

3. *A. pinnatifida*, Nees. Thallus pinnately divided or subsimple, flat or somewhat channelled; branches horizontal, the broader pinnatifid or dentate, obtuse; calyptra somewhat smooth.—On dripping rocks, Hokokus, N. J. (Austin), N. Haven, Conn. (Eaton). (Eu.)

* * * *Thallus wider (2" or more), simple or irregularly lobed.*

4. *A. sessilis*, Spreng. Thallus decumbent, irregularly lobed, 1–2' long, 3–5" wide; involucre none; pedicel $\frac{1}{2}$ –1' long, sometimes folded upon itself and remaining within the calyptra, the capsule thus appearing sessile; antheridia on elongated receptacles.—Wooded swamps. Elongated floating forms, 5–6' long, have been found in the White Mts. (Farlow, Faxon).

5. *A. pinguis*, Dumort. Thallus 1–2' long, decumbent or ascending, fleshy, linear-oblong, simple or slightly lobed, the margin sinuate; dioecious; involucre short, lacerate; calyptra cylindric, smooth; capsule brownish, furrowed; antheridia in 2-lobed receptacles.—Wet banks, N. J. to Ohio, and southward. (Eu.)

ORDER 138. ANTHOCEROTACEÆ. (HORNED LIVERWORTS.)

Plant-body a thallus, irregularly branching, flaccid, without epidermis or pores, and more or less vesiculose. Involucre single, tubular. Calyptra rupturing early near the base, and borne on the apex of the capsule. Capsule dorsal, pod-like, erect or curved outward, more or less perfectly 2-valved, usually stomatose, tapering into a pedicel or often sessile with a bulbous base. Columella filiform. Elaters with or without spiral fibres. Spores flattish, more or less convex-prismatic, papillose or smooth.

1. *Anthoceros*. Capsule narrowly linear, exsertly pedicelled, 2-valved. Elaters present.
2. *Notothylas*. Capsule very short, sessile, not valved below the middle. Elaters not obvious.

1. ANTHOCEROS, Micheli. (Pl. 22.)

Thallus dark green or blackish, usually depressed, variously lobed, with large chlorophyll-grains, frequently glandular-thickened at the apex or in lines along the middle so as to appear nerved. Monoecious or dioecious. Capsule linear, 2-valved, exsertly pedicelled. Elaters simple or branched, often geniculate, more or less heteromorphous, the fibres wanting or indistinct. (Name from *άνθος*, flower, and *κέρας*, horn, from the shape of the capsule.)

1. *A. lævis*, L. (Pl. 22.) Thallus smooth, nearly flat above; dioecious; involucre 1–2' long, trumpet-shaped when dry, repand-toothed; capsule pale brown or yellowish, 1–1½' long; elaters rather short, yellowish; spores yellow, nearly smooth, angular.—Wet clay banks, from Canada south and westward. (Eu.)

2. *A. punctatus*, L. Thallus small, depressed, or often cespitose and erect, more or less glandular; monoecious; involucre rather short, oblong-linear, slightly repand, sometimes scarious at the mouth; capsule 1' high, black; elaters fuscous, flattish, geniculate; spores black, strongly muriculate, sharply angled.—Wet banks, Canada to Mo., and southward. (Eu.)

2. NOTOTHYLAS, Sulliv. (Pl. 22.)

Thallus orbicular, tender, lacinate and undulate or crisped, papillose-reticulate. Monoecious. Involucre sessile, continuous with the thallus, opening irregularly above. Capsule very short, oblong-globose or ovate-cylindric, pedicelled from a thickened bulb, 2-valved to the middle or rupturing irregularly. Elaters none, or fragmentary and inconspicuous. Spores subglobose, smoothish. Antheridia elliptic-globose, immersed in the thallus. (Name from *νόθος*, the back, and *θυλάς*, a bag, from the shape and position of the involucre.)

1. *N. orbiculàris*, Sulliv. (Pl. 22.) Thallus 3–8" wide; capsules 1–2" long, erect or decurved, wholly included or slightly exserted, of thin and loose texture, with a suture on each side; spores light yellowish-brown. (Including *N. valvata*, Sulliv.)—Wet places, Canada to the Gulf.

