Fl. Bor.-Am., II, 272. *Hook.*, Fl. Bor.-Am., II, 262. *Pursh*, II, 665. *Gray*, Man., 668. *Provancher*, Fl. Can., 717. *Lawson*, Can. Nat., I, 274. *Macoun's Cat.*, No. 2321. *Fowler's N. B. Cat.*, No. 764. *Ball*, Trans. N. S. Inst. Nat. Sci., IV, 154. *Watt*, Can. Nat., IV, 363. *Eaton*, Ferns of N. A., II, 195. Underwood, Our Nat. Ferns, etc., 109.

The Sensitive Fern, which grows in wet places open or shaded, usually measures from 6 inches to 2½ feet high. The barren and fertile fronds are extremely unlike, the former being leaf-like, very sensitive to frost, quickly wilting when plucked, and much

taller and more common than the latter, which are non-leaf-like and remain erect, though drying up, through the winter. Rootstock elongated, creeping, naked; stalks scattered, very sparingly chaffy and darkened at the base, green above when fresh but brownish when dry, the sterile usually a little longer than their fronds, the fertile usually much longer; sterile fronds foliaceous, smooth, triangular-ovate in outline, 3 to 15 inches in length, deeply pinnatifid into oblong-lanceolate, generally obtuse, entire, undulate or sinuate-pinnatifid segments, which are connected by a wing gradually widening upward, or the lowest pair sometimes distinct; fertile fronds nearly black, rigid, much contracted, bipinnate with the erect, appressed, narrow pinnæ divided into pinnules, which are rolled into berry-like closed involucre; veins of the sterile fronds copiously anastomosing, those of the fertile free.

This fern is subject to considerable variation as regards its size and the cutting of its pinnæ and folding of their segments. All possible forms intermediate between the typical sterile and fertile fronds may occur, and var. *obtusilobata*, Torr., (*Onoclea obtusilobata*, Schk.), is the one standing about midway between the two. In it the pinnæ of some of the sterile fronds are again pinnatifid, and the so-formed pinnules becoming contracted and somewhat revolute, without entirely losing their foliaceous character, bear a few sori. This form is often produced from rootstocks which bear normal sterile fronds also, and the same plant may produce var. *obtusilobata* one year and the type form the next,—a plant with bipinnate sterile fronds, thus standing between the normal sterile frond and var. *obtusilobata*, is var. *bipinnata*, Lawson in Can. Nat., Vol. I, p. 274. Mr. McCord, in the same volume, p. 356, mentions a form with glandular sterile fronds.

Common throughout every part of Canada westward (in the swampy and wooded region) to the head of Lake Winnipegosis and the Saskatchewan. Only two stations are recorded with us for var. *obtusilobata*, viz., wet meadow one mile north of Murray Town Hall, Northumberland Co., Ont.—*Macoun*, and Ottawa, Ont.—*J. Fletcher*; but there is little doubt that a careful search would show it to be much more common.

2.—*O. STRUTHIOPTERIS*, *Hoff.*, (Ostrich-Fern), Swartz, Syn. Fil., 111. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., II, 201. Underwood, Our Nat. Ferns, etc., 109.

O. nodulosa, Schkuhr.

O. Germanica, Hook.

Osmunda Struthiopteris, L.

Struthiopteris Germanica, Willd., Hook., Fl. Bor.-Am., II, 262. Gray, Man., 667. Provancher, Fl. Can., 717. Macoun's Cat., No. 2320. Fowler's N. B. Cat., No. 763. Ball, Trans. N. S. Inst. Nat. Sci., IV, 154. Lawson, Can. Nat., I, 273, as var. *Pennsylvanica*.

Struthiopteris Pennsylvanica, Willd, Pursh, II, 666.

A tall and showy species growing in large tufts, commonly 1½ to 6 feet high, in low, open or wooded, especially alluvial, ground. The barren and fertile fronds are quite different. The former, which are leaf-like, much the taller, and non-evergreen, grow in a circle and curve outward to form a beautiful vase-like receptacle for the latter, which are few in number, non-leaf-like, and remain erect, though drying up, long after the sterile have vanished. Rootstock short, thick, erect, covered with old stalk-bases, giving off long, slender, subterranean stolons; stalks short, stout, angular, those of the fertile fronds a little the longest, darkened and chaffy at the base, green above when fresh but brown when dry; sterile fronds broadly-lanceolate, 1¼ to 5 feet long, abruptly short-pointed,

much narrowed at the base, pinnate into numerous, sessile, linear-lanceolate, acuminate pinnae (the lowest ones deflexed), which are in turn deeply pinnatifid into crowded, oblong, obtuse, entire segments; fertile fronds 9 inches to 1½ feet long, dark coloured, contracted, rigid, pinnate into obtuse, obliquely ascending, almost entire or pinnately lobed pinnae, the margins of which are rolled backward to form necklace-like or almost cylindrical bodies enclosing the fruit; veins of both sterile and fertile fronds free.

