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Ferns of Iowa

...and Their Allies.

By T. J. FITZPATRICK, Professor in Graceland College.

THE FERNS

AND

THEIR ALLIES

OF

IOWA

BY

T. J. FITZPATRICK,

Professor in Graceland College.

Price 25 Cents.

LAMONI, IOWA.
PATRIOT BOOK PRINT.
1896.

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ERRATA.

Page 4, line 19, for *Sporangir* read *Sporangia.*
" 5, " 34, " *contral* " *central.*
" 6, " 9, " *CHEILATHES* read *CHEILANTHES.*
" 7, " 21, " *reiniform* read *reniform.*

CRYPTOGAMOUS OR FLOWERLESS PLANTS.

Plants destitute of true floral organs and having instead of seed minute bodies called spores.

PTERIDOPHYTA COHN.

Vascular acrogens containing woody tissue in the stems. Sexual organs consisting of antheridia and archegonia formed on a prothallus which is developed from a spore on germination, and upon which an asexual plant is produced.

ORDER 1. EQUISETACEAE DC.

Rush like plants with jointed hollow stems and perennial jointed running roots. Leaves represented by small sheaths at joints or a short spike terminating the stem. Prothallus above ground, green, usually lobed and dioecious.

EQUISETUM L. HORSE-TAIL. SCOURING-RUSH.

Stems simple, sometimes with short whorled branches near the nodes, erect, hollow except at the nodes. Surface marked lengthwise with alternate ridges and furrows. The cuticle frequently containing silica. Spore cases 5—6, situated on the under side of an angled shield like scale of the spike, one celled, opening down the inner side. Spores numerous.

* *Stems annual of two kinds, fertile and sterile, fruiting in the spring.*

E. ARVENSE L. Fertile stems pale or brownish 4—10 inches high, appearing before the sterile, unbranched, soon perishing. Sheaths large, with about 12 acuminate brown teeth. Sterile

stems green, 8—20 inches high, much branched, 6—19 furrowed; branches 4—angled. Common in sandy soil all over the state. Fruiting in March and April.

** *Stems all alike, evergreen, simple or with a few short erect branches. Fruiting in the summer. Sheaths appressed.*

E. HYEMALE L. (Scouring-rush.) Stems 1—4 feet high, rough, 8—34 grooved. Sheaths cylindric, enlongated, with a dark band near the base and a black limb. Teeth blackish, membranaceous, deciduous. Central air cavity of the stem large. Common along streams or near springy places. July—September.

E. LAEVIGATUM BRAUN. Stems 1—4 feet high, slender, pale green, 14—30 furrowed. Sheaths enlarging slightly upwards, with a black girdle at the limb and rarely an obscure one at the base. Teeth deciduous, white margined. June—July. In upland soil. Common in the western part of the state and frequent generally.

E ROBUSTUM BRAUN. Stems 3—11 feet high and sometimes one inch thick, 20—48 furrowed. Sheaths short, cylindric, marked with black girdles at the base and at the base of the deciduous teeth. River banks. Reported by Arthur from Keokuk and Clinton counties and by Fink from Fayette county.

*** *Stems annual, fruiting during the summer, all of one kind or the two kinds contemporary, herbaceous.*

E. LIMOSUM L. Stems 2—3 feet high, slightly many furrowed, usually producing many upright branches after fructification. Sheaths appressed with 18 dark-brown short acute rigid teeth. Shallow water. Reported by Arthur from Story county and by Cratty from Emmet county.

ORDER 2. FILICES JUSS.

Acotyledinous plants, perennial in our species, terrestrial, stemless. Rootstalks creeping or descending. Fronds leaf like, usually stalked, from 1—3 pinnate or entire, growing from the upper side of a creeping rhizome or in tufts or crowns terminating erect stems. Sporangia in clusters, variously arranged on the back or margin of the fronds. On reaching development

the sporangia burst discharging numerous spores. Prothallus above ground, green, monoecious or dioecious, on the under surface of which are developed the antheridia and archegonia.

Suborder I. POLYPODIACEAE.

Sporangia in lines, dots, or clusters on the back or margin of the frond or its divisions, naked or covered by a thin membrane called the indusium formed from modified epidermis.

