

EATON DANIEL CADY

BEAUTIFUL FERNS

Daniel Eaton
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ADIANTUM PEDATUM, Linnæus. American Maiden-hair

Adiantum pedatum: – Root-stock creeping, scaly, and copiously rooting; stalks scattered, a foot or more high, dark-brown and polished, forked at the top; fronds six to fifteen inches broad, membranaceous, smooth, spreading nearly horizontally, composed of several (six to fourteen) slender divisions radiating from the outer side of the recurved branches of the stalk, and bearing numerous oblong or triangular-oblong short-stalked pinnules having the lower margin entire and often slightly concave, the base parallel with the polished hairlike rachis, the upper margin lobed or cleft and bearing a few oblong-lunate or transversely linear reflexed involucre; sporangia on the inner surface of the involucre (as in all *Adianta*), borne on the extended apices of the free forking veinlets, which proceed from a principal vein closely parallel to the lower margin of the pinnule.

Adiantum pedatum, Linnæus, Sp. Pl., p. 1557. – Thunberg, Flora Japonica, p. 339. – Swartz, Syn. Fil., p.

121. – Schkuhr, Krypt. Gew., p. 107, t. 115. – Willdenow, Sp. Pl., v., p. 438. – Michaux, Fl. Bor. Am., ii., p. 263. – Pursh, Fl. Am. Sept., ii., p. 670. – Torrey, Fl. of N. Y., ii., p. 487. – Gray, Manual. – Ruprecht, Distrib. Crypt. Vasc., in Imp. Ross., p. 49. – Hooker, Sp. Fil., ii., p. 28. – Brackenridge, Filices of the U. S. Expl. Exped., p. 100. – Eaton, in Parry's Exped. to Japan, ii., p. 329. – Maximowicz, Primitiæ Fl. Amurensis, p. 341. – Mettenius, Fil. Hort. Lips., p. 47; Prolusio Fl. Japon. in Ann. Mus. Bot. Lugd. – Batav., iii., p. 171. – Hooker & Baker, Syn. Fil., p. 125. – Milde, Fil. Eur. et Atl., p. 31. – Keyserling, Gen. Adiantum, in Mem. Acad. Petrop., ser. vii., xxii., No. 2, pp. 5, 28.

Adiantum Americanum, Cornutus, Canad. Pl. Hist., p. 7, t. 6 (1635).

Maiden Hair, or Cappellus veneris verus, Josselyn, New Englands Rarities Discovered, p. 55 (1672).

Adiantum fronde supra-decomposita bipartita, foliis partialibus alternis, foliolis trapeziformibus obtusis, Gronovius, Flora Virginica (1739), p. 123. (For other ancient references see Linnæus, as quoted above.)

Adiantum boreale, Presl, Tent. Pterid., p. 158.

Hab. – In rich, moist woods, especially among rocks. Common from New Brunswick and Canada southward to Central Alabama, Professor Eugene A. Smith, and westward to Lake Superior, Wisconsin, and Arkansas. Also in Utah, California, Oregon, British Columbia, the islands of Alaska, Kamtschatka, Japan, Mantchooria, and the Himalayan provinces of India. Ruprecht speaks

of specimens from Newfoundland, and Professor Gray informs me that it exists in De La Pylaie's collection from that island.

Description. — The root-stock is elongated and creeping. It is about the diameter of a goose-quill, is covered with minute ovate scales, roots copiously from beneath and along the sides, and produces fronds from the right and left sides alternately. The stalks are usually from a foot to fifteen inches high, and from half a line to a line in thickness. When very young, they bear a few scattered narrow scales; but these soon fall off, leaving minute pointed scars. The mature stalk is roundish in section, the convexity being greatest on the side which corresponds to the under surface of the frond. The two convexities, anterior and posterior, are separated by two obscure angles or ridges, which extend the whole length of the stalk. The anterior, or flatter, convex surface is nearly black, while the other side is a dark purplish brown. The fibro-vascular bundle is U-shaped near the base of the stalk; but higher up it is more like a broad, open V; and just below the forking of the stalk it separates into two portions. The two branches of the stalk diverge at an angle of about fifty degrees, and rise obliquely, gracefully recurving till they nearly meet again. From the outer side of the curve each branch sends out from two to seven slender diverging branchlets, which are the rachises of the pinnæ. The branchlets nearest the forking of the stalk are from four to fifteen inches long, those more remote successively shorter. Thus the whole frond is

