Order 131. FÍLICES. (Ferns,)

Leafy plants, with the leaves (fronds) *usually raised on a stalk or petiole* (stipe), *rising from a* (sometimes greatly elongated) *rootstock, separately rolled up* (circinate) *in the bud, and bearing on the under surface or along the margin small reticulated sporangia, which at length split open and discharge the numerous minute spores. Prothallus green, above ground, normally monœcious.*

Suborder I. **Polypodiàceæ.** Sporangia collected in dots, lines, or variously shaped clusters (*sori* or *fruit-dots*) on the back or margins of the frond or its divisions, cellular-reticulated, stalked, the stalk running into a vertical incomplete many-jointed ring, which by straightening at maturity ruptures the sporangium transversely on the inner side, discharging the spores. Fruit-dots often covered (at least when young) by a membrane called the *indusium* (or less properly the *involucre*), growing either from the back or the margin of the frond. (Plates 16–19.)

Tribe I. POLYPODIEÆ. Fructification on the back of the frond, in round or roundish fruit-dots (*sori*) placed on the veins or at the ends of the veins, without indusium of any kind. Stipes articulated to the rootstock, leaving a distinct scar when separated. Veins free (not reticulated) in our species.

1. **Polypodium.** Sori round, in one or more rows, on each side of the midrib or of the segments of the frond.

Tribe II. GRAMMITIDEÆ. Sori more or less elongated, without indusium, placed on the back of the frond, usually along the veins or near their extremities. Veins free in our species.

2. **Notholæna.** Sori short, of few rather large sporangia, placed near the tips of the veins; under surface of the frond usually either chaffy, woolly, or powdery.

Tribe III. PTERIDEÆ. Fructification marginal or intramarginal, provided with a general indusium formed of the (either altered or unchanged) margin of the frond. Stipes not articulated to the rootstock. Veins free in all our species.

* Sporangia at the ends of the veins, on a reflexed portion of the margin of the frond.

3. **Adiantum.** Midrib of the pinnules marginal or none. Stipe black and polished.

* * Sporangia borne on a continuous marginal vein-like receptacle, connecting the apices of the veins, and covered by a delicate whitish indusium formed of the reflexed margin.

4. **Pteris.** Midrib of the pinnules central. Stipe light-colored.

* * * Sporangia at or near the ends of the unconnected veins, borne on the under surface of the frond; indusium various.

5. **Cheilanthes.** Sori minute, at the ends of the veins; indusium continuous or interrupted. Fronds mostly chaffy, woolly, or pulverulent, rarely smooth.

6. **Pellæa.** Sori on the upper part of the veins, distinct, or mostly forming a confluent submarginal band of sporangia. Indusium membranaceous, continuous, rarely wanting. Sterile and fertile fronds not very unlike; stipes dark-colored; fronds smooth.

7. **Cryptogramme.** Sori roundish or elongated and extending far down the free veins, at first covered by the very broad continuous indusium, at length exposed and confluent. Sterile and fertile fronds very different; stipes light-colored; fronds smooth.

Tribe IV. BLECHNEÆ. Sori oblong or linear, borne on a veinlet parallel to the midrib, and covered with a special usually concave or arched indusium attached to the fruiting veinlet, and opening along the inner side.

8. **Woodwardia.** Sori forming a chain-like row each side of the midrib or central vein. Veins reticulated.

Tribe V. ASPLENIEÆ. Sori more or less elongated, occupying one or both sides of oblique veins, covered by a special indusium which is attached by one side to the fertile vein, and is free on the other. Stipes not articulated.

9. **Asplenium.** Sori on the upper side or rarely on both sides of a veinlet. Veins free in all our species.

10. **Scolopendrium.** Sori linear, confluent in pairs, each pair appearing like a single sorus with a double indusium opening down the middle. Veins free.

11. **Camptosorus.** Sori oblong, variously curved, or some of them in opposite pairs. Veins reticulated.

Tribe VI. ASPIDIEÆ. Sori round or roundish, on the back or rarely at the apex of the vein, with a special indusium, rarely naked. Stipes not articulated to the rootstock.

* Indusium obsolete or none.

12. **Phegopteris.** Sori round, rather small. Veins free in our species.

* * Indusium evident, round or roundish, covering the sporangia, at least when young. Sterile and fertile fronds not very unlike. Veins free in our species.

13. **Aspidium.** Indusium flat or slightly convex, orbicular or round-reniform, fixed by the centre, opening all round the margin.

14. **Cystopteris.** Indusium convex, fixed by a broad base partly under the sorus, commonly reflexed as the sporangia ripen.

* * * Indusium obscure, irregularly semicircular. Fertile fronds much contracted and very unlike the sterile ones.

15. **Onoclea.** Sporangia on an elevated receptacle; divisions of the fertile frond pod-like or berry-like.

Tribe VII. WOODSIEÆ. Sori round, borne on the veins; indusium fixed under the sorus, divided into segments or into slender filaments.

16. **Woodsia.** Small ferns with free veins. Indusium very delicate.

Tribe VIII. DICKSONIEÆ. Sori roundish, marginal or submarginal. Indusium cup-shaped or two-valved, the outer portion composed of a reflexed lobule of the frond, or more or less united to it.

17. **Dicksonia.** Indusium in our species small, membranaceous, nearly globular. Frond elongated, decompound.

Suborder II. **Hymenophyllàceæ.** Sporangia sessile on a bristle-like receptacle within a cup-shaped or bivalvular involucre, the ring transverse and complete. Fronds delicately membranaceous.

18. **Trichomanes.** Involucres funnel-form or cup-shaped.

Suborder III. **Schizæàceæ.** Sporangia ovate, sessile, having a complete transverse articulated ring at the apex, and opening by a longitudinal slit. (Pl. 19.)

19. **Schizæa.** Sporangia naked, fixed in a double row to the midrib of the narrow fertile segments. Sterile fronds rigid, simple or dichotomously branched.

20. **Lygodium.** Sporangia borne in a double row on narrow fertile segments, each sporangium seated on a separate veinlet, and provided with a special scale-like indusium. Fronds leafy, climbing.

Suborder IV. **Osmundàceæ.** Sporangia naked, globose, mostly pedicelled, reticulated, with no ring or mere traces of one near the apex, opening into two valves by a longitudinal slit. Stipes winged at base and almost stipulate! (Pl. 19.)

21. **Osmunda.** Fertile pinnæ or fronds very much contracted, bearing the abundant and large sporangia upon the margins of the very narrow segments. Veins free.

1. POLYPÒDIUM, L. Polypody. (Pl. 16.)

Fruit-dots round, naked, arranged on the back of the frond in one or more rows each side of the midrib or central vein, or irregularly scattered, each borne in our species on the end of a free veinlet. Rootstocks creeping, branched, often covered with chaffy scales, bearing scattered roundish knobs, to which the stipes are attached by a distinct articulation. (Name from πολύς, *many*, and πούς, *foot*, alluding to the branching rootstock.)

