

scales which coalesce with its base. — Wet borders of ponds, Newf. to N. Eng. and along the Great Lakes to Minn., south in the mountains to Va.

2. *M. cerifera*, L. (BAYBERRY. WAX-MYRTLE.) Leaves oblong-lanceolate, narrowed at the base, entire or wavy-toothed toward the apex, shining and resinous-dotted both sides, somewhat preceding the flowers, fragrant; sterile catkins scattered, oblong; scales wedge-shaped at the base; nuts scattered and naked, bony, and incrusting with white wax. — Sandy soil near the coast, from Nova Scotia to Fla. and Ala.; also on L. Erie. Shrub 3–8° high, but sometimes a tree 35° high; fruit sometimes persistent for 2 or 3 years.

\* \* Frequently monœcious; fertile catkins globular; ovary surrounded by 8 long linear-awl-shaped persistent scales; nut ovoid-oblong; leaves pinnatifid with many rounded lobes.

3. *M. asplenifolia*, Endl. Shrub 1–2° high, with sweet-scented fern-like linear-lanceolate leaves; stipules half heart-shaped; scales of the sterile catkins kidney-heart-shaped, pointed. (*Comptonia asplenifolia*, Ait.) — Sterile hills, N. Eng. to N. C., west to Minn. and Ind. Known as Sweet Fern.

#### ORDER 103. CUPULIFERÆ. (OAK FAMILY.)

Monœcious trees or shrubs, with alternate simple straight-veined leaves, deciduous stipules, the sterile flowers in catkins (or capitate-clustered in the Beech), the fertile solitary, clustered, spiked, or in scaly catkins, the 1-celled and 1-seeded nut with or without an involucre. Ovary more or less 2–7-celled, with 1 or 2 pendulous anatropous ovules in each cell; but all the cells and ovules except one disappearing in the fruit. Seed with no albumen, filled with the embryo.

**Tribe I. BETULÆ.** Flowers in scaly catkins, 2 or 3 to each bract. Sterile catkins pendulous. Stamens 2–4, and calyx usually 2–4-parted. Fertile flowers with no calyx, and no involucre to the compressed and often winged small nut. Ovary 2-celled, 2-ovuled.

1. *Betula*. Stamens 2, bifid. Fertile scales thin, 3-lobed, deciduous with the nuts.

2. *Alnus*. Stamens 4. Fertile scales thick, entire, persisting after the nuts have fallen.

**Tribe II. CORYLÆ.** Sterile catkins pendulous, with no calyx; stamens 3 or more to each bract and more or less adnate to it, the filaments often forked (anthers 1-celled). Fertile flowers in a short ament or head, 2 to each bract, and each with one or more bractlets which form a foliaceous involucre to the nut. Ovary 2-celled, 2-ovuled.

\* Bract of staminate flower furnished with a pair of bractlets inside; fertile flowers few

3. *Corylus*. Involucre leafy-coriaceous, enclosing the large bony nut.

\* \* Bract of staminate flower simple; fertile flowers in short catkins; nut small, achene-like

4. *Ostrya*. Each ovary and nut included in a bladder and closed bag.

5. *Carpinus*. Each nut subtended by an enlarged leafy bractlet.

**Tribe III. QUERCINEÆ.** Sterile flowers with 4–7-lobed calyx and stamens indefinite (3–20). Fertile flowers 1 or few, enclosed in a cupule consisting of consolidated bracts, which becomes indurated (scaly or prickly) and surrounds or encloses the nut.

\* Sterile flowers in slender catkins.

6. *Quercus*. Cupule 1-flowered, scaly and entire; nut hard and terete.

7. *Castanea*. Cupule 2–4-flowered, forming a prickly hard bur, 2–4-valved when ripe.

\* \* Sterile flowers in a small head.

8. *Fagus*. Cupule 2-flowered, 4-valved, containing 2 sharply triangular nuts.