from five or six to fifteen or eighteen inches broad, and, while somewhat funnel-form in the centre, radiates nearly horizontally towards the circumference. A pressed specimen can give but little idea of its graceful position.

The pinnules, or leaflets, are from six to twelve lines long, and three or four broad, and are placed alternately on the rachises of the pinnæ. They are very numerous, seldom fewer than twelve on each side of one of the middle (or lower) rachises, and in large fronds sometimes as many as forty on each side. The outer rachises bear fewer and fewer pinnules, and the outermost of even a very large frond will not have more than eight or ten on each side. They are attached to the rachis by a very short and slender stalk. Their usual form is dimidiate-oblong; that is, they appear as if cut in two longitudinally, and the lower half removed, so that the lower edge is entire, and straight, or often slightly hollowed; the base, or edge nearest the rachis, is also straight and entire; it is parallel with the rachis, or even overlaps it a little; the upper edge is more or less lobed or incised, but in general nearly parallel with the lower, and the end is rounded and slightly lobed. The point of attachment is, of course, at the angle between the lower and basal edges. The terminal pinnule of each pinna, and the basal one, which, indeed, very often proceeds from one of the recurved branches *just below* the origin of the pinna, are broadly cuneate or transversely oblong in shape, the two sides which meet at the point of attachment being equal; and the few pinnules near the basal one are shorter and more triangular than

the middle ones. The texture is delicately membranaceous, but elastic; the color is a lively green, and both surfaces are very smooth. The upper surface appears to be destitute of stomata; and this may be the reason why water will not adhere to the pinnules, but either falls off, or stands in spheroids ready to fall. The veins are free: in the symmetrical basal and apical pinnules the veinlets fork repeatedly from the very base; but in the oblong middle pinnules there is a faint principal vein running close to the lower edge; and from this the veinlets diverge obliquely, and fork about three times before reaching the superior margin. The incisions of the superior margin are usually very narrow, and extend only to about one-third of the breadth of the pinnule; but in some specimens from California and Oregon they are wider and considerably deeper. The lobes are from four to six or seven in number: in sterile fronds they are minutely toothed at the end; but in the commoner fertile fronds they are reflexed and changed in character, so as to form somewhat crescent-shaped or transversely elongated involucre of a pale-brownish color. The tips of the veinlets extend into these involucre, and bear the sporangia on the under or inner surface. In this peculiarity is the essential generic character of *Adiantum*. The spores of this species are spheroid-tetrahedral, the three radiating angles marked with slender vittæ, or bands. They are mature in the latter part of summer; but the fronds remain until frost, often changing from green to variegated shades of brown.

There do not seem to be any well-marked variations in this

fern. Ruprecht has a "var. *Aleuticum*," the *Ad. boreale* of Presl, separated mainly on account of its smaller size and fewer parts.

The genus *Adiantum* contains eighty-three species, according to Mr. Baker's estimate; but this number is reduced to sixty-seven by the more recent and very careful recension of Keyserling. The species vary in form from a simple and reniform frond an inch or two in diameter to others with ample tripinnate and even quadripinnate fronds. The species with distinctly bipartite and radiated fronds are *Ad. patens*, *hispidulum*, and *flabellulatum*. *A. patens* is found in Mexico and Central America. It is a smaller plant than *A. pedatum*, and has deeply-sunken reniform involucre. The other two occur in South-eastern Asia, the *hispidulum* extending to Africa and to New Zealand, and the *flabellulatum* to Japan: the former has hispid surfaces and small roundish involucre; and the latter has rusty-fibrillose rachises, coriaceous pinnules, and transversely oblong sub-confluent involucre. *Ad. patens* follows the form and branching of our fern very closely; but the two Old-World species often depart from it, and show a tendency to develop branches on one or other of the longest pinnæ, thus indicating an approach towards a pyramidal structure of the frond.