1. **P. vulgàre,** L. (Pl. 16, fig. 1–3.) Fronds evergreen, oblong, *smooth both sides*, 4–10′ high, simple and deeply pinnatifid; the divisions linear-oblong, obtuse or somewhat acute, remotely and obscurely toothed; veins once or twice forked; *fruit-dots large, midway between the midrib and the margin.* — Rocks; common. July. (Eu.)

2. **P. incànum,** Swartz. Fronds evergreen and coriaceous, oblong, 2–6′ high, *grayish and very scurfy underneath with peltate scales*, simply pinnatifid; the divisions oblong-linear, obtuse; *fruit-dots rather small, near the margin;* veins forking, free in the N. American plant! — Rocks and trunks of trees, Va. and Ohio to Ill., and southward. Aug.

2. NOTHOLÆNA, R. Brown. Cloak-Fern.

Fruit-dots roundish or oblong, placed near the ends of the veins, soon more or less confluent into an irregular marginal band, with no proper involucre. Veins always free. Fronds of small size, 1–4-pinnate, the lower surface almost always either hairy, tomentose, chaffy, or covered with a fine waxy white or yellow powder. (Name from νόθος, *spurious*, and λαῖνα, *a cloak*, the woolly coating of the original species forming a spurious covering to the sporangia.)

1. **N. dealbàta,** Kunze. Fronds triangular-ovate, 1–3′ long, 3–4-pinnate; rhachis and branches straight, black and shining; ultimate pinnules scarcely a line long, white and powdery on the lower surface. — Clefts of calcareous rocks, Mo., Kan., and southwestward. July–Aug.

3. ADIÁNTUM, L. Maidenhair. (Pl. 17.)

Fruit-dots marginal, short, borne on the under side of a transversely oblong, crescent-shaped or roundish, more or less altered margin or summit of a lobe or tooth of the frond reflexed to form an indusium; the sporangia attached to the approximated tips of the free forking veins. — Main rib (costa) of the pinnules none (in our species), or at the lower margin. Stipes black and polished. (The ancient name, from α- privative and διαίνω, meaning *unwetted*, the smooth foliage repelling rain-drops.)

1. **A. pedàtum,** L. (Pl. 17, fig. 1–3.) *Frond forked at the summit of the upright slender stalk* (9–15′ high), the recurved branches bearing on one side several slender spreading pinnate divisions; pinnules numerous, short-stalked and obliquely triangular-oblong, entire on the lower margin, from which the veins all proceed, and cleft and fruit-bearing on the other. — Rich, moist woods. July. — A delicate and most graceful Fern.

2. **A. Capillus-Véneris,** L. *Fronds with a continuous main rhachis, ovate-lanceolate,* 9–18′ long, often pendent, 2–3-pinnate at the base, the upper third or half simply pinnate; pinnules wedge-obovate or rhomboid, 6–12″ long, deeply and irregularly incised; veinlets flabellately forking from the base; involucres lunulate or transversely oblong. — Moist rocky places, Va. to Mo., and southward. (Eu.)

4. PTÈRIS, L. Brake or Bracken. (Pl. 17.)

Sporangia in a continuous slender line of fructification, occupying the entire margin of the fertile frond, and covered by its reflexed narrow edge which forms a continuous membranaceous indusium, attached to an uninterrupted transverse vein-like receptacle connecting the tips of the forked free veins. — Fronds 1–3-pinnate or decompound. (The ancient Greek name of Ferns, from πτερόν, *a wing*, on account of the prevalent pinnate or feathery fronds.)

1. **P. aquilina,** L. (Common Brake.) Frond dull green (2–3° wide), ternate at the summit of an erect stout stalk (1–2° high), the widely spreading branches twice pinnate; pinnules oblong-lanceolate; the upper undivided; the lower more or less pinnatifid, with oblong obtuse lobes, margined all round with the indusium, which is really double in this species. — Var. caudàta, with the lobes very narrow and revolute, the terminal ones much elongated, is a southern form, which extends in a modified condition as far north as New Jersey. — Thickets and hillsides, common. Aug. (Eu.)

5. CHEILÁNTHES, Swartz. Lip-Fern. (Pl. 17.)

Sporangia borne on the thickened ends of free veinlets, forming small and roundish distinct or nearly contiguous marginal fruit-dots, covered by a mostly whitish and membranaceous, sometimes herbaceous, common indusium, formed of the reflexed margin of separate lobes or of the whole pinnule. — Low, mostly with 2–3-pinnate and hairy or chaffy, rarely smooth fronds, the sterile and fertile nearly alike, the divisions with the principal vein central. Some species with continuous indusium connect this genus very closely with the next. (Name composed of χεῖλος, *a lip*, and ἄνθος, *flower*, from the shape of the indusium.)

* *Fronds smooth, or at most hairy.*

1. **C. Alabaménsis,** Kunze. *Fronds smooth,* chartaceous (2–8′ long), ovate-lanceolate, bipinnate; pinnæ numerous, oblong-lanceolate; pinnules triangular-oblong, rather acute, often auriculate or lobed; *indusium continuous, rather broad, pale, and of firm consistence.* — On rocks, mountains of Va. to Ky., and southward.

2. **C. vestita,** Swartz. (Pl. 17, fig. 1, 2.) Fronds (6–15′ high), lanceolate-oblong, hirsute, as are the brown and shining stipes, with *straightish prominently articulated rusty hairs*, twice pinnate; pinnæ rather distant, triangular-ovate; pinnules oblong, crowded (2–4″ long), more or less incised, *the ends of the roundish or oblong lobes reflexed and forming separate herbaceous involucres*, which are pushed back by the ripened sporangia. — Clefts of rocks, Manhattan Island (*W. W. Denslow*) and N. J. to Ill., and southward.

* * *Fronds woolly or tomentose.*

3. **C. tomentòsa,** Link. Fronds (12–20′ high) lanceolate-oblong, densely tomentose with *slender and entangled whitish obscurely articulated hairs*, thrice pinnate; primary and secondary pinnæ oblong or ovate-oblong; *pinnules distinct*, minute (½–1″ long), roundish-obovate, sessile or adnate-decurrent, the upper surface less woolly, *the reflexed narrow margin forming a continuous some-*

what membranaceous indusium. — Mountains of Va. and Ky.; thence west and southward. — Stipe and rhachis rather stout, brown, covered with narrow chaffy scales and whitish hairs.