This fern occasionally presents a condition analogous to the var. *obtusilobata* of *O. sensibilis*, in the shape of fronds intermediate between the barren and fertile, bearing a few sori on contracted though still herbaceous pinnae.

The Ostrich-Fern in Canada ranges from Nova Scotia to Lake Winnipeg and the Saskatchewan, being very common as far west as Lake Huron. Only noted about forty miles north of Michipicotin on the Magpie River, and about five miles up the Kaministiquia River, Lake Superior, Ont.; along the Assiniboine River, from Winnipeg to the Souris River, Man.—*Macoun*. North-west Angle, Lake of the Woods, Man.—*Burgess*. Canada to the Saskatchewan.—*Richardson*.

Genus XVII.—WOODSIA, *R. Br.*, WOODSIA.

§ Stalks obscurely articulated near the base; fronds chaffy or smooth, never glandular.

* Fronds glabrous or nearly so.

1.—*W. GLABELLA*, *R. Br.*, (Smooth Woodsia), Hook., Fl. Bor.-Am., II, 259. Gray, Man., 669. Lawson, Can. Nat., I, 289. Watt, Can. Nat., IV, 363. Hook. and Baker, Syn. Fil., 47. Macoun's Cat., No. 2326. Goode, Can. Nat., IX, 298. Fowler's N. B. Cat., No. 766. Eaton, Ferns of N. A., II, 115. Underwood, Our Nat. Ferns, etc., 110.

W. Alpina, var. *glabella*, Eaton.

Polypodium fontanum, L.

This species of Woodsia is extremely delicate and non-evergreen, growing in tufts on moist, shaded rocks, or in their crevices, and only reaching a height of 1½ to 6 inches. Rootstocks short, ascending, clustered; stalks slender, usually less than an inch in length, smooth or with a little chaff below the articulation; fronds bright green, narrowly linear-lanceolate, usually 1 to 5 inches long by 3 to 6 lines wide, glabrous both sides, pinnate; pinnae 1 to 3 lines long, roundish-ovate or somewhat deltoid, obtuse, and crenately lobed into 3 to 7, rounded, nearly entire lobes; sori very few; indusia with only a few long cilia on their margins.

The degree of variation in this fern does not seem to be very great, var. *Belli* of Lawson having been since referred by him to *W. hyperborea*, in which *W. glabella* finds its closest ally. The differences between the two plants consist only in the latter being shorter, with narrower, more delicate and perfectly smooth fronds, which have but slightly lobed pinnae and very scantily ciliate indusia. Bifurcating fronds are very occasionally seen, and many of the Lake Superior specimens differ from those found in the Eastern Provinces in having their pinnae markedly more distant and more inclined to be triangular.

Though comparatively rare and quite local, the Smooth Woodsia in Canada has a wide

range, extending from New Brunswick west to the Rocky Mountains, while northward it reaches the Arctic Circle. The Tunnel, Restigouche, N. B., rare.—*Fowler*. Grand Falls, N. B.—*P. Jack*. Limestone rocks, twelve miles up Jupiter River, and under cliffs at Ellis Bay, Island of Anticosti, Que.; frequent in crevices of rocks along the Gaspé coast and on cliffs along the Ste. Anne des Monts River, and Rivière du Loup, Que.; ledges of rock, Kakabeka Falls, Kaministiquia River, ten miles south of Fort William, Red Rock near the C. P. Ry. station, and on trap rocks up the Nipigon River, Lake Superior, Ont.; limestone rocks, Pine Portage, Clearwater River, below Methy Portage, Lat. 57°; crevices of rock, Bow River Pass, Rocky Mountains, N. W. Ter.—*Macoun*. Saguenay River and Montmorenci Falls, Que.—*D. A. Watt*. Great Bear Lake, the original station, N. W. Ter.—*Richardson*. On rocks along the Arctic coast, from Mackenzie River to Baffin Bay.—*Hook.*, Arc. Pl.

2.—*W. HYPERBOREA*, *R. Br.*, (Northern Woodsia, Alpine Woodsia, Flowercup-Fern), *Hook.*, Fl. Bor.-Am., II, 259. *Hook.* and *Baker*, Syn. Fil., 46. *Provancher*, Fl. Can., 720. *Macoun's Cat.*, No. 2327. *Watt*, Can. Nat., IV, 363. *Eaton*, Ferns of N. A., II, 107. *Underwood*, Our Nat. Ferns, etc., 110.

W. Alpina, S. F. Gray, Lawson, Trans. Bot. Soc. Ed., VIII, 108, and Can. Nat., I, 289.

W. Ilvensis, var., Benth.

Polypodium hyperboreum, Swartz, Syn. Fil., 39.

Acrostichum alpinum, Bolton.

Polypodium arvonicum, Smith.