The remaining *Adianta* of the United States are *Ad. Capillus-Veneris* (Linnæus), found from North Carolina to California; *Ad. emarginatum* (Hooker), which is the *Ad. Chilense* of American botanists, but not of Kaulfuss, found in California and Oregon; and *Ad. tricholepis* (Fée), which occurs in Texas and California,

and extends southwards to Central America.

The American Maiden-hair is easily cultivated, and will grow very freely either in a shaded corner of a garden or in the house, and is perhaps more elegant and graceful than any other of our ferns, the climbing-fern scarcely excepted. Josselyn evidently mistook it for the Venus-hair, one of the chief ingredients in a syrup which was formerly a famous remedy for nearly all ailments, and said, "The Apothecaries for shame now will substitute *Wall-Rue* no more for Maiden Hair, since it grows in abundance in *New-England*, from whence they may have good store."

Mr. Emerton's figure is taken from a living plant, and shows the frond as it appears before it has been flattened in a collector's portfolio.

ONOCLEA

STRUTHIOPTERIS, Hoffmann.

Ostrich-Fern

Onoclea Struthiopteris: – Caudex short, thick, erect, emitting slender subterranean stolons; stalks stout, a few inches to a foot long, chaffy at the base; fronds standing in a vase-like crown, dimorphous; sterile ones one to ten feet high, herbaceous-membranaceous, broadly lanceolate, narrowed from the middle to the base, abruptly short-acuminate, pinnate; pinnæ very many, sessile, the lowest ones sinuate and deflexed, the rest three to eight inches long, five to nine lines wide, linear-lanceolate, acuminate, deeply pinnatifid into numerous close-placed oblong obtuse entire segments provided with a midvein and several simple veinlets on each side; fertile fronds in the middle of the crown or vase, much shorter than the sterile, rigid, contracted, narrowed at the base, pinnate; pinnæ one to two inches long, crowded, obliquely ascending, linear, obtuse, sub-entire or pinnately lobed, the lobes one or two lines long and broad, the margins much recurved, and the whole pinna forming a somewhat articulated pod-like body; veinlets of the fertile segments few, soriferous on the back; receptacle elevated; indusium very delicate, lacerate-toothed, half surrounding the sorus; sporangia at length confluent and filling the fertile pinnæ.

Onoclea Struthiopteris, Hoffmann, "Deutschlands Flora, p. 11 (1795)." – Swartz, Syn. Fil., p. 111. – Weber & Mohr, Taschenbuch, p. 47, t. iv., f. 3, 4. – Schkuhr, Krypt. Gew., p. 97, t. 105. – Mettenius, Fil. Hort. Lips., p. 97, t. xvii., f. 11-15. – Milde, Fil. Eur. et Atlant., p. 154.

Onoclea nodulosa, Schkuhr, Krypt. Gew., p. 97, t. 104 (Perhaps also of Michaux, but this is still uncertain).

Onoclea Germanica, Hooker, Sp. Fil., iv., p. 161. – Hooker & Baker, Syn. Fil., p. 46.

Osmunda Struthiopteris, Linnæus, Sp. Pl., p. 1522.

Struthiopteris Germanica, Willdenow, "Enum, p. 1071;" Sp. Pl., v., p. 288. – Link, Fil. Hort. Berol., p. 38. – Hooker, Fl. Bor. – Am., ii., p. 262. – Torrey, Fl. New York, ii., p. 486. – Gray, Manual, ed. i., p. 623, etc. – Koch, Syn. Fl. Germ. et Helv., ed. iii., p. 739. – Williamson, Fern-Etchings, t. 44.