Tribe I. Polypodieae. Fruit dots round on the back or ends of the veins. Indusium wanting. Stipes articulated to the rootstock. Veins free.

1. Polypodium. Fruit dots large, round, at the ends of free veinlets, usually in a single row on each side of the midrib.

Tribe II. Pterideae. Fruit dots usually marginal. Indusuim general and often partly formed from unchanged reflexed margin of the frond. Veins free. Stipes continuous with the rootstock.

2. Pteris. Sporangia a continuous marginal line, connecting the apices of free veins. Indusium delicate, whitish, formed from reflexed margin of the frond.

3. Adiantum. Sporangia separate, marginal, at the ends of free veins. Stipes shining, black.

4. Pellaea. Sori continuous, near the margin and near the ends of free veins. Indusium continuous, membranaceous.

5. Cheilanthes. Sori small, at the ends of the veins. Fronds chaffy or woolly. Indusium continuous or interrupted.

Tribe III. Asplenieae. Sori usually elongated, oblique to the midvein, on one or both sides of the veins. Indusium attached to the vein on one side and free on the other. Stipes continuous with the rootstock.

6. Camptosorus. Sori oblong, single or in pairs, somewhat curved. Veins reticulated.

7. Asplenium. Sori usually on the upper side of a veinlet. Veins free.

Tribe IV. Aspideae. Sori dorsal, round or roundish, on

the back, rarely at the apex of the vein. Indusium usually membranaceous, sometimes wanting. Stipes continuous with the rootstock. Veins usually free.

8. CYSTOPTERIS. Indusium saccate, attached across the fruiting veinlet below the sorus, falling away.

9. ASPIDIUM. Indusium orbicular or reniform, attached by a depressed center or at the sinus, opening around the margin.

10. PHEGOPTERIS. Indusium wanting, sori small on the back of free veins near the apex.

11. ONOCLEA. Sterile fronds foliaceous. Fertile frond much contracted into pod or berry like divisions. Indusium rudimentary enclosed with the sorus.

TRIBE V. WOODSIEAE. Sori round, borne near the middle of the free veins. Indusium spheroidal, attached beneath the sorus, breaking above into spreading segments.

12. WOODSIA. The only genus.

SUBORDER II. OSMUNDACEAE.

Sporangia naked, globose, usually pedicelled, in panicled clusters, opening longitudinally. Annulus none or a rudimentary one at the apex.

TRIBE VI. OSMUNDEAE. The only tribe.

13. OSMUNDA. Sporangia large, numerous, borne upon separate pinnae or fronds. Veins free.

1. POLYPODIUM L. POLYPODY.

Low ferns with large round fruit dots. Indusium none. Rootstock creeping, scaly covered and provided with protruding knobs to which the stipe articulates. Fruit dots on the ends of free veinlets.

P. VULGARE L. Fronds 4—6 inches high, oblong, deeply pinnatifid; divisions alternate, oblong, obtuse, minutely toothed, smooth on both sides, green; fruit dots large, orbicular, in two rows, midway between midrib and margin. July—October. Grows in the cracks of shaded calcarious cliffs in the eastern river counties. Occasionally found in the interior as in Webster county, etc.

2. PTERIS L. Brake or Bracken.

Sporangia in a continuous line, marginal; indusium a thin membrane formed from the reflexed margin; fronds about 3—pinnate; midrib of the pinnules central.

P. aquilina L. Stipe stout, light colored, 3—divided at the summit; frond broad, 2—3 feet, twice pinnate; pinnae lanceolate, long; pinnules oblong, obtuse, alternate, entire or the lower frequently lobed or pinnatifid. August—September. Common in all the eastern counties, scarce westward. Prefers shaded upland woods.

3. ADIANTUM L. Maidenhair.

Fruit dots oblong, marginal; indusium formed from the reflexed margin; midrib marginal, opposite the sori; stipe slender, shining, black.

A. pedatum L. Frond 8 –16 inches high, forked at the summit of the stipe; branches recurved, bearing from above several slender, diverging, pinnate divisions; pinnules numerous, short stalked, alternate, oblique, triangular oblong, lower margin entire bearing the obscure midrib from which spring the veins; opposite margin cleft. July—August. Rich woods. Iowa's commonest fern. State wide.