2. *N. melanóspora*, Sulliv. Thallus small, depressed or sometimes cespitose, of lax texture; capsule often without sutures; spores dark brown, a half larger.—Moist ground, Ohio (Sullivant).

ORDER 139. MARCHANTIACEÆ. LIVERWORTS.

Plant-body a thallus, dichotomous or subpalmately branching, usually innovating from the apex or beneath it, more or less thickened in the middle, and bearing numerous rootlets beneath and usually colored or imbricating scales. Epidermis usually more or less distinct and strongly porose above. Capsules globose, rarely oval, opening irregularly, pendent from the under side of a peduncled disk-like receptacle (*carpocephalum*). Elaters present, mostly 2-spiral.

* Thallus plainly costate, distinctly porose except in n. 6.

+ Gemmæ present on sterile stems.

1. *Marchantia*. Gemmæ in cup-shaped receptacles. Fertile receptacle 7–11-rayed.
2. *Lunularia*. Gemmæ in crescent-shaped receptacles. Fertile receptacle cruciform.

+ + Gemmæ wanting.

+ + Receptacle conic-hemispherical, 2–4-lobed; perianth lobed or fringed.

2. *Preissia*. Receptacle 2–4-lobed, with as many alternate rib-like rays. Perianth 4–5-lobed.

3. *Fimbriaria*. Receptacle 4-lobed. Perianth conspicuous, split into 8–16 fringe-like segments.

+ + Receptacle more or less conical; perianth none.

4. *Conocephalus*. Thallus very large, strongly areolate. Receptacle conical, membranous.

5. *Grimaldia*. Thallus small. Peduncle chaffy at base and apex. Receptacle conic-hemispheric, truncately 3–4-lobed.

6. *Asterella*. Thallus eporose. Receptacle conic-hemispheric, becoming flattened, acutely 4–(1–6)-lobed.

* * Thallus thin, ecostate or barely costate.

. *Dumortiera*. Receptacle convex, 2–8-lobed. Perianth none.

1. MARCHANTIA, Marchant f. (Pl. 22.)

Thallus large, forking, areolate, porose, with broad diffused midrib; gemmæ in a cup-shaped receptacle. Dioecious. Fertile receptacle peduncled from an apical sinus of the thallus, radiately lobed. Involucres alternate with the rays, membranous, lacerate, enclosing 3–6 1-fruited cleft perianths. Calyptra per-

sistent. Capsule globose, exserted, pendulous, dehiscing by several revolute segments. Elaters long, attenuate to each end. Spores smooth. Antheridia immersed in a peduncled disk-like radiate or lobed receptacle. (Named for *Nicholas Marchant*, a French botanist.)

1. *M. polymórpha*, L. Thallus 2-5' long, $\frac{1}{2}$ -1 $\frac{1}{2}$ ' wide, numerous porose, venulose; receptacle divided into usually 9 terete rays; peduncles 1-3' high; antheridial disk crenately or palmately 2-8-lobed, on a peduncle 1' high or less. — Everywhere common. (Eu.)

2. PREÏSSIA, Nees. (Pl. 22.)

Thallus obcordate, sparingly forked, increasing by joints; pores conspicuous; gemmæ none. Dioecious or monœcious. Fertile receptacle hemispheric, 1-4-lobed, with as many alternating shorter rib-like rays. Outer involucre attached beneath the lobes, 1-3-fruited, opening outward by an irregular line; perianth obconic-campanulate, angular, unequally 4-5-lobed. Calyptra persistent. Capsule large, distinctly pedicelled, dehiscing by 4-8 revolute segments. Elaters short. Spores coarsely tuberculate. (Named for *L. Preiss*, a German botanist.)

1. *P. commutata*, Nees. Thallus 1-2' long, with conspicuous white pores above, and dark purple scales beneath; usually monœcious; peduncle $\frac{1}{2}$ -1' high; capsules conspicuous, dark purple; antheridia in a peduncled disk-like receptacle. (*P. hemisphærica*, *Cogn.*) — On slaty and limestone rocks, from N. J. north and westward. (Eu.)