4. **C. lanuginòsa,** Nutt. Stipes slender, at first hairy, black or brown, shining; fronds (3 – 6′ high) ovate-lanceolate, woolly with *soft whitish distinctly articulated flattened hairs*, becoming smoother above, twice or thrice pinnate; pinnæ (5.– 6″ long) ovate, the lowest distant, the others contiguous; *pinnules crenately pinnatifid*, or mostly divided into minute and roundish densely crowded segments (½ – 1″ long), *the herbaceous margin recurved forming an almost continuous indusium.* — In dense tufts, on dry rocks and cliffs, Ill. to Minn., thence west and southward.

6. PELLÆA, Link. Cliff-Brake. (Pl. 16.)

Sporangia in roundish or elongated clusters on the upper part of the free veins, distinct, or confluent laterally so as to imitate the marginal continuous line of fructification of Pteris, commonly covered by a broad membranaceous and continuous (rarely interrupted) general indusium, which consists of the reflexed and altered margin of the fertile pinnule or division. Small ferns, with 1 – 3-pinnate fronds, the fertile ones with narrower divisions than the sterile, but otherwise similar. Stipes generally dark-colored, smooth and shining. (Name from πελλός, *dusky*, alluding to the stipe.)

1. **P. grácilis,** Hook. (Pl. 16.) Fronds smooth (3 – 6′ high), *delicately membranaceous and slender*, of few pinnæ, the lower ones once or twice pinnately parted into 3 – 5 decurrent divisions, those of the fertile frond oblong or linear-oblong, entire or sparingly incised; of the sterile ovate or obovate, crenate or incised; veins of the fertile fronds mostly only once forked. — Shaded calcareous rocks, Mass. to Minn., and northward; rare. July. — Rootstock very slender, creeping; stipes polished, brownish, darker and sparingly chaffy at base.

2. **P. atropurpùrea,** Link. Smooth, except some bristly-chaffy hairs on the midribs and especially on the *dark purple and polished stalk* and rhachis, 6 – 15′ high; *frond coriaceous*, pale, once or below twice pinnate; the divisions broadly linear or oblong, or the sterile sometimes oval, chiefly entire, somewhat heart-shaped or else truncate at the stalked base; veins about twice forked. — Dry calcareous rocks; not common, but of wide range. July. — Rootstock short and stout; stipes clustered.

7. CRYPTOGRÁMME, R. Brown. Rock-Brake.

Fruit-dots roundish or elongated and extending far down on the free forking veins. True involucre or indusium none, the herbaceous margins of the fertile segments at first reflexed and meeting at the midrib, at length opening out flat and exposing the confluent sporangia. — Low ferns, with smooth, 2 – 3-pinnate fronds, the fertile ones taller than the sterile, and with much narrower divisions. (Name from κρυπτός, *hidden*, and γραμμή, *a line*, alluding to the lines of sporangia at first concealed by the reflexed margin.)

1. **C. acrostichoides,** R. Brown. Stipes densely tufted, straw-colored; fronds 2 – 3-pinnate (6 – 10′ high); fertile segments stalked, linear or linear-oblong (3 – 5″ long), the sporangia in lines extending down the veins almost

to the midrib, confluent when ripe and covering the under surface of the now fully opened segments; sterile fronds on much shorter stipes, with ovate or obovate decurrent and crenately toothed or incised segments. (Allosorus acrostichoides, *Sprengel.*) — On rocks, from L. Superior westward and northward. — Very near C. crispa of Eu.

8. WOODWÁRDIA, Smith. Chain-Fern. (Pl. 17.)

Fruit-dots oblong or linear, arranged in one or more chain-like rows on transverse anastomosing veinlets parallel and near to the midrib. Indusium fixed by its outer margin to the fruitful veinlet, free and opening on the side next the midrib. Veins more or less reticulated, free toward the margin of the frond. — Large ferns, with pinnatifid or pinnate fronds. (Named for *Thomas J. Woodward*, an English botanist.)

§ 1. ANCHÍSTEA. *Sterile and fertile fronds alike; veins forming only one row of meshes (areoles).*

1. **W. Virgínica,** Smith. (Pl. 17, fig. 4, 5.) Fronds (2 – 3° high) pinnate, with numerous lanceolate pinnatifid pinnæ; segments oblong; veins forming a row of narrow areoles along the midrib both of the pinnæ and of the lobes, the outer veinlets free; fruit-dots oblong, one to each areole, confluent when ripe. — Wet swamps, Maine to Ark., and southward. Rootstocks creeping, often 6 – 8° long! July.

§ 2. LORINSÈRIA. *Sterile and fertile fronds unlike; veins of the sterile fronds forming many rows of meshes.*

2. **W. angustifòlia,** Smith. (Pl. 17, fig. 1 – 3.) Fronds pinnatifid; sterile ones (12 – 18′ high) with lanceolate serrulate divisions united by a broad wing; fertile fronds taller, with narrowly linear almost disconnected divisions, the areoles and fruit-dots (4 – 5″ long) in a single row each side of the secondary midribs; rootstocks creeping. — Wet woods, New Eng., near the coast, to Ark., and southward; rare. Aug., Sept.

9. ASPLÈNIUM, L. Spleenwort. (Pl. 18.)

Fruit-dots oblong or linear, oblique, separate; the straight, or rarely curved, indusium fixed lengthwise by one edge to the upper (inner) side of the fertile vein; — in some species a part of the fruit-dots are double, the fertile vein bearing two indusia placed back to back. Veins free in all our species. (Name from α- privative and σπλήν, *the spleen*, for supposed remedial properties.)

§ 1. ASPLENIUM proper. *Indusium straight or slightly curved, attached to the upper side of the vein, rarely double.*

* *Small evergreen ferns; fronds pinnatifid, or pinnate only near the base.*

1. **A. pinnatífidum,** Nutt. *Fronds* (3 – 6′ long) lanceolate, *pinnatifid, or pinnate below, tapering above into a slender prolongation,* "the apex sometimes rooting"; *lobes roundish-ovate, obtuse, or the lowest pair long-acuminate;* fruit-dots irregular, those next the midrib often double, even the slender prolongation fertile. — On cliffs and rocks, Penn. to Mo., and southward; very rare. July. — Resembles the Walking-Leaf (Camptosorus), but the veins are free. *Stipes brownish, becoming green above, and so passing into the broad pale green midrib.*

2. **A. ebenoides,** R. R. Scott. *Fronds* (4–9′ long) broadly lanceolate *pinnatifid, below pinnate, the apex prolonged and slender; divisions lanceolate from a broad base, the lower ones shorter,* often proliferous, as is the apex of the frond; fruit-dots much as in the last; *stipes black and polished, as is the lower part of the midrib, especially beneath.* — Limestone cliffs, Conn. and Penn., and southward; very rare, usually growing with Camptosorus and Asplenium ebeneum, of which *Rev. M. G. Berkeley* considered it a probable hybrid.