#### 1. BÉTULA, Tourn. BIRCH.

Sterile flowers 3, and bractlets 2, to each shield-shaped scale or bract of the catkins, consisting each of a calyx of one scale bearing 4 short filaments with 1-celled anthers (or strictly of two 2-parted filaments, each division bearing an anther-cell). Fertile flowers 2 or 3 to each 3-lobed bract, without bractlets or calyx, each of a naked ovary, becoming a broadly winged and scale-like nutlet (or small samara) crowned with the two spreading stigmas. — Outer bark usually separable in sheets, that of the branchlets dotted. Twigs and leaves often spicy-aromatic. Foliage mostly thin and light. Buds sessile, scaly. Sterile catkins long and drooping, terminal and lateral, sessile, formed in summer, remaining naked through the succeeding winter, and expanding their golden flowers in early spring, with or preceding the leaves; fertile catkins oblong or cylindrical, peduncled, usually terminating very short 2-leaved early lateral branches of the season. (The ancient Latin name, of Celtic origin.)

\* Trees, with brown or yellow-gray bark, sweet-aromatic as well as the twigs, membranaceous and straight-veined Hornbeam-like leaves heart-shaped or rounded at base, on short petioles, and sessile very thick fruiting catkins; their scales about equally 3-cleft, rather persistent; wing of fruit not broader than the seed-bearing body.

1. *B. lenta*, L. (CHERRY B. SWEET OR BLACK BIRCH.) Bark of trunk dark brown, close (outer layers scarcely laminate), very sweet-aromatic; leaves ovate or oblong-ovate from a more or less heart-shaped base, acuminate, sharply and finely doubly serrate all round, when mature shining or bright green above and glabrous except on the veins beneath; fruiting catkins oblong-cylindrical (1–1½' long), the scales with short and divergent lobes. — Rich woodlands, Newf. to N. Del., and south in the mountains, west to Minn., and S. Ind. Tree 50–75° high, with reddish bronze-colored spray; wood rose-colored, fine-grained, valuable for cabinet-work.

2. *B. lutea*, Michx. f. (YELLOW OR GRAY BIRCH.) Bark of trunk yellowish- or silvery-gray, detaching in very thin filmy layers, within and the twigs much less aromatic; leaves (3–5' long) slightly or not at all heart-shaped and often narrowish toward the base, duller-green above and usually more downy on the veins beneath; fruiting catkins oblong-ovoid (1' or less in length, 6–9" thick), the thinner scales (5–6" long) twice as large as in n. 1, and with narrower barely spreading lobes. — Rich moist woodlands, Canada and N. Eng. to Del., west to Minn.; also along high peaks to Tenn. and N. C. Often 60–90° high at the north; wood whiter and less valuable.

\* \* Trees, with chalky-white bark separable in thin sheets, ovate or triangular leaves of firmer texture, on long slender petioles; fruiting catkins cylindrical, usually hanging on rather slender peduncles; their scales glabrous, with short diverging lobes, freely deciduous; wing of the fruit much broader than its body.

3. *B. populifolia*, Ait. (AMERICAN WHITE BIRCH. GRAY BIRCH.) Trunk usually ascending (15–30° high); leaves triangular (deltoid), very taper-pointed (usually abruptly), truncate or nearly so at the broad base, smooth and shining both sides, except the resinous glands when young. (*B. alba*, var.



*populifolia*, Spach.)—Poor sandy soils, N. Brunswick to Del., west to L. Ontario. Bark much less separable than the next; leaves on slender petioles, tremulous as those of the aspen.

4. **B. papyrifera**, Marshall. (PAPER OR CANOE BIRCH. WHITE BIRCH.) Leaves ovate, taper-pointed, heart-shaped or abrupt (or rarely wedge-shaped) at base, smooth and green above, pale, glandular-dotted, and a little hairy on the veins beneath, sharply and unequally doubly serrate, 3-4 times the length of the petiole. (B. papyracea, Ait.)—Rich woodlands and stream-banks, N. Eng. to N. Penn., N. Ill., and Minn., and far north and westward. Tree 50-75° high, with bark freely splitting into paper-like layers.—Var. **MINOR**, Tuckerman, is a dwarf form of the alpine region of the White Mts.

\*\*\* Tree, with greenish-brown bark, somewhat laminate, and reddish twigs, ovate leaves whitish beneath, and soft-downy peduncled fruiting catkins.