3. FIMBRIARIA, Nees. (Pl. 22.)

Thallus thickened in the middle by a keeled costa, usually conspicuously porose, with dark purple scales beneath; gemmæ none. Monœcious. Receptacle rising from the apex, conic or hemispheric, concave beneath and expanded into usually 4 large campanulate 1-fruited involucre. Perianth oblong-oval or subconic, exserted half its length and cleft into 8-16 fringe-like segments. Calyptra with a long style, fugacious. Capsule nearly sessile, irregularly circumscissile. Elaters rather short, 1-4-spiral. Spores angular, subreticulate. Antheridia immersed in the thallus. (Name from *fimbria*, a fringe, alluding to the perianth.)

1. *F. tenella*, Nees. Thallus of one or more long-wedge-shaped emarginate divisions about 6-9" long, grayish-green and porose above, purple on the margins; peduncle 1' high or more, usually purple; receptacle obtusely conic; perianth white, 8-cleft. — On damp ground in sandy fields or on rocks, central N. Y. to Mo., and southward.

4. CONOCÉPHALUS, Neck. (Pl. 22.)

Thallus dichotomous, copiously reticulate and porose, with a narrow costa; gemmæ none. Receptacle conic-mitriform, membranous. Involucre 5-8, tubular, 1-fruited, suspended from the apex of the peduncle; perianth none. Calyptra persistent, campanulate, 2-4-lobed at the apex. Capsule pedicelled, oblong-pyriform, dehiscing by 5-8 revolute segments. Elaters short, thick. Spores muriculate. Antheridia imbedded in an oval disk sessile near the apex of the thallus. (Name from *κῶνος*, a cone, and *κεφαλή*, a head.)

1. *C. cónicus*, Dumort. Thallus 2-6' long, $\frac{1}{2}$ - $\frac{3}{4}$ ' wide; receptacle conic, striate, crenate. (*Fegatella conica*, *Corda.*) — Shady banks; common. (Eu.)

5. GRIMALDIA, Raddi. (Pl. 23.)

Thallus thick, more or less channelled, dichotomous, innovating from the apex, with thick epidermis, closely areolate and porose-scarious above, purple and more or less scaly beneath; gemmæ none. Monœcious or dioecious. Receptacle peduncled, hemispherical or conoidal, 3-4-lobed. Involucre as many, 1-fruited, each a distention of the lobe. Capsule filling the involucre, circumscissile in the middle, the calyptra persistent at its base. Antheridia in an oval or obcordate disk immersed in the apex of the thallus. (Named for *D. Grimaldi*, an Italian botanist.)

1. *G. bárbifrons*, Bisch. (Pl. 23.) Thallus linear-obcuneate, 3-6" long, 1-2" wide, 2-lobed at the apex, pale green with usually distinct whitish pores, the scales beneath often extending far beyond the margin and becoming whitish; peduncle profusely chaffy at base and apex, sometimes much reduced; antheridial disks obcordate. (Including *G. sessilis*, *Sulliv.*) — Thin soil on rocks, Conn. and N. J. to Iowa; rare or local. (Eu.)

2. *G. rupéstris*, Lindenb. Thallus 3-6" long, 1-3" wide, with membranous margins; receptacle small, hemispherical, 1-4-fruited, the peduncle about 1' high, sparingly scaly at base, barbate at the apex; involucre short, crenulate; spores tuberculate. (*Duvalia rupestris*, *Nees.*) — On calcareous or shaly rocks, N. Y. and Ohio. (Eu.)

6. ASTERÉLLA, Beauv. (Pl. 22.)

Thallus rigid, very indistinctly porose, the midrib broad, strong and distinct. Receptacle conic-hemispheric, becoming flattened, 1-6- (usually 4-) lobed. Monœcious. Involucre coherent with the lobes, 1-fruited, 2-valved. Calyptra minute, lacerate, persistent at the base of the capsule. Capsule greenish, rupturing by irregular narrow teeth or by a fragmentary operculum. Elaters moderately long, mostly 2-spiral. Spores tuberculate. Antheridia in sessile lunate disks. (Diminutive of *aster*, a star, from the form of the receptacle.)

1. *A. hemisphærica*, Beauv. Thallus forking and increasing by joints, pale green, purple beneath; receptacle papillose on the summit (less so at maturity); peduncle bearded at base and apex, $\frac{1}{2}$ -1' long, often 2-3 times longer after maturity. (*Reboulia hemisphærica*, *Raddi.*) — Shaded banks, chiefly along streams; more common southward. — A smaller form or perhaps variety (*Reboulia microcephala*, *Nees*; *R. Sullivantii*, *Lehm.*) occurs in Penn., Ohio, and southward. (Eu.)