4. PELLAEA LINK.

Sporangia marginal, (resembling Pteris) composed of confluent elongated or roundish clusters; indusium broad, membranaceous, continuous, formed from a modified reflexed margin. Ferns with small 2—3 pinnate fronds and dusky stipes.

P. atropurpurea Link. Stipes clustered from a short stout rootstock, dark purple, shining, scarcely with hairy bristles; fronds pale coriaceous, once or the lower portion twice pinnate; pinnae oblong, truncate at the base; veins twice forked. Low ferns, 4—8 inches high, with a dense tuft of purple chaffy bristles at the base around the cluster of stipes. Grows from the cracks in calcarious cliffs. Common locally throughout the limestone regions of the eastern and central parts of the state.

P. GRACILIS HOOK. Rootstock long and slender; stipe short, brownish, hairy, chaffy sparingly at the base; fronds 3—6 inches high, membranaceous, delicate; pinnae few, 3—5 pinnately incised decurrent divisions, sterile pinnae linear—oblong to oblong, entire or incised, fertile obovate, crenate or incised; veins once forked. Rare, on calcarious rocks. July. Has been found in Fayette, Winnisheik, Delaware, Dubuque, and Johnson counties.

5. CHEILANTHES SWARTZ.

Fruit dots small, roundish, distinct or contiguous, on the ends of free veinlets; indusium continuous, usually membranaceous, whitish, formed from the reflexed margin of the lobes or of the pinnule. Low ferns 2—3 pinnate, divisions with principal vein central.

C. LANUGINOSA NUTT. Low; from 2—5 inches, ovate, lanceolate, woolly with soft whitish hair; pinnules one-half inch long or less, lower distinct, upper crowded; pinnules made up of small densely crowded segments or else crenately pinnatifid; stipe slender, inch or so in length, hairy when young, becoming smooth, shining, black or brown. Growing on the face of dry rocky cliffs. July—August. Local. Allamakee. Winnisheik, Dubuque, and Jones counties.

6. CAMPTOSORUS LINK. WALKING-LEAF.

Fruit dots arranged irregularly on the back of the frond at various angles to the midvein, oblong to linear, on either side of the netted veins, near the midrib, single, but more or less in pairs toward the margin in which case the indusia are open face to face, sometimes confluent at the ends.

C. RHIZOPHYLLUS LINK. Frond 6—12 inches long, evergreen, sub-coriaceous, stalked, entire or slightly lobed below, long acuminate or produced into a long recurved thread like extention which takes root and produces a new plant, whence the name; base of the frond auriculate or cordate. Grows near shaded calcarious cliffs. On account of its coriacious character this fern may be found from early spring to October. Fruiting in July. Frequent in the eastern counties.

7. ASPLENIUM L. Spleenwort.

Sori oblong or linear, oblique to the midvein, distinct, and parallel to the free veins; indusium attached lengthwise to the upper side of the vein.

A. ANGUSTIFOLIUM Mx. Three—four feet high; fronds narrowly lanceolate, thin, once pinnate; pinnae opposite, lanceolate, short stalked, entire or minutely crenulate; sori 25—30 on each side of the midvein, slightly curved; indusia obscurely convex. Rich woods. July—August. Reported from Jackson county by Mr. Shimek and from Muscatine county by Mr. Witter.

A. THELYPTEROIDES Mx. Fronds tufted, varying from 1—3 feet in height, lanceolate or slightly ovate-lanceolate; pinnae linear-lanceolate to almost linear, sub-pinnate, the segments obtuse, minutely toothed; fruit dots oblong, occasionally double, 3 or 4 pairs to each segment. Found in wooded districts in Muscatine, Fayette, Johnson counties. July—September.

A. FILIX-FOEMINA Bernh. Fronds ovate-oblong to lanceolate, twice pinnate, 2—3 feet high; pinnae lanceolate; pinnules narrowly lanceolate, doubly serrate; secondary rhachis narrowly winged; indusium delicate, curved, frequently becoming reinform or horse-shoe shaped by crossing the vein and being attached to both sides; fruit dots short, more or less curved, at length confluent. July. Common in the woody districts, generally distributed over the state.