5. **B. nigra**, L. (RIVER OR RED BIRCH.) Leaves rhombic-ovate, acutish at both ends, irregularly doubly serrate, whitish and (until old) downy underneath; petioles and peduncle of nearly the same length (3-7") and with the oblong catkin tomentose; the bracts with oblong-linear nearly equal lobes; fruit broadly winged.—Banks of streams, Mass. to Fla., west to Minn., E. Kan., and Tex. Tree 50-75° high, with light-colored wood and somewhat Alder-like leaves.

\*\*\* Shrubs, with brownish bark, rounded or wedge-shaped crenate and mostly small leaves of thickish or coriaceous texture, and oblong or cylindrical glabrous and mostly erect catkins, on short peduncles.

6. **B. pumila**, L. (LOW BIRCH.) Stems (2-8° high) erect or ascending, not glandular; young branches and lower face of young leaves mostly soft-downy; leaves obovate, roundish, or orbicular (6-16" long), pale beneath, veinlets on both faces finely reticulated; wing of the fruit mostly narrower than the body.—Bogs, W. Conn. and N. J. to Ind. and Minn., and northward throughout Canada. Leaves usually not at all resiniferous or glandular-dotted.

7. **B. glandulosa**, Michx. (DWARF BIRCH.) Stems erect or mostly spreading (1-4° high), or when alpine procumbent; branchlets glabrous, conspicuously dotted with resinous wart-like glands; leaves roundish wedge-obovate or sometimes orbicular (6-9" long), green and glabrous both sides, less reticulated; fruiting catkins mostly shorter and oblong or oval; wing of the fruit narrower than or sometimes equalling the body.—High mountains of N. Eng. and N. Y., to L. Superior, and far northward.

## 2. **ALNUS**, Tourn. ALDER.

Sterile catkins elongated and drooping, with 4 or 5 bractlets and 3 (rarely 6) flowers upon each short-stalked shield-shaped scale; each flower usually with a 3-5-parted calyx and as many stamens; filaments short and simple; anthers 2-celled. Fertile catkins ovoid or oblong; the fleshy scales each 2-3 flowered, with a calyx of 4 little scales adherent to the scales or bracts of the catkin, which are thick and woody in fruit, wedge-obovate, truncate, or 3-5-lobed, and persistent.—Shrubs or small trees, with few-scaled leaf-buds, and solitary or often racemose-clustered catkins, terminating leafless branchlets or peduncles. (The ancient Latin name.)

§ 1. Flowers developed in spring with the leaves; the sterile from catkins which have remained naked over winter; while the fertile have been enclosed in a scaly bud; fruit with a conspicuous thin wing, as in Birch.

1. **A. viridis**, DC. (GREEN OR MOUNTAIN ALDER.) Shrub 3-8° high; leaves round-oval, ovate, or slightly heart-shaped, glutinous and smooth or softly downy beneath, irregularly serrulate or biserrulate with very sharp and closely set teeth, sometimes sinuate-toothed and serrulate (var. *SINUATA*, Regel), on young shoots often cut-toothed; fertile catkins slender-stalked, clustered, ovoid (6-8" long).—On mountains and mountain streams, Newf. to W. Mass., N. Y., L. Superior, and far north and west; also in the Alleghanies to N. C. (Eu., Asia.)

§ 2. Flowers developed in earliest spring, before the leaves, from mostly clustered catkins which (of both sorts) were formed the foregoing summer and have remained naked over winter; fruit wingless or with a narrow coriaceous margin.

2. **A. incana**, Willd. (SPECKLED OR HOARY A.) Leaves broadly oval or ovate, rounded at base, sharply and often doubly serrate, whitened and mostly downy beneath; stipules oblong-lanceolate; fruit orbicular.—Borders of streams and swamps, Newf. to Mass., E. Neb., Minn., and westward. Shrub or tree 8-20° high; the common Alder northward. (Eu., Asia.)

3. **A. serrulata**, Willd. (SMOOTH A.) Leaves obovate, acute at base, sharply serrate with minute teeth, thickish, green both sides, smooth or often downy beneath; stipules oval; fruit ovate.—Borders of streams and swamps, Mass. to Fla., west to S. E. Minn. and Tex.; common. Shrub forming dense thickets, or sometimes at the south a small tree 6-35° high.