* * *Small evergreen ferns; the narrow fronds simply pinnate with numerous pinnæ.*

+– *Pinnæ not auricled.*

3. **A. víride,** Hudson. *Fronds* (2–5′ long) tufted, *linear in outline, pale green, softly herbaceous; pinnæ roundish-ovate or ovate-rhomboid,* short-stalked, crenately toothed (2–4″ long), the midvein indistinct and forking; *the slender stipe brownish and passing into a green herbaceous rhachis.* — Shaded cliffs; northern New Eng., west and northward; rare. (Eu.)

4. **A. Trichómanes,** L. *Fronds* (3–8′ long) in dense spreading tufts, *linear in outline, dark green and more rigid; pinnæ roundish-oblong or oval* (3–4″ long), entire or crenulate, rarely incised, unequal-sided, obliquely wedge-truncate at base, attached by a narrow point, the midvein forking and evanescent; *the thread-like stipe and rhachis purple-brown and shining.* — Shaded cliffs; common. July. (Eu.)

+– +– *Pinnæ more or less auricled.*

5. **A. párvulum,** Mart. & Gal. Fronds upright (4–10′ high), narrowly linear-oblanceolate; *pinnæ* (2–6″ long) *rigid and thickish, mostly opposite,* nearly sessile, somewhat deflexed, oblong, obtuse, *entire or crenulate,* auricled on the upper or both sides; sori rather few, as near the margin as the continuous midvein; stipe and rhachis black and shining. — Mountains of Va. to Mo., and southward. — Nearly intermediate between the last and the next.

6. **A. ebèneum,** Ait. Fronds upright (9–18′ high), linear-oblanceolate in outline, fertile ones much the taller; *pinnæ* (6–18″ long) *firmly membranaceous, mostly alternate,* sessile, spreading, oblong or oblong-linear, *finely serrate or even incised,* the base auricled on the upper or both sides; sori many, nearer the elongated midvein than the margin; stipe and rhachis blackish-purple and shining. — Rocky, open woods; rather common.

* * * *Small evergreen ferns; the broader fronds* 1–3-*pinnate; pinnæ incised.*

7. **A. Bradlèyi,** D. C. Eaton. *Fronds oblong-lanceolate,* 4–7′ long, besides the blackish and somewhat shining stipe, membranaceous, pinnate; pinnæ rather numerous, *the lower ones no larger than the middle ones,* all short-stalked, oblong-ovate, obtuse, incised or pinnatifid into oblong toothed lobes. — On rocks, Ky. and southward; rare. A single plant has been gathered near Newburg, N. Y. — Intermediate between A. ebeneum and A. montanum.

8. **A. montànum,** Willd. *Fronds ovate-lanceolate from a broad base* (2–5′ long), subcoriaceous, pinnate; pinnæ ovate-oblong, the lowest pinnately cleft into oblong or ovate cut-toothed lobes, the upper gradually simpler; *rhachis green, broad and flat; stipe brown at base.* — Cliffs and rocks, from Conn. and Penn. to Ky., and southward. July.

9. **A. Rùta-murària,** L. *Fronds deltoid-ovate* (1–2½′ long), subcoriaceous, laxly 2–3-pinnate at base, the pinnæ alternate; *ultimate segments few,* stalked (2–5″ long), *from narrowly cuneate to roundish-obovate,* toothed or incised at the apex; veins forking; sori 2–4 on a segment. — Limestone cliffs, Vt. to Mich., and southward; scarce. July. (Eu.)

* * * * *Tall ferns* (2–4° *high*), *not evergreen; fronds pinnate or sub-bipinnate.*

10. **A. angustifòlium,** Michx. *Fronds* thin, *simply pinnate; pinnæ* numerous, short-stalked, *linear-lanceolate, acuminate,* entire or crenulate (3–4′ long), *those of the fertile frond narrower;* fruit-dots linear, 20–40 each side of the midvein; indusia slightly convex. — Rich woods, W. New Eng. to Wisc., and southward along the mountains. Sept.

11. **A. thelypteroides,** Michx. (Pl. 18, fig. 1, 2.) *Fronds* (2–3° high) *pinnate; pinnæ deeply pinnatifid,* linear-lanceolate (3–5′ long); the lobes oblong, obtuse, minutely toothed, crowded, each bearing 3–6 pairs of *oblong fruit-dots,* some of them double. — Rich woods; not rare. July–Sept.

§ 2. ATHÝRIUM. *Indusium delicate, curved, often crossing the vein, and attached to both sides of it, thus becoming reniform, or shaped like a horseshoe.*

12. **A. Filix-fœmina,** Bernh. Fronds (1–3° high) ovate-oblong or broadly lanceolate, twice pinnate; pinnæ lanceolate, numerous; pinnules confluent on the secondary rhachis by a narrow margin, oblong and doubly serrate, or elongated and pinnately incised with cut-toothed segments; fruit-dots short, variously curved, at length confluent. — Moist woods; common and presenting many varying forms. July. (Eu.)

10. SCOLOPÉNDRIUM, Smith. Hart's-Tongue. (Pl. 18.)

Fruit-dots linear, elongated, almost at right angles to the midrib, contiguous by twos, one on the upper side of one veinlet, and the next on the lower side of the next superior veinlet, thus appearing to have a double indusium opening along the middle. (The ancient Greek name, so called because the numerous parallel lines of fruit resemble the feet of the centipede, or *Scolopendra.*)

1. **S. vulgàre,** Smith. Frond oblong-lanceolate from an auricled-heart-shaped base, entire or wavy-margined (7–18′ long, 1–2′ wide), bright green. — Shaded ravines and under limestone cliffs; central N. Y.; also in Canada and Tenn.; very rare. Aug. (Eu.)

11. CAMPTOSÒRUS, Link. Walking-Leaf. (Pl. 18.)

Fruit-dots oblong or linear, as in Asplenium, but irregularly scattered on either side of the *reticulated veins* of the simple frond, those next the midrib single, the outer ones inclined to approximate in pairs (so that their two indusia open face to face), or to become confluent at their ends, thus forming crooked lines (whence the name, from *καμπτός, bent,* and *σωρός,* for *fruit-dot.*)

1. **C. rhizophýllus,** Link. Fronds evergreen, sub-coriaceous, growing in tufts, spreading or procumbent (4–12′ long), gradually narrowed from a cordate or auricled base to a long and slender acumination, which often roots at the end and forms a new plant. — Shaded rocks, especially calcareous rocks, N. Eng. to Minn., and southward to Kan. and Ala. — The auricles are sometimes greatly elongated, and even rooting; in another form they are lacking, as in the thinner leaved C. Sibiricus. July.

12. PHEGÓPTERIS, Fée. Beech Fern.

Fruit-dots small, round, naked (no indusium), borne on the back of the veins below the apex. Stipe continuous with the rootstock. — Our species have free veins and bright green membranaceous fronds, decaying in early autumn. (Name composed of *φηγός*, an *oak* or *beech*, and *πτερίς*, *fern*.)