7. DUMORTIÈRA, Nees. (Pl. 22.)

Thallus large, thin, soft, with a slight costa, dichotomous, usually with scattered hair-like rootlets beneath; gemmæ none. Receptacle convex, 2-8-lobed. Involucre 1-fruited, connate with the lobes beneath, horizontal, opening by a vertical terminal slit. Capsule distinctly pedicelled, oblong-globose, dehiscing by 4-6 irregular valves. Elaters 2-3-spiral, parietal, very long, straight, attenuate both ways. Spores muriculate. Antheridia in a short peduncled disk paleaceous beneath. (Named for *B. C. Dumortier*, a Belgian botanist.)

1. *D. hirsuta*, Nees. Thallus 2-5' long, 6-9" wide, deep green, becoming blackish, entire on the margins, naked above or with a delicate appressed pubescence; dioecious; receptacle many-fruited, the margin closely hairy; peduncle rather long, chaffy at the apex. — On moist calcareous rocks, Easton, Penn. (Porter), and southward.

8. LUNULÀRIA, Micheli. (Pl. 25.)

Thallus oblong with rounded lobes, distinctly areolate and porose, with imbricate sublunate scales beneath; gemmæ in crescent-shaped receptacles. Dioecious. Fertile receptacle usually cruciately divided into 4 horizontal segments or involucre, which are tubular, vertically bilabiate and 1-fruited. Calyptra included, persistent. Capsule exserted, 4-8-valved. Elaters short, very slender, mostly free. Spores nearly smooth. Antheridia borne in the apical sinus of the thallus. (Name from *lunula*, a little moon.)

L. vulgaris, Raddi. Thallus 1-2' long, forked, innovating from the apex, with a somewhat diffuse costa; peduncle very hairy, 1-1½' long. — Introduced into greenhouses; always sterile, but easily recognized by the characteristic receptacles. (*L. cruciata*, Dumort.) (Int. from Eu.)

ORDER 140. RICCIACEÆ.

Plant-body a dichotomously branching thallus, terrestrial or aquatic. Capsules short-pedicelled, or sessile on the thallus, or immersed in its substance, free or connate with the calyptra, globose, at length rupturing irregularly. Calyptra crowned with a more or less deciduous point. Elaters none. Spores usually angular, reticulate or muriculate. Antheridia ovate, immersed in the thallus in flask-shaped cavities with protruding orifices (*ostioles*).

1. *Riccia*. Capsule immersed in the thallus. Involucre none.

2. *Sphaerocarpus*. Capsule sessile on the thallus. Involucre inflated-pyriform.

1. RÍCCIA, Micheli. (Pl. 22.)

Thallus at first radiately divided, the centre often soon decaying; the divisions bifid or di-trichotomous, flat or depressed or channelled above, usually convex and naked or squamulose beneath; margins naked or spinulose-ciliate; epidermis usually distinct, eporose; air-cavities evident or wanting. Capsule immersed, sessile. Calyptra with a persistent style. Spores alveolate or muriculate, usually flattened and angular. (Named for *P. F. Ricci*, an Italian nobleman, patron of Micheli.)

§ 1. LICHENODES. Fruit mostly protuberant above; spores about 84μ broad, issuing through openings in the upper surface of the thallus; terrestrial species (on damp, usually trodden or cultivated ground), without air-cavities.

* Thallus naked, without cilia or scales.

1. *R. Fróstii*, Aust. Thallus orbicular, 6-12" broad, thinnish, grayish-green, the apex and narrowly membranous margins sometimes purplish, minutely pitted; divisions linear or subspatulate, subtruncate and slightly emarginate; rootlets smooth or obsoletely papillose within; capsules very prominent beneath; spores barely 50μ broad, nearly round, somewhat margined, with depressed sides when dry, fuscous. — Ohio, Ill., and westward.

* * Thallus with white scales beneath (dark purple in n. 4), the margin naked.

2. *R. sorocarpa*, Bisch. Thallus 3-8" in diameter, pale green becoming whitish, finely reticulate, subradiately or dichotomously divided, the oblong-linear segments subacute, deeply sulcate, with a few inconspicuous scales toward the apex not extending beyond the margin; margins erect when dry; spores issuing through chinks early appearing along the groove above. — Thin rocky soil and cultivated fields, Closter, N. J. (Austin), western N. Y. (Clinton), and Ill. (Hall). (Eu.)