A small, non-evergreen fern, 3 to 8 inches high, growing in tufts on moist, mossy rocks. Rootstocks short, ascending, clustered, thickly set with old stalk-bases; stalks less than half the length of the fronds, stout for the size of the plant, numerous, chaffy near the base, and sparingly so with hair-like scales or almost smooth above, shining, reddish-brown; fronds linear-lanceolate, 2 to 6 inches long by 6 lines to 1 inch wide, sparingly chaffy, hairy or nearly smooth, pinnate; pinnæ 3 to 6 lines long, triangular-ovate, obtuse, pinnately lobed into a few obtuse, rounded or obovate, nearly entire lobes; sori usually distinct; indusia long-ciliate.

By some authorities this fern is not considered distinct from *W. Ilvensis*. Usually the two are easily separated, but intermediate forms occur, and it is at times very hard to decide under which to place such. *W. hyperborea* is usually the smaller, narrower, more delicate in texture, smoother, and has shorter, more obtuse and less deeply lobed pinnæ, with sori usually remaining distinct. Prof. Lawson, in Can. Nat., Vol. I, p. 4, describes a nearly smooth form, with longer (9 inches) and lax fronds, which he proposes to distinguish as var. *Belli*, but the distinctions seem insufficient to warrant the construction of a distinct variety.

In Canada this fern occurs very locally from New Brunswick to the Saskatchewan, and north to the Arctic Circle. Aroostook Falls, Victoria Co., N. B.—*Hay and Wetmore*. Dartmouth River, Gaspé, Que., twenty miles from its mouth, var. *Belli*.—*J. Bell*. Perpendicular faces of rocky cliffs near Cape Rosier, Gaspé, Que.; on rocks and in their crevices twenty miles up the Ste. Anne des Monts River, and at the Falls of the same river at the base of Mont Albert, Que.; on mountain masses along the north shore of Lake Superior, west of Nipigon Bay, on cliffs of Jack Fish Island, Lake Nipigon, and on ledges of rock between the Hudson's Bay Co.'s post and Lake Superior at Michipicotin, Ont.—*Macoun*.

On a moist, mossy bank near the falls on the Rivière-du-Loup, within reach of the spray from the falls, and on mossy rocks in a ravine, Temiscouata, Que.—*D. A. Watt*. Norway House, Lake Winnipeg.—*Richardson*. Nottingham Island, Hudson Strait.—*R. Bell*. On rocks along the Arctic coast, from the Mackenzie River to Baffin Bay.—*Hook.*, Arc. Pl.

* * Fronds very hairy and chaffy beneath.

3.—*W. ILVENSIS*, *R. Br.*, (Rusty Woodsia, Woolly-Fern), *Hook.*, Fl. Bor.-Am., II, 259. Pursh, II, 660. Gray, Man., 669. Provancher, Fl. Can., 720. Lawson, Can. Nat., I, 288. *Hook.* and Baker, Syn. Fil., 46. Macoun's Cat., No. 2325. Fowler's N. B. Cat., No. 765. Ball, Trans. N. S. Inst. Nat. Sci., IV, 155. Watt, Can. Nat., IV, 363. Eaton, Ferns of N. A., II, 111. Underwood, Our Nat. Ferns, etc., 110.

W. hyperborea, var. *rufidula*, Koch.

Acrostichum Ilvense, L.

Polypodium Ilvense, Swartz, Syn. Fil., 39.

Nephrodium rufidulum, Mx., Fl. Bor.-Am., II, 269.

Aspidium rufidulum, Swartz, Syn. Fil., 58.

A small, dull green, rather coarse looking, tufted, non-evergreen, but hardy fern, growing usually from 3 to 13 inches high, on exposed metamorphic rocks and in their crevices. Rootstock short, ascending, tufted, covered with old stalk-bases; stalks commonly about half the length of the fronds, stout for the size of the plant, greenish when fresh but straw-coloured or reddish-brown when dry, very hairy and chaffy; fronds lanceolate, usually about 2 to 8 inches long by $\frac{1}{2}$ to 2 wide, as a rule thickly covered on the under side with chaff and hair, which is whitish when young but afterwards rusty, green and smoother on the upper surface, pinnate; pinnæ sessile, 6 to 9 lines long, oblong-ovate, rather acute, and pinnatifid into about 9 to 21 oblong, obtuse, usually crenate lobes, which have slightly reflexed margins; sori numerous and at length confluent; indusia long-ciliate.

This fern is occasionally almost smooth, and, as before stated, the less chaffy forms are hard to distinguish from the more chaffy ones of *W. hyperborea*, and the var. *gracilis* of Prof. Lawson in Can. Nat., I, p. 288, which, as stated by him, seems to agree better with *W. hyperborea* in technical characters, is one of these intermediate forms, and probably referable to that species, which is found in the locality where Lawson's form was collected. Some specimens from the north of Lake Superior are more delicate in appearance than usual, from having all their parts narrower and much more distant, while the fronds themselves are narrower and more acuminate.