* *Fronds twice pinnatifid; pinnæ all sessile, adnate to the winged rhachis.*

1. **P. polypodioides,** Fée. Fronds triangular, *longer than broad* (4–9′ long), hairy on the veins, especially beneath; pinnæ linear-lanceolate, *the lowest pair deflexed and standing forward;* their divisions oblong, obtuse, entire, the basal decurrent upon the main rhachis; fruit-dots all near the margin. — Damp woods; common northward. July. — Rootstock slender, creeping, bearing a few distant slender stalks, rather longer than the fronds. (Eu.)

2. **P. hexagonóptera,** Fée. Fronds triangular, *usually broader than long* (7–12′ broad), slightly pubescent and often finely glandular beneath; pinnæ lanceolate; upper segments oblong, obtuse, toothed or entire, *those of the very large lowest pinnæ elongated and pinnately lobed,* basal ones very much decurrent and forming a continuous many-angled wing along the main rhachis; fruit-dots near the margin; some also between the sinus and the midrib. — Rather open woods, New Eng. to Minn., and southward; common. July. — Larger and broader than the last, which it often closely resembles.

* * *Fronds ternate, the three divisions petioled; rhachis wingless.*

3. **P. Dryópteris,** Fée. *Fronds smooth,* broadly triangular (4–6′ wide); the three triangular primary divisions *all widely spreading,* 1–2-pinnate; segments oblong, obtuse, entire or toothed; fruit-dots near the margin. — Rocky woods; common northward. July. (Eu.)

4. **P. calcárea,** Fée. *Fronds minutely glandular* and somewhat rigid, *the lateral divisions ascending;* lowest inferior pinnæ of the lateral divisions smaller in proportion than in the last species, which it otherwise closely resembles. — Iowa and Minn.; rare. July. (Eu.)

13. ASPÍDIUM, Swartz. Shield Fern. Wood Fern. (Pl. 19.)

Fruit-dots round, borne on the back or rarely at the apex of the veins. Indusium covering the sporangia, flat or flattish, scarious, orbicular and peltate at the centre, or round-kidney-shaped and fixed either centrally or by the sinus, opening all round the margin. Stipe continuous (not articulated) with the rootstock. — Our species have free veins and 1–3-pinnate fronds. (Name, *ἀσπίδιον, a small shield,* from the shape of the indusium.)

§ 1. DRYÓPTERIS. *Indusium reniform, or orbicular with a narrow sinus.*

* *Veins simple or simply forked and straight; fronds annual, decaying in autumn, the stalks and slender creeping rootstocks nearly naked.*

1. **A. Thelýpteris,** Swartz. Fronds pinnate, lanceolate in outline; pinnæ horizontal or slightly recurved, linear-lanceolate, deeply pinnatifid, *the lowest pairs scarcely smaller;* lobes oblong, entire, obtuse or appearing acute when in fruit from the *strongly revolute margins; veins mostly forked,* bearing the (soon confluent) fruit-dots near their middle; indusium minute, smooth and naked. — Marshes; common. Aug. — Stalk 1° long or more, usually longer than the frond, which is of thicker texture than the next, and slightly downy. (Eu.)

2. **A. Noveboracénse,** Swartz. Fronds pinnate, lanceolate in outline, *tapering both ways from the middle;* pinnæ lanceolate, *the lowest 2 or more pairs gradually shorter and deflexed;* lobes flat, oblong, basal ones often enlarged and incised; *veins simple,* or forked in the basal lobes; fruit-dots distinct, near the margin; indusium minute, the margin glanduliferous. — Swamps and moist thickets; common. July. — Frond pale green, delicate and membranaceous, hairy beneath along the midribs and veins.

* * *Veins, at least the lowest, more than once forked or somewhat pinnately branching; fruit-bearing veinlets often obscure or vanishing above the fruit-dot; fronds, at least the sterile ones, often evergreen; stalks and apex of the thickened rootstock scaly or chaffy, and often the main rhachis also.*

+ *Fronds small, pinnate; pinnæ pinnatifid; indusia very large, persistent.*

3. **A. frágrans,** Swartz. Fronds (4–12′ high) glandular and aromatic, narrowly lanceolate, with linear-oblong pinnately-parted pinnæ; their crowded divisions (2″ long) oblong, obtuse, toothed or nearly entire, nearly covered beneath with the very large thin imbricated indusia, which are orbicular with a narrow sinus, the margin sparingly glanduliferous and often ragged. — On rocks, especially near waterfalls, mountains of northern New Eng., west and northward. — Rootstock stout, nearly erect, densely chaffy, as are the crowded stipes and rhachis. (Asia, and barely reaching S. E. Eu.)

+ + *Large* (1–2½° *high*), *the fronds mostly twice pinnate with variously toothed and incised pinnules; indusia rather small, shrivelled in age, or deciduous.*

4. **A. spinulósum,** Swartz. Stipes with a few *pale-brown deciduous scales;* frond ovate-lanceolate, twice pinnate; *pinnæ oblique to the rhachis, elongated-triangular,* the lower pairs broadly triangular; pinnules set obliquely on the midribs, connected by a very narrow wing, oblong, acute, incisely serrate or pinnatifid with spinulosely-toothed lobes; *indusium* smooth and *without marginal glands.* — In damp woods, New Eng. to Ky., and northward. July. — The common European type, rare in North America. (Eu.)

Var. **intermédium,** D. C. Eaton. *Scales* of the stipe few, *brown with a darker centre;* frond broadly oblong-ovate, twice or often thrice pinnate; *pinnæ spreading, oblong-lanceolate,* the lower unequally triangular-ovate; pinnules crowded, ovate-oblong, spreading, pinnately divided; the oblong lobes spinulose-toothed at the apex; *margin of the indusium denticulate and beset with minute stalked glands.* — Woods, everywhere.

Var. **dilatátum,** Hook. *Scales* of the stipe large, *brown with a dark centre; frond broader, ovate or triangular-ovate* in outline, oftenest thrice pinnate; pinnules lance-oblong, the lowest often much elongated; *indusium* (in the North American plant) *smooth and naked.* — A dwarf state, fruiting when only 5–8′ high, answers to var. dumetorum. — N. New Eng. to Minn., chiefly in mountain woods, and northward. (Eu.)

5. **A. Boóttii,** Tuckerman. *Scales* of the stipe *pale-brown;* fronds (1–2½° long) elongated-lanceolate in outline, somewhat narrowed at base; lowest pinnæ triangular-ovate, the upper longer and narrower; pinnules oblong-ovate, sharply spinulose-serrate or the lower pinnatifid; *indusium minutely glandular.* (A. spinulosum, var. Boottii, of last ed. A. cristatum, var. uliginosum, *Milde.*) — Wet thickets and about ponds, New Eng. to Del. and Minn. July. — Sterile fronds much smaller and simpler than the fertile. (Eu.)