A. □EBENEUM Ait. Low, 6—10 inches high, linear—lanceolate in outline; pinnae at right-angles to the rhachis, auricled at the base above and sometimes below, alternate, oblong, finely serrate or incised, one-half to an inch in length, sessile, firmly membranaceous; sori many nearer the midrib than the margin; stipe blackish-purple, shining. Woodland hillsides, rare. Muscatine county. Reppert.

8. CYSTOPTERIS BERNHARDI.

Fruits dots small, round, borne on the back of a straight fork of free veins; indusium in the form of a delicate hood, arched over the sorus and attached to one side toward the midrib, falling away. Delicate tufted ferns, 2—3 pinnate.

C. BULBIFERA BERNH. (Bladder-Fern). 10—20 inches high; frond elongate-lanceolate, twice pinnate; pinnae numerous, short, usually opposite; pinnules narrowly oblong, cut, lobed or nearly entire; one sorus to each lobe; rhachis and pinnae often bearing bladder like bulbets on the under side, wingless. Common near the base of calcarious cliffs in the eastern counties of Iowa. July—September. This fern varies much, and some of its forms closely resemble the next.

C. FRAGILIS BERNH. Usually shorter, frond oblong, lanceolate, twice pinnate; pinnules cut toothed or pinnatifid, about one sorus to each segment; pinnae and pinnules ovate or ovate-lanceolate, decurrent. Common all over the state in wooded districts. Prefers calcarious soil. July—September.

9. ASPIDIUM SWARTZ. SHIELD OR WOOD-FERN.

Fruit dots round, borne on the back of free veins, between the midrib and margin; indusium orbicular and attached by a depressed center, or kidney shaped and centrally attached or at the sinus, opening at the margin; stipe continuous with the rootstock, covered with chaffy scales.

A. ACROSTICHOIDES SWARTZ. (Christmas-Fern). Frond 10—30 inches high, lanceolate, once pinnate, stalked; pinnae alternate, somewhat scythe-shaped, oblong-lanceolate, appressed mucronate toothed, half-halberd-lobed on upper side at the base, short stalked; the fertile pinnules much contracted, terminal; fruit dots in two rows near the ~~the~~ midrib, becoming contiguous; indusium circular, attached by a depressed center. Evergreen ferns with a chaffy rhachis. Prefers wooded cliffs. July—August. Not common. Muscatine and Johnson counties.

A. GOLDIANUM HOOK. Frond about 3 feet high, broadly ovate, stipe chaffy; pinnae many, about opposite, oblong lanceolate, pinnately parted or divided; pinnules somewhat decurrent on the secondary rhachis, cleft teeth appressed; fruit dots small, near the midrib; indusium large, orbicular. Grows usually with the fronds in a tufted circle. Rich woods. July—October. Eastern river counties.

A. CRISTATUM SWARTZ. 12—20 inches high; stipes with chaffy scales; fronds oblong or lanceolate, dark green, narrow; pinnae short, oblong-lanceolate or triangular-ovate, pinnately cleft and minutely toothed; fruit-dots large, midway; indusium reniform, sinus shallow. Found in a damp ravine along Millar's creek and in a boggy place near Bayfield, Cedar river region. Muscatine county. Scarce. Reppert.

A. THELYPTERIS SWARTZ. Fronds elongate-lanceolate, annual, from creeping rootstocks, decaying in autumn; pinnae horizontal, slightly recurved, lanceolate, deeply pinnatifid, segments ovate-oblong, obtuse or appearing acute during fruiting season when the margins are reflexed; venation simple or simply forked; fruit-dots about midway between margin and midrib, soon confluent Delaware, Johnson, Fayette counties.

A. SPINULOSUM SWARTZ. Stipes with a few pale-brown deciduous scales; fronds ovate-lanceolate, pinnae oblique to the rhachis, elongate triangular, the lower pairs broadly triangular; pinnules oblique to the midrib, connected by a very narrow wing, oblong, incised or pinnatifid with lobes spinulose toothed, indusia smooth without marginal glands —UNDERWOOD. Lee county—Arthur; Muscatine county—Arthur and Witter.

10. PHEGOPTERIS FEE. BEECH-FERN

Fruit dots small, round; indusium wanting, borne on the back of free veins below the apex. Fronds membranaceous, green. Stipe continuous with the rootstock.