Woodsia Ilvensis occurs in places within our limits from Nova Scotia to the Rocky Mountains, and north beyond the Arctic circle. Not common in Nova Scotia.—*A. H. McKay*. Salt Mountain, Whycocomagh, Cape Breton, N. S.—*Lindsay*. Abundant on Gold River, near Chester, Lunenburg Co., N. S.—*Rev. E. H. Ball*. High rocks, east side of Lake Thomas, Halifax Co., N. S.; Hay's Falls, near Woodstock, N. B.—*P. Jack*. Near Truro, N. S.—*Campbell*. The "Look Out," Cape Blomidon, N. S.—*Macoun* and *Burgess*. Sugar Loaf, Restigouche, and mouth of Upsalquitch, N. B.—*Fowler*. Keswick, Nashwaaksis, St. Stephen, and near Green Head, St. John, N. B.—*J. Vroom*. Extremely abundant in many parts of Quebec and Ontario.—*Provancher*, *D'Urban*, *Lawson*, *Macoun*, *Fletcher*, *Logie*, *Burgess*, etc. Very abundant and luxuriant west and north-west of Lake

Superior, producing fronds over a foot long and nearly two inches wide.—*Macoun*. Echimamish River to Oxford House, and Nelson River, near Hudson Bay, N. W. Territory.—*R. Bell*. Canada to Hudson Bay, Bear Lake, and the Rocky Mountains.—*Richardson* and *Drummond*. Rocks along the Arctic coast from Mackenzie River to Baffin Bay, also in Arctic Greenland and along the east and north-east coast.—*Hook.*, Arc. Pl.

§ § Stalks not articulated; fronds glandular-pubescent or smooth, not chaffy.

* *Indusia* of a few broad segments, at first covering the sorus.

4.—*W. OBTUSA*, *Torrey*, (Obtuse-leaved *Woodsia*), *Gray*, *Man.*, 668. *Lawson*, *Can. Nat.*, I, 289. *Hook.* and *Baker*, *Syn. Fil.*, 48. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 154. *Macoun's Cat.*, No. 2330. *Eaton*, *Ferns of N. A.*, II, 189. *Underwood*, *Our Nat. Ferns*, etc., 111.

W. Perriniana, *Hook.* and *Grev.*

Polypodium obtusum, *Spreng*

Aspidium obtusum, *Willd.*, *Pursh*, II, 662.

Hypopeltis obtusa, *Torr.*

Cystopteris obtusa, *Presl.*

Physematium obtusum, *Hook.*, *Fl. Bor.-Am.*, II, 259.

Physematium Perrinianum, *Presl.*

This is a non-evergreen species found growing in tufts in rocky places, and reaching a height of 9 inches to 1½ feet. Rootstock short, creeping, somewhat chaffy, and covered with old stalk-bases; stalks green when fresh but stramineous when dry, darkened close to the base, chaffy when young, about half the length of the fronds; fronds broadly-lanceolate in outline, commonly about 6 to 12 inches long by 2 to 3 wide, delicate, minutely glandular-hairy especially on the under side, nearly bipinnate; pinnæ rather distant, triangular-ovate or triangular-lanceolate, obtuse, pinnately parted into oblong, obtuse, crenately toothed segments, the lower of which are pinnatifid; *indusia* nearly covering the sporangia at first, but afterward splitting into 4 to 6 spreading, jagged lobes.

Though not rare in parts of the United States, the only known station for this fern in Canada is near Canning, Nova Scotia, in the gorge through which Dr. Hamilton's Road winds up to the summit of North Mountain, where it was found by Mr. Peter Jack of Halifax, who kindly supplied a specimen for examination. The plant credited in "Ferns of North America" to British Columbia as *Woodsia obtusa*, on the authority of a list of the specimens collected in 1861 on the Galton Mountains by Dr. Lyall, is not that species, but, as Prof. Eaton recently writes, *Woodsia scopulina*, while Prof. How's plant so called, collected at Windsor, Nova Scotia, and now in the provincial museum at Halifax, is only a form of *Cystopteris fragilis*.

* * *Indusia* small, never covering the sori, split into narrow segments or reduced to minute ciliae.

5.—*W. SCOPULINA*, *D. C. Eaton*, (Rocky Mountain *Woodsia*), *Hook.* and *Baker*, *Syn. Fil.*, 48. *Macoun's Cat.*, No. 2328. *Eaton*, *Ferns of N. A.*, II, 193. *Underwood*, *Our Nat. Ferns*, etc., 110.

W. obtusa, *Gray*, not of *Torrey*.

A non-evergreen species usually from 6 to 12 inches high, growing in dense masses on rocks and in their crevices, chiefly in the shade. Rootstocks short, creeping, very

chaffy, covered with old stalk-bases; stalks shorter than the fronds, quite dark near the base but lighter upward, puberulent with minute pointed hairs and stalked glands; fronds lanceolate in outline, 4 to 8 inches long by 9 lines to 2 inches wide, pinnate, rachis and under surface puberulent and glandular like the stalk; pinnæ numerous, oblong-ovate, sub-acute, deeply pinnatifid into short, ovate or oblong, obtuse, crenulate or toothed lobes; sori sub-marginal; indusia very delicate and deeply cleft into narrow segments which terminate in short hairs.