+ + + *Large* (2–4° *high*); *fronds once pinnate and the pinnæ deeply pinnatifid, or nearly twice pinnate; fruit-dots not very near the margin; the indusium large, thinnish and flat, persistent.*

6. **A. cristàtum,** Swartz. *Frond linear-oblong or lanceolate in outline* (1–2° long); *pinnæ short* (2–3′ long), *triangular-oblong*, or the lowest nearly triangular-ovate, from a somewhat heart-shaped base, acute, deeply pinnatifid; the *divisions* (6–10 *pairs*) *oblong*, very obtuse, finely serrate or cut-toothed, the lowest pinnatifid-lobed; *fruit-dots as near the midvein as the margin;* indusium round-reniform, the sinus mostly shallow, smooth and naked. — Swamps, etc.; common. July. — Stipes and the stout creeping rootstock bearing broad and deciduous chaffy scales. (Eu.)

Var. **Clintoniànum.** *Frond in every way much larger* (2½–4° long), *pinnæ* oblong-lanceolate, *broadest at base* (4–6′ long, 1–2′ broad), deeply pinnatifid; the *divisions* (8–16 *pairs*) crowded or distant, *linear-oblong*, obtuse, obscurely serrate or cut-toothed, the basal sometimes pinnately lobed; veins pinnately forking, the lowest anterior veinlets bearing the *fruit-dots near the midvein;* indusium orbicular with a shallow sinus, smooth and naked. — Swampy woods, New Eng. to N. J., N. Y. (*G. W. Clinton*, etc.), and westward. July. — Rootstock stout, creeping, chaffy (like the stipes) with large bright-brown scales. A showy fern, unlike any European form of A. cristatum, and often mistaken for A. Goldianum.

7. **A. Goldiànum,** Hook. *Frond broadly ovate*, or the fertile ovate-oblong in outline (2–3° long); *pinnæ* (6–9′ long), oblong-lanceolate, *broadest in the middle*, pinnately parted; the *divisions* (*about* 20 *pairs*) *oblong-linear, slightly scythe-shaped* (9–15″ long), serrate with appressed teeth; veins pinnately forking and bearing the *fruit-dots very near the midvein;* indusium very large, orbicular with a deep narrow sinus, smooth and without marginal glands. — Rich and moist woods, from Conn. to Ky., and northward. July. — A stately fern, often 4° high, the fronds growing in a circle from a stout ascending chaffy rootstock, and decaying in autumn. Indusium with the sides of the sinus often overlapping, thus appearing to be round and entire as in § Polystichum.

+ + + + + *Large* (1–3° *high*); *stipes very chaffy at base; fronds twice pinnate, but the upper pinnules confluent, some of the lower pinnatifid-toothed; fruit-dots rather large; indusium convex, without marginal glands, persistent.*

8. **A. Fílix-mas,** Swartz. Frond lanceolate in outline (1–3° high); pinnæ linear-lanceolate, tapering from base to apex; pinnules oblong, very obtuse, serrate at the apex and obscurely so at the sides, the basal incisely lobed, distinct, the upper confluent; fruit-dots nearer the midvein than the margin, and usually confined to the lower half of each fertile pinnule. — Rocky woods, N. Mich. to the Dakotas and Col. — Frond thickish but not surviving the winter. (Eu.)

9. **A. marginàle,** Swartz. (Pl. 19, fig. 1, 2.) Frond evergreen, smooth, thickish and almost coriaceous, ovate-oblong in outline (1–2° long); pinnæ lanceolate, acuminate, slightly broadest above the base; pinnules oblong or oblong-scythe-shaped, crowded, obtuse or pointed, entire or crenately-toothed; fruit-dots close to the margin. — Rocky hillsides in rich woods; common, especially northward. Aug.

§ 2. POLÝSTICHUM. *Indusium orbicular and entire, peltate, fixed by the depressed centre; fronds rigid and coriaceous, evergreen, very chaffy on the rhachis, etc.; pinnæ or pinnules auricled at base on the upper side, crowded, the teeth or lobes bristle-tipped.*

* *Fronds simply pinnate.*

10. **A. acrostichoides,** Swartz. (Christmas Fern.) (Pl. 19, fig. 3, 4.) Frond lanceolate (1–2½° high), *stalked; pinnæ linear-lanceolate*, somewhat scythe-shaped, half-halberd-shaped at the slightly stalked base, serrulate with appressed bristly teeth; *the fertile* (upper) *contracted and smaller*, bearing contiguous fruit-dots near the midrib, which are confluent with age, covering the surface. — Var. incìsum is a state with cut-lobed pinnæ, a not unfrequent case in the sterile fronds; sometimes with all the tips fertile. — Common in rocky woods, especially northward. July.

11. **A. Lonchìtis,** Swartz. Frond linear-lanceolate (9–20′ high), *scarcely stalked, very rigid; pinnæ broadly lanceolate-scythe-shaped, or the lowest triangular*, strongly auricled on the upper side, and wedge-truncate on the lower, densely spinulose-toothed (1′ or less in length), copiously fruit-bearing; fruit-dots contiguous and near the margins. — Woods, southern shore of Lake Superior, and northward. (Eu.)

* * *Fronds bipinnate.*

12. **A. aculeàtum,** Swartz, var. **Braùnii,** Koch. *Fronds spreading* (1½–2° long), oblong-lanceolate in outline, with a tapering base, the lower of the many pairs of oblong-lanceolate pinnæ gradually reduced in size and obtuse; pinnules ovate or oblong, obtuse, truncate and almost rectangular at base, short-stalked, or the upper confluent, sharply toothed, beset with long and soft as well as chaffy hairs. — Deep woods, mountains of New Eng., N. Y., and Penn., and northward. (Eu.)

14. CYSTÓPTERIS, Bernhardi. Bladder Fern. (Pl. 19.)

Fruit-dots roundish, borne on the back of a straight fork of the free veins; the delicate indusium hood-like or arched, attached by a broad base on the inner side (toward the midrib) partly under the fruit-dot, early opening free at the other side, which looks toward the apex of the lobe, and is somewhat jagged, soon thrown back or withering away. — Tufted ferns with slender and delicate 2–3-pinnate fronds; the lobes cut-toothed. (Name composed of κύστις, *a bladder*, and πτερίς, *fern*, from the inflated indusium.)

1. **C. bulbífera,** Bernh. (Pl. 19, fig. 1–3.) *Frond lanceolate, elongated* (1–2° long), 2-pinnate; the pinnæ lanceolate-oblong, pointed, horizontal (1–2′ long); the *rhachis and pinnæ often bearing bulblets underneath, wingless;* pinnules crowded, oblong, obtuse, toothed or pinnatifid; indusium short, truncate on the free side. — Shaded ravines, not rare from N. Eng. to Ark., commoner on calcareous rocks. July. — Specimens from Tenn. and Ark. have sometimes shorter fronds and few or no bulblets, indicating an approach to the next species.