3. *R. lamellōsa*, Raddi. Thallus pale green, elegantly reticulated, subradiately divided, the divisions obovate or obcordate, bifid or 2-lobed, 2-5" long, channelled at the apex, with membranous ascending margins, and furnished beneath with transverse scales which extend considerably beyond the margin; spores much as in n. 2. — Thin rocky soil, Closter, N. J. (Austin).

4. *R. nigrélla*, DC. Thallus dichotomously divided, the divisions linear, channelled, with entire narrowly membranous margins, green above, dark purple beneath and furnished with transverse semicircular scales not exceeding the margin. — Rocky ground, N. Y. (Torrey), and Chester, Penn. (Porter). (Eu.)

* * * Thallus more or less ciliate, naked beneath or obsoletely squamous along the extreme edge.

5. *R. arvensis*, Aust. Thallus much divided, 3-9" broad, papillose-reticulate, dull green both sides, becoming fuscous above, the flat margins at length purple; divisions sulcate, dichotomous, the linear-elliptic or subspatulate lobes acutish and obsoletely emarginate; cilia whitish, very short and inconspicuous or nearly wanting; capsules aggregated toward the apex; spores 71-84μ broad, dark fuscous, reticulate, with pellucid margin. — Var. *nifra*, Aust., decidedly ciliate and with spine-like hairs scattered over the upper surface; divisions broader, more obtuse; spores nearly black, larger (84-101μ) and smoother. — Cultivated fields and (the var.) rocky places, Closter, N. J. (Austin).

6. *R. Lescuriana*, Aust. Stellately or subcruciately divided, the obcordate or cuneate-linear divisions 2-6" long, punctate-reticulate, subglaucous or ashy-green both sides or becoming purple beneath, the slightly concave lobes emarginate, closely ciliate with short obtuse spine-like white hairs; capsules scattered, chiefly near the base of the divisions; spores 71-83μ broad, dark brown, reticulate, not margined. — Cultivated fields and rocky grounds, N. J. to Ill., and southward.

§ 2. SPONGODES. Thallus with large air-cavities usually opening by pits through the upper surface, and with slight depressions over the capsules which are prominent beneath; spores 41-51μ broad, obtusely angular or globose; terrestrial.

7. *R. crystallina*, L. Orbicular, 6-9" broad, the obcordate or cuneate divisions bifid or 2-lobed, flat above and the surface much broken up into pits, the margins subcrenate; capsules scattered; spores issuing through the upper surface. — On mud flats, Ill. (Hall), west and southward. (Eu.)

8. *R. lutescens*, Schwein. Orbicular, 1-1½' in diameter, light green; divisions 6-8, linear, 2-3 times forked, narrowly channelled, obcordate and

thickened at the apex, with delicate whitish obliquely ovate appressed scales; rootlets wanting beneath above the middle; fruiting plant unknown. — Dried up pools and ditches, Canada to Mo., and southward. An analogous form has been developed by Lindberg from *R. natans*.

9. *R. tenuis*, Aust. Thallus thin, olive or yellowish-green, shining, the 2-4 divisions roundish-obovate, 2-4" long, flat, with sinuate margins, green beneath with a slender costa and few rootlets; capsule very delicate, closely adherent to the substance of the thallus, minutely apiculate; spores round or short-oval, conspicuously depressed at one end when dry. — Wet ground in open woods, Closter and Lawrence, N. J. (Austin), and Mo. (Hall).

§ 3. *RICCIÉLLA*. Thallus linear, dichotomous, floating or rarely terrestrial; capsule protuberant from the lower surface.

10. *R. fluitans*, L. Thallus often in extended patches, thin, green, radiately expanding, the often imbricate divisions $\frac{1}{2}$ -1 $\frac{1}{2}$ " wide, parallel-nerved, flat, without rootlets, cavernous only toward the slightly dilated very obtuse or subtruncate apex; capsules present only in some terrestrial forms, very prominent below, rupturing beneath the apex. — Very variable. The most notable form is var. *SULLIVANTI*, Aust., with divisions about $\frac{1}{2}$ " wide, channelled, cavernous throughout, the margins crisped-crenulate, and rootlets numerous on the costa tumid with abundant capsules, which are tipped with a long funnel-mouthed point; spores obscurely angled, reticulate and margined. (*R. Sullivani*, Aust.) — In ponds or ditches or growing in wet places upon the ground; the variety often in cultivated fields. (Eu.)