Struthiopteris Pennsylvanica, Willdenow, Sp. Pl., v., p. 289. – Pursh, Fl. Am. Sept., ii., p. 266. – Torrey, Compendium, p. 385. – Bigelow, Fl. Boston., ed. iii., p. 421.

Struthiopteris, the genus only, Willdenow, in Berl. Mag., 1809, p. 160.

Hab. – Low grounds, especially in fine alluvial soil subject to the overflow of rivers; from the Saskatchewan and Lake Winnipeg to New Brunswick, and southward to Pennsylvania and Illinois. Mentioned by Alexander Braun as coming from Arkansas. From Lapland to Sicily, and eastward to the Amoor region, Sachalin and Kamtschatka. Not known in the western parts of either Europe or

America.

Description: – The ostrich-fern is one of our finest ferns, being surpassed in grandeur only by *Acrostichum aureum*, *Woodwardia radicans*, and perhaps *Osmunda regalis*. The plant is propagated chiefly by long and slender stolons, bearing appressed rudimentary stalk-bases. These stolons are said by Sachs to originate from buds formed on the stalks near the base: they run underground for several inches or a foot, and at the end rise to the surface and there thicken into a short erect caudex, covered by imbricating stalk-bases, and throwing up from the apex a grand vase-like circle of foliage, which is often higher than a man's head, and sometimes extends above his utmost reach.

The stalks are seldom over a foot long: they are flattened, blackish, and chaffy at the base, but above ground they are green, drying dull-brown, somewhat four-sided, and deeply channelled in front, when dried furrowed on the sides also. They contain two flattened fibro-vascular bundles. The stalks of the sterile fronds are rather longer than the others, but more rigid, and remain erect till the second year.

The sterile fronds are oblong-lanceolate in outline, gradually narrowed to the base from near the middle and abruptly short acuminate. The pinnæ are usually of nearly equal breadth from the base to beyond the middle. They are pinnatifid to within a line of the midrib into numerous oblong and obtuse segments, the veins of which are free, simple and pinnately arranged on a midvein.

The fertile fronds are produced late in the summer, and are contracted, much shorter than the others, and very rigid. The pinnæ are sometimes nearly entire, and in other examples pinnately lobed. The margins are very much recurved, so that the pinnæ are pod-like, and either sub-cylindrical or somewhat moniliform. The venation is free, and the sori are dorsal on the veins. Mr. Faxon writes: "The indusium can be detected only when the fertile frond is very young, and appears as a very delicate, lacerate membrane, attached at the base of the receptacle, and serving to separate the sorus from its neighbors. I have not found it in any case hood-like as in *O. sensibilis*. The sori are quickly confluent, and all trace of the indusium is soon lost. The membranaceous edge of the transformed fertile pinna is attached near the bases of the inferior sori and a fold is usually found pressed against the sori as seen in the drawing (Fig. 3). This is usually ruptured, so as to leave a portion attached at the base of the sorus, and must not be mistaken for the true indusium, which is within."

The sporangia have twenty-six or twenty-eight articulations of the ring. The spores are dark-colored and ovoid.

Imperfectly fertile fronds are often found, which are analogous to the "*obtusilobata*" condition of *O. sensibilis*.

PHEGOPTERIS

ALPESTRIS, Mettenius.

Alpine Beech-Fern

Phegopteris alpestris: – Root-stock short and thick, erect or oblique; stalks sub-terminal, four to ten inches long, bearing a few brown spreading scales near the base; fronds one to two feet long, oblong-lanceolate, membranaceous, smooth, pinnate with delicately bi-pinnatifid deltoid-lanceolate pinnae, the lower ones distant, and decreasing moderately; pinnules ovate-oblong or oblong-lanceolate, doubly incised and toothed; sori small, rounded, naked, usually copious on all or all but the lowest pinnae.