* *Rhachis winged, fronds two pinnate.*

P. HEXAGONOPTERA FEE. 1—2 feet high; stipe long, smooth, frond triangular-ovate, pinnae lanceolate, acuminate, opposite, deeply pinnatifid, sessile; segments on upper pinnae oblong, obtuse, entire or toothed; lower segments alternate, toothed or pinnatifid, basal lobes united to form a many angled winged rhachis; fruit dots near the margin of the segments or between the sinus and the secondary rhachis Common in rich shady hillsides in the eastern counties. July—September.

P. POLYPODIOIDES FEE. Low 5—9 inches high; fronds triangular, longer than broad, twice pinnate; pinnae elongate lanceolate, bases decurrent on the primary rhachis, lower pair

deflexed and standing forward; fruit dots orbicular, near the margin of the pinnules. Woods. July. Found in Delaware county. Macbride.

** *Fronds 3 divided, divisions petioled, rhachis wingless.*

P. CALCARAE FEE. Frond ternate, rigid, minutely glandular, lateral divisions ascending, bi-pinnate; sori marginal. Not common. July. Has been found in Johnson, Jackson, Cedar, Allamakee, and Jones counties. This fern very much resembles the early stages of *Pteris aquilina* and may be mistaken for it.

11. ONOCLEA L.

Fronds of two kinds, fertile and sterile. Fertile fronds rigid, pod or berry like in appearance, concealing the sporangia; sterile fronds foliaceous. Rootstocks running, constantly projecting new fronds.

O. SENSIBILIS L. (Sensitive-Fern). Sterile frond 9—16 inches high, broadly or triangular-ovate; pinnae lanceolate-ovate, reticulate veined, deeply pinnatifid into oblong segments or else sinuately lobed. Moist thickets. July. Frequent. Widely distributed over the state.

O. STRUTHIOPTERIS HOFFMAN. Sterile fronds in a cluster or corm of decaying stalks, short stalked, 2—5 feet high, broadly lanceolate; pinnae lanceolate, linear, tapering gradually, free veined, sessile, pinnatifid into long lobes, projecting forward; fertile frond shorter, pinnate into globular pinnae. Stoloniferous. Frequent in moist wooded places near streams in the eastern and western portions of the state. July.

12. WOODSIA R. BROWN Rock Polypod.

Fruit dots round, borne, on the back of forked free veins; indusium delicate, attached by the base beneath the sorus, bursting above into several segments

W. OBTUSA TORR. Fronds 5—12 inches, lanceolate, minutely hairy; pinnae few, broadly ovate or oblong, bluntish, pinnately parted or pinnatifid, segments oblong, obtuse, crennately toothed or toothed lobed; veins free, forked, bearing fruit dots

one to each lobe, on or just below the lobes; indusium bursting into several jagged lobes which with the sorus gives the appearance of a small flower. Not common. Rocky cliffs. August. Found in Johnson, Muscatine, Jackson, and Delaware counties.

13. OSMUNDA L. Flowering-Fern.

Tall ferns from thickened rootstocks. Fronds clustered, fertile and sterile or mixed; sporangia globular, in bead like clusters on rhachis like divisions of the fertile pinnae; fertile pinnae destitute of chlorophyll.

O. CLAYTONIANA L. 1—2 feet high, pinnate; pinnae lanceolate, pinnatifid into oblong, obtuse, straight veined divisions; the middle 2—5 pinnae fertile, pinnatifid into globular like divisions. The fern is densely woolly when young but soon becomes glabrous. Fruits while unfolding. May. Prefers low ground in rich woods. Common in the wooded portions of the eastern part of the state but becomes scarce through the central and western portions.

O. CINNAMOMEA L. Sterile fronds tall, 3—5 feet high, in clusters, clothed with cinnamon colored wool when young, at length glabrous; pinnae pinnatifid, segments ovate, oblong, obtuse, entire; fertile fronds shorter, 2—3 feet, appearing before the sterile, decay early, contracted, bi-pinnate, covered with rusty colored sporangia. Prefers moist localities. May. Found once in Johnson conuty by Mr. Shimek and reported from Muscatine county by Mr. Witter.