§ 4. *RICCIOCARPUS*. Thallus obcordate, floating or rarely terrestrial; capsules not protruding, at length exposed by a cleft in the central groove.

11. *R. natans*, L. (Pl. 22.) Divisions obcordate or cuneate, broadly emarginate, 3-6" long, purplish, very narrowly channelled, with numerous uniform air-cavities beneath the epidermis, rooting toward the base and at length with dark purple scales beneath the apex; capsules in 1 or 2 rows beneath the groove; spores black, angular, strongly papillose. — Canada to the Gulf. (Eu.)

2. SPHÆROCARPUS, Micheli. (Pl. 22.)

Thallus lobed, without costa or epidermis. Involucres sessile, obconic or pyriform, perforated at the apex, continuous with the thallus at base. Calyptra closely investing the single globose indehiscent capsule, crowned with a deciduous point. Spores globose, muriculate, remaining united in a coccus. Antheridia borne in follicular bodies on the surface of a separate thallus. — An anomalous genus, perhaps more closely related to the Jungermanniaceæ. (Name from *σφαῖρος*, a sphere, and *καρπός*, fruit.)

1. *S. terrestris*, Smith. Thallus orbicular, 3-6" broad, covered by the clustered inflated involucres, which are nearly 1" long, 3-4 times the length of the capsule; coccus 102-127 μ wide, indistinctly lobed. (*S. Michelii*, Bellardi.) — In cultivated fields, mostly southern. (Eu.)

ADDITIONS AND CORRECTIONS.

Page 59. — *ARGEMONE MEXICANA*. Collected at Merodosia, Ill., with white flowers, by A. B. Seymour.

Page 75. — Insert after *Cleome integrifolia* —

C. SPINOSA, L. Viscid-pubescent, 3-4° high; a pair of short stipular spines under the petiole of each leaf; leaflets 5-7, oblong-lanceolate; flowers large, rose-purple to white; stamens 2-3' long; stipe of the linear pod about 2' long. (*C. pungens*, Willd.) — An escape from cultivation, near Mt. Carmel, Ill. (Schneck), and in waste grounds southward; also on ballast. (Int. from Trop. Amer.)

Page 86. — *Arenaria Grœnlandica*. Found on Mt. Desert Island, Maine (Rand).

Page 87. — *Stellaria borealis*. In the mountains of northern N. J.

S. humifusa. This species has also been found on Cranberry Island, near Mt. Desert, Maine, by J. H. Redfield.

Page 91. — Under *Talinum teretifolium* add the character — style equalling the stamens. — Insert

2. *T. calycinum*, Engelm. Leaves somewhat broader; flowers and capsules larger; stamens 30 or more; style twice longer than the stamens, declined. — Central Kan. to W. Tex.

Under *Claytonia* insert —

3. *C. Chamissonis*, Esch. Weak, procumbent or ascending, rooting below and perennial by lateral and terminal filiform runners; leaves several pairs, oblong-spatulate, 1-2' long; inflorescence racemously 1-9-flowered; petals pale rose-color; capsule small, 1-3-seeded. — In a cold ravine, Winona Co., Minn.; in the mountains from Colorado north and westward.

Page 211. — *Hydrocotyle Americana*. Add — propagating by filiform tuberiferous stolons.

Page 230. — Insert after the genus *Dipsacus* —

2. SCABIOSA, Tourne. SCABIOUS.

Characters of *Dipsacus*, but the green leaves of the involucre and involucels not rigid nor spinescent. (Name from *scabies*, the itch, from its use as a remedy.)

S. AUSTRALIS, Wulf. Perennial, sparsely branched, nearly glabrous, 1 $\frac{1}{2}$ -3° high; leaves narrowly lanceolate to linear, the lower oblanceolate, slightly toothed or entire; heads short-oblong; calyx obtusely short-lobed; corolla pale blue. — Central N. Y. and Penn.; rare. (Adv. from Eu.)