Specimens vary greatly in the amount of their pubescence, the smoother forms being very difficult to distinguish from *W. Oregana*. Some British Columbian specimens from near Yale have fronds fully two inches wide with the pinnæ so crowded as to overlap.

In the United States this species extends as far eastward as Minnesota, but with us, as far as known at present, it is confined to the Rocky Mountains and British Columbia. Rocky Mountains and Elk River, Kootanie Valley, B. C.—*G. M. Dawson*. Among loose rocks on mountain side, specimens thirteen inches long, at Lytton, B. C., also on Mount Finlayson, near Victoria, Vancouver Island, B. C.—*J. Fletcher*. Along the Fraser and Thompson Rivers, B. C., from Yale to Spence's Bridge, and on the mountains at these places; abundant in Kicking House Pass, Rocky Mountains. N. W. T.—*Macoun*.

6.—*W. OREGANA*, *D. C. Eaton*, (Oregon Woodsia), Gray, Man., 669. *Macoun's Cat.*, No. 2329. *Watt, Can. Nat.*, IV, 363. *Eaton, Ferns of N. A.*, II, 185. *Underwood, Our Nat. Ferns*, etc., 110.

W. obtusa, var. *Lyallii*, Hooker.

This is a delicate, non-evergreen fern, with the fertile and sterile fronds somewhat unlike (the former being the taller), growing from 5 to 10 inches high in dense patches in the crevices of rocks, very often where exposed to the sun. Rootstocks short, creeping, chaffy, covered with old stalk-bases; stalks usually rather more than half the length of the fronds, slender, chaffy below when young, darkened near the base but greenish or straw-colored above; fronds lanceolate or linear-lanceolate, 3 to 6 inches long by 8 to 12 lines wide, smooth, pinnate; pinnæ triangular-oblong, obtuse or acutish, pinnatifid into segments, which are obtuse, oblong or ovate, crenate or toothed, with the teeth often reflexed and covering the sub-marginal sori; indusia very minute and divided almost to the centre into a few beaded hairs.

Woodsia Oregana and *scopulina* are very much alike, and, unless the specimens are in good condition, it is difficult to distinguish the one from the other. The most important distinctions are the minute glandular pubescence of the latter, the difference in the division of its larger indusia, and the similarity of its fertile and sterile fronds. In general appearance, too, *W. Oregana* resembles small forms of *W. obtusa*, from which, however, its glabrous fronds and rudimentary involucre distinguish it. Forking fronds are not uncommon in this species.

The Oregon Woodsia, ranges from British Columbia eastward to Lake Nipigon, while northward it is known to reach as high as Lake Athabasca. Along the Fraser and Thomson Rivers, B. C., from Yale to Spence's Bridge; on Blackwater River, along the Telegraph Trail, and at Fort St. James, northern British Columbia; Peace River Pass, Rocky Mountains; Fort Chipewyan, Lake Athabasca, N. W. Ter., Lat. 58° 48'; crevices of rocks, Blackwater River, Lake Nipigon, Ont., 1884, a very glandular form.—*Macoun*.

Genus XVIII.—DICKSONIA, *L'Her.*, DICKSONIA.

1.—*D. PILOSIUSCULA*, *Willd.*, (Hairy Dicksonia, Gossamer-Fern, Hay-scented Fern), *Hook.*, *Fl. Bor.-Am.*, II, 264. *Pursh*, II, 671. *Eaton*, *Ferns of N. A.*, I, 339. *Underwood*, *Our Nat. Ferns*, etc., 111.

D. pubescens, *Swartz*.

D. punctilobula, *Kunze*, *Gray*, *Man.*, 669. *Provancher*, *Fl. Can.*, 720. *Macoun's Cat.*, No. 2331. *Fowler's N. B. Cat.*, No. 767. *Ball*, *Trans. N. S. Inst. Nat. Sci.*, IV, 155.

Nephrodium punctilobulum, *Mx.*, *Fl. Bor.-Am.*, II, 268.

Aspidium punctilobulum, *Swartz*, *Syn. Fil.*, 60.

Dennstaedtia punctilobula, *Moore*, *Lawson*, *Can.*, *Nat.*, I, 287.

The Gossamer-Fern is a very delicate and beautiful species, with pale-green, feathery fronds, which wither quickly when plucked, decay in autumn, and give out a pleasant hay-like odour in drying. It is a rather common fern in eastern North America, growing in moist soil in pastures and open woods, and on rocky hillsides, reaching a height of 1½ to 4 feet. Rootstock slender, branching, extensively creeping, naked except for a little hair at its growing extremity; stalks commonly forming about one-third or less of the height of the plant, scattered, stout, erect, darkened toward the base but gradually fading to straw-color, greenish when fresh, chaffless but somewhat puberulent; fronds ovate-lanceolate in outline, 1 to 3 feet long by 3 to 10 inches wide, long pointed, hairy and minutely glandular especially beneath, bi-pinnate; pinnæ lanceolate and pointed; pinnules oblong, mostly obtuse, pinnatifid into oblong and obtuse, cut toothed lobes; sori minute, each on a recurved toothlet, usually one at the upper margin of each lobe of the pinnules.