§ 3. Flowers in autumn (Sept.) from catkins of the season; the fertile mostly solitary in the axils of the leaves, ripening the fruit a year later; fruit wingless.

4. **A. maritima**, Muhl. (SEA-SIDE A.) Glabrous; leaves oblong, ovate, or obovate with a wedge-shaped base, slender-petioled, sharply serrulate, bright green, or rather rusty beneath; fruiting catkins large, ovoid or oblong (9-12" long, 6" thick).—Borders of streams and swamps. S. Del. and E. Md., near the coast. Small tree 15-25° high. (E. Asia.)

## 3. **CORYLUS**, Tourn. HAZEL-NUT. FILBERT.

Sterile flowers in drooping cylindrical catkins, consisting of 8 (half-) stamens with 1-celled anthers, their short filaments and pair of scaly bractlets cohering more or less with the inner face of the scale of the catkin. Fertile flowers several in a scaly bud, each a single ovary in the axil of a scale or bract, and accompanied by a pair of lateral bractlets; ovary tipped with a short limb of the adherent calyx, incompletely 2-celled, with 2 pendulous ovules, one of them sterile; style short; stigmas 2, elongated and slender. Nut ovoid or oblong, bony, enclosed in a leafy or partly coriaceous cup or involucre, consisting of the two bractlets enlarged and often grown together, lacerated at the border. Cotyledons very thick (raised to the surface in germination), edible; the short radicle included.—Shrubs or small trees, with thinish doubly-toothed leaves, folded lengthwise in the bud, flowering in early spring; sterile catkins single or fascicled from scaly buds of the axils of the preceding year, the fertile ter-



minating early leafy shoots. (The classical name, probably from *kópus*, a helmet, from the involucre.)

1. *C. Americana*, Walt. (WILD HAZEL-NUT.) Leaves roundish-heart-shaped, pointed; involucre open above down to the globose nut, of 2 broad foliaceous cut-toothed almost distinct bracts, their base coriaceous and downy, or with glandular bristles intermixed. — Thickets, N. Eng. to Ont. and the Dakotas, and southward. Twigs and petioles often glandular-bristly.

2. *C. rostrata*, Ait. (BEAKED HAZEL-NUT.) Leaves ovate or ovate-oblong, somewhat heart-shaped, pointed; involucre of united bracts, much prolonged above the ovoid nut into a narrow tubular beak, densely bristly. — N. Scotia to northern N. J., Mich., Minn., and westward, and south in the mountains to Ga. Shrub 2–6° high.

#### 4. *ÓSTRYA*, Michx. HOP-HORNBEAM. IRON-WOOD.

Sterile flowers in drooping cylindrical catkins, consisting of several stamens in the axil of each bract; filaments short, often forked, bearing 1-celled (half-) anthers; their tips hairy. Fertile flowers in short catkins; a pair to each deciduous bract, each of an incompletely 2-celled 2-ovuled ovary, crowned with the short bearded border of the adherent calyx, tipped with 2 long-linear stigmas, and enclosed in a tubular bractlet, which in fruit becomes a closed bladder oblong bag, very much larger than the small and smooth nut; these inflated involucre loosely imbricated to form a sort of strobile, in appearance like that of the Hop. — Slender trees, with very hard wood, brownish furrowed bark, and foliage resembling that of Birch; leaves open and concave in the bud, more or less plaited on the straight veins. Flowers in spring, appearing with the leaves; the sterile catkins 1–3 together from scaly buds at the tip of the branches of the preceding year; the fertile single, terminating short leafy shoots of the season. (The classical name.)

1. *O. Virginica*, Willd. (AMERICAN HOP-HORNBEAM. LEVER-WOOD.) Leaves oblong-ovate, taper-pointed, very sharply doubly serrate, downy beneath, with 11–15 principal veins; buds acute; involucre sacs bristly-hairy at the base. — Rich woods, common, from the Atlantic to N. Minn., Neb., E. Kan., and southward. Tree 25–45° high; hop-like strobiles full-grown in Aug.