Phegopteris alpestris, Mettenius, Fil. Hort. Lips., p. 83; *Phegopteris*, p. 10.

Polypodium alpestre, Hoppe, “in Spreng. Syst. Veg., iv., par. ii., p. 320.” – Koch, Syn. Fl. Germ., “ed. 2, p. 974;” ed. 3, p. 731. – Moore, Nat. Pr. Brit. Ferns, t. vii. – Hooker & Arnott, Brit. Fl., ed. 7, p. 582. – Hooker, Brit. Ferns, t. vi.; Sp. Fil., iv., p. 251. – Hooker & Baker, Syn. Fil., p. 311.

Aspidium alpestre, Swartz, Syn. Fil., p. 421. – Schkuhr, Krypt. Gew., p. 58, t. 60.

Asplenium alpestre, Mettenius, Asplenium, p. 198, t. vi., figs. 1-6.

Pseudathyrium alpestre, Newman, “Phytologist, iv., p. 370;” Hist. Brit. Ferns, ed. iii., p. 200.

Athyrium alpestre, "Nylander;" Milde, Fil. Eu. & Atl., p. 53.

Polypodium rhæticum, Linnæus, Sp. Pl., p. 1552, *fide* Schkuhr, l. c.; but Moore thinks the plant not the same.

Aspidium rhæticum, Swartz, Syn. Fil., p. 59. – Willdenow, Sp. Pl., v., p. 280.

Hab. – Among rocks at high elevations; on Lassen's Peak, Mount Shasta, Pyramid Peak, Mount Rose, and other high points in the Sierra of California, Brewer, Lemmon, Muir; Cascade Mountains of British Columbia, Lyall. In the Alps and the mountains of Northern Europe; also in the Caucasus, and in Asia Minor.

Description. – The root-stock is rather short, but branching, and seems to form great entangled masses. The fronds stand in a crown or circle, rising from the end of the root-stock, which is made thick and heavy with the chaffy bases of former stalks. Mr. Lemmon writes thus: "It grows in a limited locality, so far as I know, near the summit of Mount Rose, near Webber Lake, and say at an elevation of 7,000 feet; lat. $39\frac{1}{2}^{\circ}$ N. Fronds collected into a large mass four feet across, short at the circumference, in the centre three feet high; most of them fertile, and densely so, as in the specimen sent."

The stalks are usually but a few (four to six) inches long, and in the dried specimens of a brownish straw-color, becoming nearly black at the base. They bear a few large ferruginous chaffy scales, and are deeply channelled and furrowed. The fibro-vascular system of the stalk is altered by contraction in drying,

but apparently agrees with Dr. Milde's description of *Athyrium*: "There are two oblong peripheric bundles in the *base* of the stalk, which, at the base of the lamina, are united into one of a horse-shoe shape by an arc parallel to the back of the stalk." In the middle of a stalk from one of the California specimens I find two systems of ducts, one on each side of the stalk, and the two united by a curved and contorted border of firm blackish tissue (sclerenchyma).

The fronds are from one to two feet long, and from three to six inches wide. In general shape they are oblong-lanceolate, acuminate, and slightly narrowed at the base. The texture is softly membranaceous, and both surfaces are smooth. The primary pinnæ are numerous, the lower ones gradually farther apart: their shape is lanceolate from a broad base. They are usually twice pinnatifid, the pinnules being connected by a very narrow foliaceous border along the midribs. The ultimate segments are sharply toothed. The fruit-dots are very abundant, and usually are found on all the pinnæ. They are placed on the back of the free veinlets, and are apparently devoid of indusium; though Dr. Mettenius has discovered on young fronds an exceedingly delicate and fugitive indusium, resembling in some degree that of *Asplenium* § *Athyrium*. Accordingly, in his later work, he referred the species to the genus *Asplenium*, placing it next to *A. Filix-fœmina*. Milde, in his work on the ferns of Europe and Atlantis, sought to re-establish *Athyrium* as a genus, and placed this fern in it, saying "sori ... rotundi, primum breviter oblongi

indusio fugaci minutissimo ciliato instructi.” The spores are ovoid, and apparently covered with anastomosing raised lines. Those I have examined are fuscous-brown, but Milde says “sub-nigræ verrucosæ.”