Forking fronds and pinnæ of this fern are far from rare, but beyond this it seems to be subject to little variation except that of size, and of a greater or less degree of pubescence and glandulosity.

In its range this fern seems to be confined to about the eastern third of our territory, not extending westward beyond the Georgian Bay. Very common in Nova Scotia.—*Rev. E. H. Ball*. Very abundant in New Brunswick.—*Fowler*. Common in extreme eastern Quebec.—*Macoun*. Lennoxville and Waterloo, Que.—*Hon. Wm. Sheppard*. Richmond and Drummond Cos., Que.—*J. A. Bothwell*. Sorel, Que.—*Lady Dalhousie*. Montreal, Que.—*MacLagan*. Abundant in Harrington Township and on Hamilton's Farm, River Rouge, Argenteuil Co., Que.—*W. S. M. D'Urban*. Abundant in Stewart's Bush, Ottawa, Ont., and at Casselman, Ont.—*J. Fletcher*. Near Prescott, Ont.—*B. Billings*. Near Kingston, Ont.—*J. Bell*. Common along the roadside between Flinton and the Addington Road, Addington Co., Ont.; low rich woods a little east of Norwood, Peterboro Co., Ont.—*Macoun*. Parry Sound, Georgian Bay, Ont.—*Logie*.

Genus XIX.—SCHIZÆA, *Smith*, SCHIZÆA.

1.—*S. PUSILLA*, *Pursh*, (New Jersey Schizæa, One-sided Fern), ~~Gray~~ ^{Gray}, II, 657. *Man.*, 669. *Hook. and Baker*, *Syn. Fil.*, 428. *Lawson*, *Can. Nat.*, I, 291. *Eaton*, *Ferns of N. A.*, I, 185. *Underwood*, *Our Nat. Ferns*, etc., 113.

S. filifolia, *De la Pylaie*.

S. tortuosa, Muhl.

This is an extremely local, and very peculiar looking, little sedge-like plant, $1\frac{1}{2}$ to 4 inches high, growing in tufts in low grounds. The sterile and fertile fronds are unlike, the former resembling bunches of short curled leaves, the latter straighter and projecting above them like a slender culm. Rootstock very minute, horizontal, and creeping; sterile fronds linear, very slender, flattened, tortuous, scarcely an inch long by a quarter of a line wide; fertile fronds equally slender, but straighter, $1\frac{1}{2}$ to 4 inches long, bearing at the top a triangular-ovate fertile appendage, which is 2 to 4 lines broad at the base by usually a little less length, and consists of 4 to 6 pairs of closely placed oblong pinnæ; the two halves of the appendage usually folded together, at least in the dried specimen.

For this rare American fern but one station is known in Canada, viz., on the shore of Grand Lake, twenty-three miles from Halifax, N. S., where it was discovered in August, 1879, by a Miss Knight. It has not been found since that time though carefully searched for by Mr. McKay, of Pictou, who says, however, that bush fires have swept over the place since it was got, which may account for its absence. It had previously been recorded by De la Pylaie as occurring in Newfoundland, and its discovery in Nova Scotia is particularly interesting as confirming the authenticity of that station.

Genus XX.—OSMUNDA, L., FLOWERING-FERN.

* Sterile fronds fully bipinnate with separate pinnules.

1.—*O. REGALIS*, L., (Royal-Fern, Flowering-Fern), Swartz, Syn. Fil., 160. Mx., Fl. Bor.-Am., II, 273. Gray, Man., 670. Hook. and Baker, Syn. Fil., 427. Provancher, Fl. Can., 721. Macoun's Cat., No. 2332. Fowler's N. B. Cat., No. 768. Ball, Trans. N. S. Inst. Nat. Sci., IV, 155. Watt, Can. Nat., IV, 364. Eaton, Ferns of N. A., I, 209. Underwood, Our Nat. Ferns, etc., 113.

O. spectabilis, Willd., Pursh, II, 658. Hook., Fl. Bor.-Am., II, 265.

O. regalis, var. *spectabilis*, Milde, Lawson, Can. Nat. I, 290.

O. glaucescens, Link.

An elegant, non-evergreen, pale green fern, commonly 2 to 5 feet high, growing in swamps, wet woods, low thickets, and by the margins of ponds and rivers, sometimes even in running water. The fertile and sterile fronds are unlike, the former producing at their summits a racemose panicle of fructification. Rootstock creeping and greatly thickened with imbricated stalk-bases; stalks erect, stout, tufted, commonly about half the length of the fronds, smooth or with a little brown deciduous cobwebby wool, their bases dilated to form stipular wings; sterile fronds ovate-oblong in outline, $1\frac{1}{4}$ to $3\frac{1}{2}$ feet long by 8 to 20 inches wide, smooth, bipinnate; pinnæ stalked, with rather leathery, sessile or short-stalked pinnules, which are commonly oblong-oval, obtuse, obliquely-truncate at the base, and crenulate-serrate; fertile fronds like the sterile except that several of the upper pinnæ are contracted and bipinnate, with the cylindrical divisions non-foliaceous and covered with bright brown sporangia.