Order 3. OPHIOGLOSSACEÆ.

Plants fern like in appearance, leafy, from a bulbous or fleshy root, vernation erect. Sporangia panicled in our species, developed from the internal tissue of the frond, 2-valved, ring wanting, spores sulphur colored. Prothallus monoecious, subterranean, not green.

BOTRYCHIUM SWARTZ. Moonwort.

Plants from a short erect rootstock with clustered fleshy roots; bulb for next year's frond at the base of the stipe. Frond with fertile and sterile portions; fertile portion much contracted,

1—3 pinnate, bearing a double row of globular, 2-valved, sessile sporangia; sterile portion ternate, pinnately divided; veins free.

B. VIRGINIANUM SWARTZ. Plant 1—2 feet high or frequently only a few inches; sterile segment sessile above the middle of the plant, ternate, broadly triangular, membranaceous, primary divisions short stalked, 1—2 pinnate, oblong, toothed toward the apex; veins simple braches from a midvein; fertile segment recurved, much contracted, 2—3 pinnate. Frequent in rich woods in most parts of the state. June—July.

B. TERNATUM SWARTZ. Low, 4—16 inches high, fleshy; sterile segment long stalked from near the base of the plant, ternate, triangular, divisions short stalked, pinnately decompound, final segments varying from round-reniform to triangular-lanceolate, entire or toothed; fertile segment long stalked, 2—4 pinnate. Fayette county. Woods. Only one specimen so far has been found. B. Fink.

ORDER 4. LYCOPODIACEÆ LINDL.

CLUB-MOSS FAMILY.

Low, moss-like, terrestrial plants, stems often much branched and covered with lanceolate or subulate, rarely oblong or rounded, persistent entire leaves, arranged in two to many ranks; sporangia 1—3 celled, axillary or on the upper surface of the leaves, on reaching maturity breaking into 2—3 valves and shedding copious yellow spores.

LYCOPODIUM L. CLUB-MOSS.

Perennial, terrestrial plants with evergreen, one nerved, imbricated, bract-like leaves; sporangia coriaceous, flattened, reniform, one-celled.

* *Spore-cases only in the axils of the upper bract-like leaves, giving a spike like appearance, the fruiting bracts yellowish, ovate to heart shaped.*

L. CLAVATUM L. (Common Club-Moss). Stems widely creeping, terete, branches, similar, short, leafy, erect; the fertile branches with minute leaves giving the 1—3 linear spikes terminating the branches the appearance of being pedicelled;

leaves linear-awl-shaped, many ranked, crowded, incurved-spreading, tipped like the bracts with a fine bristle. Found in the fall of 1885 in one spot near Iowa City by M. F. Linder.

L. COMPLANATUM L. (Ground-Pine). Stems widely creeping, branches erect, several times forked; branchlets crowded, flattened; leaves 4-ranked, crowded, minute; lateral rows with spreading tips, the intermediate, narrow, appressed, bases decurrent, united; peduncle slender, bearing 2—4 cylindrical spikes. Johnson county, Iowa. Local. M. F. Linder.

** *Spore-cases in the axils of the ordinary leaves.*

L. LUCIDULUM MX. Stems ascending, branches 6—12 inches long; leaves in about 8 ranks, lanceolate, flat, one nerved, minutely toothed, at first spreading, then deflexed, arranged in alternate zones of shorter and longer leaves; the shorter leaves usually bearing the sporangia in their axils. Reported from Muscatine county by Mr. Reppert.

ORDER 5. SELAGINELLACEÆ.

Moss-like plants, terrestrial or sub-aquatic, low, leafy; leaves small in 4—6 rows, or awl-shaped and elongated; sporangia one-celled, solitary, axillary.

SELAGINELLA BEAUV.

Fructification spicate, of two kinds; sporangia one-celled, solitary, axillary, some containing reddish or orange colored powdery microspores, and others containing 3—4 globose angular macrospores.

S. RUPESTRIS SPRING. Low, 2—3 inches, in prostrate or erect, much branched tufts; leaves all alike, closely appressed-imbricated, linear to linear-lanceolate, minutely ciliate, bristle tipped, rigid, convex and with a grooved keel; the leaves of the quadrangular spike broader; the two kinds of sporangia in the same axils. Found along the Cedar river in sandy soil among clumps of *Opuntia rafinesquii;* Muscatine county; local. Reppert.