There is a European var. *flexilis*, with very narrow, nearly sessile fronds, and the pinnæ often deflexed, which has not been observed in America.

Undoubtedly the greatest resemblance of this fern is to the lady-fern, *Asplenium Filix-fœmina*; but that species has a very well-developed indusium, while the minute objects delineated by Mettenius scarcely deserve the name.

The stalks are clearly continuous with the root-stock; and for this reason the plant is plainly not a *Polypodium*, whatever else it may finally be determined to be.

ASPIDIUM FRAGRANS, Swartz.

Fragrant Wood-Fern

Aspidium fragrans: – Root-stock short and stout, very chaffy, with ample bright-brown glossy scales, which also abound on the short clustered stalks, and extend, diminishing in size, nearly to the top of the frond; fronds rigid-membranaceous, glandular, aromatic, four to ten inches long, six to twenty-four lines wide, lanceolate, acuminate, narrowed from the middle to the base, bipinnate; pinnæ numerous, oblong-lanceolate; pinnules many, one to two lines long, oblong, obtuse, adnate by a decurrent base, pinnately incised with very minute crenated teeth, or in smaller fronds nearly entire, the back nearly hidden by the large thin imbricating indusia, which are orbicular with a narrow sinus, and more or less toothed and glandular around the margin.

Aspidium fragrans, Swartz, Syn. Fil., p. 51. – Willdenow, Sp. Pl., v., p. 253. – Hooker, in “Parry’s 2d Voy., App., p. 410;” Fl. Bor. Am., p. 410. – Ruprecht, Distr. Crypt. Vasc. Imp. Ross., p. 35. – Mettenius, Aspid., p. 56. – Gray, Manual, ed. 2, p. 598. – Milde, Fil. Eur. et Atlant., p. 117.

Polypodium fragrans, Linnæus, Sp. Pl., p. 1550.

Polystichum fragrans, Ledebour, “Fl. Ross., iv., p. 514.” – Maximowicz, Prim. Fl. Amur., p. 339.

Dryopteris fragrans, Schott, Gen. Fil., Observ. sub

Polysticho.

Nephrodium fragrans, Richardson, "App. to Frankl. Journ., p. 753." – Hooker & Greville, Ic. Fil., t. lxx. – Hooker, Sp. Fil., iv., p. 122. – Hooker & Baker, Syn. Fil., p. 275.

Dryopteris rubum idæum spirans, Ammann, "Ruth., p. 251."

Hab. – In crevices of shaded cliffs, and on mossy rocks, especially near cascades and rivulets, from Northern New England to Wisconsin, and northward to Arctic America. Also in the Caucasus, and in Siberia, Mantchooria, and Kamtschatka. Special American localities are Mount Kineo, Maine, A. H. and C. E. Smith; at Berlin Falls, the "Alpine Cascade," and the "Gulch," all near the White Mountains, H. Willey; Mount Mansfield, Vermont, C. G. Pringle; Lake Avalanche, Adirondack Mountains, New York, C. H. Peck; Falls of St. Croix, Wisconsin, C. C. Parry, and on the Penokee Iron Range, in the same State, Lapham; Saguenay River, Canada, D. A. Watt. It is apparently more common farther north: Sitka, Iliuliuk, Unalaska, Arakamtchetchene, Kotzebue Bay, Igloodik, Rittenbenk in Greenland, and several other places, are recorded as stations for it.

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