The sterile pinnules vary greatly in size and shape, but none of these variations seem constant enough to justify any attempt at the formation of distinct varieties thereon. In size they run from 9 lines to 2 inches in length by 3 to 8 lines wide, while in shape

they may be broadly-oval or oblong-lanceolate. Their apices may be sub-acute and their bases very unequal, rounded, sub-cordate or auricled on the lower side, while the margins may be entire or lobed in their lower half. The American plant has been described as a distinct species, under the names *O. glaucescens* and *O. spectabilis*, also as a distinct variety *O. regalis* var. *spectabilis*, but it corresponds too closely to the European to admit of such separation. The distinctions of the European *O. regalis* have been found in its darker colour, greater size, more spreading pinnæ, and auricled pinnules, but American specimens identical in all these respects are not at all uncommon. As regards the fertile fronds, sometimes some of the fruiting pinnæ are but partly contracted and continue leaf-life with sporangia along their margins, a state analogous to var. *obtusilobata* of *Onoclea sensibilis*, or, again, the fruiting may imitate that of *O. Claytoniana*, the frond being fertile in the middle and barren above and below, var. *interrupta*, Milde. K/

This plant was formerly esteemed as possessing astringent and emmenagogue properties, but is now considered of little value. In the northern parts of England an infusion of the rhizome, which is very starchy, is a popular remedy for rickets, and an application to sprains and bruises, while in the north of Europe a similar infusion has been used as a starch.

The Royal-Fern is very common in most parts of the eastern half of our territory, but becomes rare toward its western limit, which, according to Richardson and Eaton, is the Saskatchewan. Observed north of Lake Superior at Round Lake, on the line of the Canadian Pacific Railway, twelve miles east of the Pic River, and at Currant River, Thunder Bay.—*Macoun*. Muskeg Island, Lake Winnipeg.—*J. M. Macoun*.

* * Sterile fronds pinnate, with deeply pinnatifid pinnæ.

2.—*O. CLAYTONIANA*, L., (Clayton's Flowering-Fern, Interrupted Fern), Swartz, Syn. Fil., 160. Pursh, II, 657. Gray, Man., 670. Hook. and Baker, Syn. Fil., 426. Lawson, Can. Nat., I, 291. Macoun's Cat., No. 2333. Fowler's N. B. Cat., No. 768. Ball, Trans. N. S. Inst. Nat. Sci., IV, 155. Watt, Can. Nat., IV, 364. Eaton, Ferns of N. A., I, 219. Underwood, Our Nat. Ferns, etc., 113.

O. interrupta, Mx., Fl. Bor.-Am., II, 273. Hook., Fl. Bor.-Am., II, 265. Pursh, II, 657. Provancher, Fl. Can., 721.

Struthiopteris Claytoniana, Bernh.

This is a handsome, non-evergreen species, commonly about 2 to 4 feet high, growing in circular tufts in low grounds, wet woods and thickets. The sterile and fertile fronds are unlike, the former growing generally on the outside of the circle, gradually curve gracefully outward in all directions to form a vase-like surrounding for the latter, which are taller, erect, and have a few of the middle pairs of pinnæ contracted and covered with sporangia. Rootstock creeping, greatly thickened with imbricated stalk-bases; stalks stout, erect, usually a little more than half as long as the fronds, when young clothed with loose, brownish wool, with stipular wings at the base; sterile fronds oblong-lanceolate in outline, $1\frac{1}{4}$ to $2\frac{1}{2}$ feet long by 6 inches to 1 foot wide, woolly when young but smooth, except for a little of the wool in the axils of the pinnæ and along the midribs, when mature, rounded or short pointed at the apex, pinnate; pinnæ short-stalked, oblong-lanceolate, rather obtuse, deeply pinnatifid into ovate-oblong, obtuse, entire, oblique pinnules; fertile fronds like the sterile, except that 2 to 5 pairs of the central pinnæ (which

wither early in the summer), are contracted and bipinnate, with the divisions cylindrical, non-foliaceous and covered with dark-green sporangia.

This fern is subject to slight variations in the shape of its pinnæ and pinnules. The former are occasionally acutish instead of obtuse, and Prof. Lawson, in *Can. Nat.*, mentions a lax form in which they are remarkably short and somewhat triangular; the latter are sometimes seen obscurely crenulate toward the apex. The position of the fertile pinnæ, instead of being about the middle of the frond, may be near the top or bottom of it, and the number may be unequal on the two sides of the rachis. Rarely some, or even all, the fertile segments retain a foliaceous character and bear marginal fructification.