2. **C. frágilis,** Bernh. *Frond oblong-lanceolate* (4–8′ long, besides the brittle stalk which is fully as long), 2–3-pinnate; the pinnæ and *pinnules* ovate or lanceolate in outline, irregularly pinnatifid or cut-toothed, mostly acute.

decurren. on the margined or winged rhachis; indusium tapering or acute at the free end. — Shaded cliffs and rocky woods; common and greatly varying in the shape and cutting of the pinnules. July. (Eu.)

15. ONOCLÈA, L. (Pl. 16 and 19.)

Sporangia borne on elevated receptacles, forming roundish sori imperfectly covered by very delicate hood-shaped indusia attached to the base of the receptacles. Fertile fronds erect, rigid, with contracted pod-like or berry-like divisions at first completely concealing the sporangia, and at last, when dry and indurated, cracking open and allowing the spores to escape. Sterile fronds foliaceous. Rootstocks creeping and constantly forming new plants. (Name apparently from ὄνος, *a vessel*, and κλείω, *to close*, from the singularly rolled up fructification.)

§ 1. ONOCLEA proper. *Sterile frond with anastomosing veins.*

1. **O. sensíbilis,** L. (SENSITIVE FERN.) (Pl. 19, fig. 1, 2.) Fronds scattered; the sterile ones long-stalked (2 – 15′ long), triangular-ovate, pinnatifid into a few oblong-lanceolate sinuately lobed or nearly entire segments; veins reticulated with fine meshes; fertile fronds contracted, closely bipinnate, the pinnules rolled up into berry-like bodies. — Moist meadows and thickets, very common and variable, July. — Imperfectly fertile fronds sometimes occur, with the still foliaceous pinnæ cut into obovate segments with free veins and abortive sori; the so-called var. OBTUSILOBÀTA.

§ 2. STRUTHIÓPTERIS. *Sterile frond with free veins.*

2. **O. Struthiópteris,** Hoffmann. (Pl. 16, fig. 1 – 5.) Fronds growing in a crown; sterile ones short-stalked (2 – 10° high), broadly lanceolate, narrowed toward the base, pinnate with many linear-lanceolate, pinnatifid pinnæ; veins free, the veinlets simple; fertile frond shorter, pinnate with pod-like or somewhat necklace-shaped pinnæ. (Struthiopteris Germanica, *Willd.*) — Alluvial soil, common northward. July. — The rootstock sends out slender underground stolons, which bear fronds the next year. (Eu.)

16. WOÓDSIA, R. Brown. (Pl. 19.)

Fruit-dots round, borne on the back of simply-forked free veins; the very thin and often evanescent indusium attached by its base all around the receptacle, *under* the sporangia, either small and open, or else early bursting at the top into irregular pieces or lobes. — Small and tufted pinnately-divided ferns. (Dedicated to *Joseph Woods*, an English botanist.)

* *Stalks obscurely articulated some distance from the base; fronds chaffy or smooth, never glandular; indusium divided nearly to the centre into slender hairs which are curled over the sporangia.*

1. **W. Ilvénsis,** R. Brown. *Frond oblong-lanceolate* (2 – 6′ long by 12 – 18″ wide), smoothish and green above, *thickly clothed underneath as well as the stalk with rusty bristle-like chaff*, pinnate; the pinnæ crowded, oblong, obtuse, sessile, pinnately parted, *the numerous crowded segments oblong*, obtuse, obscurely crenate; the fruit-dots near the margin, somewhat confluent when old. — Exposed rocks; common, especially northward, and southward in the Alleghanies. June. (Eu.)

2. **W. hyperbòrea,** R. Brown. Frond narrowly oblong-lanceolate (2 – 6′ long by 8 – 12″ wide), smooth above, sparingly paleaceous-hirsute beneath, pinnate; the pinnæ triangular-ovate, obtuse, pinnately lobed, the lobes few and nearly entire; fruit-dots rarely confluent. — Mountain ravines, northern Vt. and N. Y., and northward; rare. (Eu.)

3. **W. glabélla,** R. Brown. (Pl. 19, fig. 1 – 3.) *Smooth and naked throughout; frond linear* and very delicate (2 – 5′ high), pinnate; *pinnæ roundish-ovate*, the lower ones rather remote (2 – 4″ long), obtuse, crenately lobed; fruit-dots scanty; the hairs of the indusium fewer than in the last two species. — On moist mossy rocks, mountains of northern New Eng., north and westward. First found at Little Falls, N. Y., by *Dr. Vasey*. (Eu.)

* * *Stalks not articulated; fronds never chaffy, often glandular-pubescent.*

+– *Indusium of a few broad segments, at first covering the sorus completely.*

4. **W. obtùsa,** Torr. (Pl. 19, fig. 4, 5.) Frond broadly lanceolate, minutely glandular-hairy (6 – 12′ high), pinnate, or nearly twice pinnate; pinnæ rather remote, triangular-ovate or oblong (1 – 2′ long), bluntish, pinnately parted; segments oblong, obtuse, crenately toothed, the lower pinnatifid with toothed lobes; veins forked, and bearing the fruit-dots on or below the minutely toothed lobes; indusium at length splitting into several spreading jagged lobes. — Rocky banks and cliffs; not rare.

+– +– *Indusium entirely concealed beneath the sorus, divided into very narrow segments or reduced to minute hairs.*

5. **W. Oregàna,** D. C. Eaton. Smooth, with fronds (2 – 8′ high, 8 – 12″ wide) elliptical-lanceolate, pinnate, the fertile ones tallest; pinnæ triangular-oblong, obtuse, pinnatifid; segments oblong or ovate, obtuse, finely toothed, and in larger fronds incised; fruit-dots near the margin; indusium very small, divided almost to the centre into a few necklace-like-jointed cilia. — Crevices of rocks, south shore of Lake Superior (*Robbins*), and westward.

6. **W. scopulìna,** D. C. Eaton. Much like the last, but the rather larger fronds puberulent beneath with minute jointed hairs and stalked glands; indusium deeply cleft into narrow segments ending in jointed hairs. — Rocky places, Minn., southward and westward.

17. DICKSÒNIA, L'Her. (Pl. 18.)

Fruit-dots small, globular, marginal, each placed on the apex of a free vein or fork; the sporangia borne on an elevated globular receptacle, enclosed in a membranaceous cup-shaped indusium which is open at the top, and on the outer side partly adherent to a reflexed toothlet of the frond. (Named for *James Dickson*, an English Cryptogamic botanist.)