ORDER 6. MARSILIACEÆ R. BR.

Perennial plants found in marshy places, rhizome creeping, slender, leaflets usually four, terminating a long slender petiole.

Fructification consisting of two sorts enclosed in capsular receptacles which are borne on peduncles which rise from the rhizome near the leaf-stalk or else more or less connected with the latter. The receptacles 2—4 valved and emit a gummy substance containing micro- and macro-spores mixed or else a mucous cylinder bearing at intervals oblong sporangia containing the two kinds of spores; each on opposite sides.

MARSILIA L.

Aquatic or in partially dried up marshes, rootstocks creeping, frequently sending up elongated petioles which bear at the summit a whorl of four nervose-veined leaflets.

M. VESITATA HOOK AND GREV. Leaflets broadly cuneate, usually hairy, entire, petioles 1—4 inches long, peduncles free from the petiole, sporocarps solitary, short-peduncled, very hairy when young. In swamps which dry up in summer; Iowa and southwestward. From Gray's Manual.

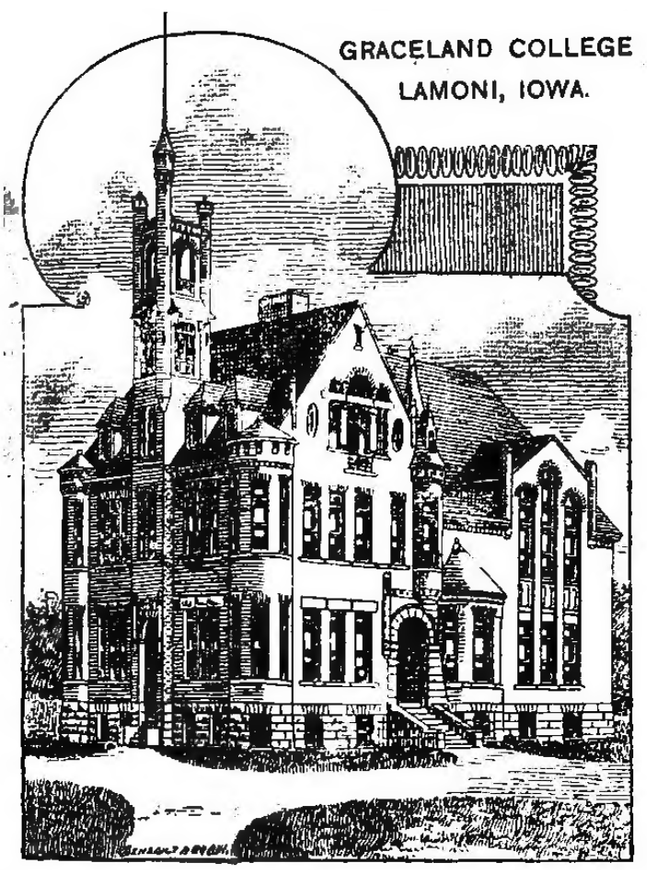
ORDER 7. SALVINIACEÆ.

Diminutive floating plants with a more or less elongated and sometimes branching axis, bearing apparently small leaves arranged in two vertical ranks; sporocarps soft, thin walled, one celled, and having a central, often branched receptacle which bears either macro-sporangia containing solitary macrospores or microsporangia with numerous microspores.

AZOLLA LAM.

Small, moss-like in aspect; stems pinnately branched; leaves minute, two-lobed, imbricated, emitting rootlets from the underside; sporocarps in two pairs beneath the stem, axillary, unequal, the smaller acorn shaped containing a basal macrospore, the larger speroidal, containing a basal placentae bearing many pedicellate micro-sporangia which contain masses of microspores.

A. CAROLINIANA WILLD. Plants deltoid in outline, much branched, one-quarter to an inch in width; leaves with minute ovate lobes, the upper green with a reddish border, the lower red. This plant occurs in large masses floating in still water. The color of the leaf-lobes imparts to the mass a characteristic reddish hue. Found in Muscatine slough. Mr. Reppert.


GRACELAND COLLEGE
LAMONI, IOWA.