Though unaware of their ever having been used, the rhizomes of this fern possess properties somewhat similar to those of *O. regalis*, and the dried fronds have been utilized in the Lower Provinces as a winter fodder for sheep.

The Interrupted-Fern is very common throughout most parts of Canada, from Nova Scotia to Lake Superior, and probably finds its western limit in Manitoba. In the east it prefers swamps, but west of Lake Superior it is found in open woods. Not uncommon around Lake Nipigon and Thunder Bay.—*Macoun*. Collected by Bourgeau at Sturgeon Lake, some hundred miles north-west of Lake Superior, and, according to Milde, on Lake Winnipeg.

3.—*O. CINNAMOMEA*, L., (Cinnamon-Fern), Swartz, *Syn. Fil.*, 160. *Mx.*, *Fl. Bor.-Am.*, II, 273. Pursh, II, 657. Hook., *Fl. Bor.-Am.*, II, 265. Gray, *Man.*, 670. Hook. and Baker, *Syn. Fil.*, 426. Provancher, *Fl. Can.*, 721. Lawson, *Can. Nat.*, I, 290. Macoun's *Cat.*, No. 2334. Fowler's *N. B. Cat.*, No. 768. Ball, *Trans. N. S. Inst. Nat. Sci.*, IV, 155. Eaton, *Ferns of N. A.*, I, 227. Underwood, *Our Nat. Ferns*, etc., 114.

O. Claytoniana, Conrad, not of L.

Struthiopteris cinnamomea, Bernh.

The Cinnamon-Fern is a non-evergreen species, growing in large clumps, from 1½ to 5 feet high, in cedar swamps, low grounds and moist thickets. The sterile and fertile fronds are unlike, the former, which are foliaceous, forming, as in *O. Claytoniana*, a green, vase-like surrounding for the latter, which are cinnamon-coloured, non-foliaceous and erect. The fertile fronds, which mature their fruit as they unfold, appear before the sterile and wither early in the season, before the latter complete their growth. Rootstock creeping, much thickened with imbricated stalk-bases; stalks stout, erect, the sterile about half as long as the fronds but the fertile about the same length, stipulate at the base, when young clothed with abundant rusty wool; sterile fronds oblong-lanceolate in outline, 1 to 3½ feet long by 6 inches to 1½ feet wide, densely rusty-woolly when young but nearly smooth at maturity, pointed or even acuminate, pinnate; pinnæ short-stalked, oblong-lanceolate, acute, deeply pinnatifid into ovate-oblong, obtuse, entire, oblique pinnules; fertile fronds very woolly when young, having all the pinnæ contracted and bipinnate, with the divisions cylindrical, non-foliaceous and covered with cinnamon-brown sporangia.

In the absence of fructification, this plant is not always easily distinguishable from *O. Claytoniana*, the most evident differences being that in *O. cinnamomea* the apex of the frond, as well as of each of the individual pinnæ, is decidedly acute or even acuminate, usually, too, the pinnæ are narrower. As stated by Mr. Davenport in the *Torrey Bulletin*,

Vol. IX, p. 101, a good distinguishing point between the sterile fronds is, that in *O. cinnamomea* at the base of each pinna there is a small, persistent bunch of wool, which is nearly or wholly wanting in *O. Claytoniana*.

Like the other Osmundas, variations in the pinnæ and pinnules are not very uncommon. The former may be more lanceolate than oblong-lanceolate, and the latter may be somewhat acute, obscurely crenulate and even in the lower ones elongated and pinnatifid, or more or less imbricated. Fertile fronds are occasionally found in which a few or most of the lower pinnæ are barren, thus imitating the normal method of fruiting in *O. regalis*, a state which constitutes the var. *frondosa*, Gray. Occasionally, too, fronds are found copying *O. Claytoniana* in being fertile in the middle, while more rarely the apex is barren and the base fertile. Var. *alata*, Hook., has the rachis slightly wing-margined, a not uncommon character of large fronds, while pinnæ, retaining a more or less foliaceous character, with a marginal fructification, are found from time to time. Var. *imbricans*, Milde, a very close approach to which is sometimes seen in American specimens, has rigid fronds, with the segments elongated and overlapping each other.

The rhizomes of this fern have been reputed to possess demulcent, sub-astringent, and tonic properties. Boiled in milk, they yield a fine mucilage, which is useful in diarrhœa.

Very common throughout Nova Scotia, New Brunswick, Quebec and Ontario to Georgian Bay, which probably is with us its western limit, though it is recorded by Lawson in the "Canadian Naturalist" as having been found at Two Heart River, Lake Superior, by R. Bell, Jr. Var. *frondosa* has been found at the following places: Windsor, N. S.—How. Halifax Water-Works, Halifax Co., N. S.—P. Jack. Molus River, Kent Co., N. B.—Fowler. Bismark, Ont., along the Canada Southern Railway.—Macoun.

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