1. **D. pilosiúscula,** Willd. Fronds minutely glandular and hairy (2 – 3° high), ovate-lanceolate and acuminate in outline, pale green, very thin, with strong chaffless stalks rising from slender extensively creeping naked rootstocks, mostly bipinnate; primary pinnæ lanceolate, pointed, the secondary pinnatifid into oblong and obtuse cut-toothed lobes; fruit-dots minute, each on a recurved toothlet, usually one at the upper margin of each lobe. (D. punctilobula, *Kunze.*) — Common in moist and shady places, from New Eng. to Minn. — Frond sweet-scented in drying.

18. TRICHÓMANES, L. Filmy Fern.

Sporangia with a transverse entire ring, sessile on a cylindrical receptacle which is produced from the end of a vein and enclosed in a funnel-form or cup-shaped involucre of the same substance with the frond. Fronds very thin and pellucid, often consisting of a single layer of cells. (An ancient Greek name for some fern.)

1. **T. radicans,** Swartz. Fronds very delicate, oblong-lanceolate in outline (4–8′ long, 6–18″ wide), bipinnatifid; rhachis narrowly winged; pinnæ triangular-ovate, the divisions toothed or again lobed; involucres tubular-funnel-shaped, margined, the mouth truncate; receptacle often much exserted. — On moist and dripping sandstone cliffs, Ky., and southward; rare. — Though the fronds are so very delicate, yet they survive for several years; they begin to fruit the second or third year, and thereafter the receptacle continues to grow and to produce new sporangia at its base. (Eu.)

19. SCHIZÆA, Smith. (Pl. 20.)

Sporangia large, ovoid, striate-rayed at the apex, opening by a longitudinal cleft, naked, vertically sessile in a double row along the single vein of the narrow divisions of the pinnate (or radiate) fertile appendages to the slender and simply linear, or (in foreign species) fan-shaped or dichotomously many-cleft fronds (whence the name, from *σχίζω, to split*).

1. **S. pusilla,** Pursh. Sterile fronds linear, very slender, flattened and tortuous; the fertile ones equally slender (½″ wide), but taller (3–4′ high), and bearing at the top the fertile appendage, consisting of about 5 pairs of crowded pinnæ (each 1–1½″ long). — Low grounds, pine barrens of N. J.; very local. Sept. (Also in Nova Scotia and Newf.)

20. LYGÒDIUM, Swartz. Climbing Fern. (Pl. 20.)

Fronds twining or climbing, bearing stalked and variously lobed (or compound) divisions in pairs, with mostly free veins; the fructification on separate contracted divisions or spike-like lobes, one side of which is covered with a double row of imbricated hooded scale-like indusia, fixed by a broad base to short oblique veinlets. Sporangia much as in Schizæa, but oblique, fixed to the veinlet by the inner side next the base, one or rarely two covered by each indusium. (Name from *λυγώδης, flexible.*)

1. **L. palmàtum,** Swartz. Very smooth; stalks slender, flexile and twining (1–3° long), from slender running rootstocks; the short alternate branches or petioles 2-forked; each fork bearing a round-heart-shaped palmately 4–7-lobed frondlet; fertile frondlets above, contracted and several times forked, forming a terminal panicle. — Low moist thickets and open woods, Mass. to Va., Ky., and sparingly southward; rare. Sept.

21. OSMÚNDA, L. Flowering Fern. (Pl. 20.)

Fertile fronds or fertile portions of the frond destitute of chlorophyll, very much contracted, and bearing on the margins of the narrow rhachis-like divisions short-pedicelled and naked sporangia; these are globular, thin and reticulated, large, opening by a longitudinal cleft into two valves, and bearing near the apex a small patch of thickened oblong cells, the rudiment of a transverse ring. — Fronds tall and upright, growing in large crowns from thickened rootstocks, once or twice pinnate; veins forking and free. Spores green. (*Osmunder*, a Saxon name of the Celtic divinity, Thor.)

* *Sterile fronds truly bipinnate.*

1. **O. regàlis,** L. (Flowering Fern.) Very smooth, pale green (2–5° high); sterile pinnules 13–25, varying from oblong-oval to lance-oblong, finely serrulate, especially toward the apex, otherwise entire, or crenately lobed toward the rounded, oblique and truncate, or even cordate and semi-auriculate base, sessile or short-stalked (1–2′ long); the fertile racemose-panicled at the summit of the frond. — Swamps and wet woods; common. The cordate pinnules sometimes found here are commoner in Europe. May, June. (Eu.)

* * *Sterile fronds once pinnate; pinnæ deeply pinnatifid; the lobes entire.*

2. **O. Claytoniàna,** L. (Pl. 20, fig. 1–3.) Clothed with loose wool when young, soon smooth; *fertile fronds taller than the sterile* (2–4° high); pinnæ oblong-lanceolate, with oblong obtuse divisions; *some* (2–5 *pairs*) *of the middle pinnæ fertile*, these entirely pinnate; sporangia greenish, turning brown. — Low grounds, common. May. — Fruiting as it unfolds.

3. **O. cinnamòmea,** L. (Cinnamon Fern.) Clothed with rusty wool when young; *sterile fronds tallest* (at length 3–5° high), smooth when full grown, the lanceolate pinnæ pinnatifid into broadly oblong obtuse divisions; *fertile fronds separate*, appearing earlier from the same rootstock and soon withering (1–2° high), contracted, twice pinnate, covered with the cinnamon-colored sporangia. — Var. frondòsa is a rare occasional state, in which some of the fronds are sterile below and more sparsely fertile at their summit, or rarely in the middle. — Swamps and low copses, everywhere. May.

Order 132. OPHIOGLOSSÀCEÆ. (Adder's-Tongue Family.)

Leafy and often somewhat fleshy plants; the leaves (*fronds*) simple or branched, often fern-like in appearance, erect in vernation, developed from underground buds formed either inside the base of the old stalk or by the side of it, and bearing in special spikes or panicles rather large subcoriaceous bivalvular sporangia formed from the main tissue of the fruiting branches. Prothallus underground, not green, monœcious. — A small order, separated from Ferns on account of the different nature of the sporangia, the erect vernation, etc.

1. **Botrychium.** Sporangia in pinnate or compound spikes, distinct. Veins free.
2. **Ophioglossum.** Sporangia cohering in a simple spike. Veins reticulated.

1. BOTRÝCHIUM, Swartz. Moonwort. (Pl. 20.)

Rootstock very short, erect, with clustered fleshy roots (which are full of starch, in very minute, irregular granules!); the base of the naked stalk containing the bud for the next year's frond; frond with an anterior fertile and a posterior sterile segment; the former mostly 1–3-pinnate, the contracted divisions bearing a double row of sessile naked sporangia; these are distinct, rather coriaceous, not reticulated, globular, without a ring, and open trans-