#### 5. *CARPINUS*, L. HORNBEAM. IRON-WOOD.

Sterile flowers in drooping cylindrical catkins, consisting of several stamens in the axil of a simple and entire scale-like bract; filaments very short, mostly 2-forked, the forks bearing 1-celled (half-) anthers with hairy tips. Fertile flowers several, spiked in a sort of loose terminal catkin, with small deciduous bracts, each subtending a pair of flowers, as in *Ostrya*; but the single involucre-like bractlet is open, enlarged in fruit and foliaceous, merely subtending the small ovate several-nerved nut. — Trees or tall shrubs, with smooth close gray bark, in this and in the slender buds and straight-veined leaves resembling the Beech; leaf-buds and inflorescence as in *Ostrya*. (The early Latin name.)

1. *C. Caroliniana*, Walter. (AMERICAN HORNBEAM. BLUE or WATER BEECH.) Leaves ovate-oblong, pointed, sharply doubly serrate, soon nearly smooth; bractlets 3-lobed, halberd-shaped, sparingly cut-toothed on one side, acute. (*C. Americana*, Michx.) — Along streams, N. Scotia to Fla., west to

Minn., Iowa, E. Kan., and Tex. Tree or shrub, 10–45° high, with ridged trunk, and very hard wood.

#### 6. *QUERCUS*, L. OAK.

Sterile flowers in slender naked catkins; bracts caducous; calyx 2–8-parted or lobed; stamens 3–12; anthers 2-celled. Fertile flowers scattered or somewhat clustered, consisting of a nearly 3-celled and 6-ovuled ovary, with a 3-lobed stigma, enclosed by a scaly bud-like involucre which becomes an indurated cup (cupule) around the base of the rounded nut or acorn. Cotyledons remaining underground in germination; radicle very short, included. — Flowers greenish or yellowish. Sterile catkins single or often several from the same lateral scaly bud, filiform and hanging in all our species. (The classical Latin name.) All flower in spring, and shed their nuts in Oct. of the same or the next year.

§ 1. *LEUCOBÁLANUS*. Bark pale, often scaly; leaves and their lobes or teeth obtuse, never bristle-pointed; stamens 6–8; scales of the cup more or less knobby at base; stigmas sessile or nearly so; abortive ovules at the base of the perfect seed; inner surface of nut glabrous; fruit maturing the first year, often peduncled; kernel commonly sweetish; wood tough and dense.

\* Leaves deciduous, lyrate or sinuate-pinnatifid, pale beneath. — WHITE OAKS.

1. *Q. álba*, L. (WHITE OAK.) Mature leaves smooth, pale or glaucous underneath, bright green above, obovate-oblong, obliquely cut into 3–9 oblong or linear and obtuse mostly entire lobes; cup hemispherical-saucer-shaped, rough or tubercled at maturity, naked, much shorter than the ovoid or oblong acorn (1' long). — All soils, Maine to S. E. Minn., E. Kan., and south to the Gulf. A large and valuable tree; lobes of the leaves short and broad (3–5), or deep and narrow (5–9).

2. *Q. stellata*, Wang. (POST OAK. IRON OAK.) Leaves grayish or yellowish-downy underneath, pale and rough above, thickish, sinuately cut into 5–7 rounded divergent lobes, the upper ones much larger and often 1–3-notched; cup deep saucer-shaped, naked, one third or half the length of the ovoid acorn (6–9" long). (*Q. obtusiloba*, Michx.) — Sandy or sterile soil, Martha's Vineyard to Mich. and E. Neb., south to Fla. and Tex.; common, especially southward. A small tree with very durable wood.

3. *Q. macrocarpa*, Michx. (BUR OAK. OVER-CUP or MOSSY-CUP OAK.) Leaves obovate or oblong, lyrate-pinnatifid or deeply sinuate-lobed, or nearly parted, sometimes nearly entire, irregular, downy or pale beneath; the lobes sparingly and obtusely toothed, or the smaller ones entire; cup deep, thick and woody (9"–2' across), conspicuously imbricated with hard and thick pointed scales, the upper ones awned, so as usually to make a mossy-fringed border; acorn broadly ovoid (1–1½' long), half immersed in or entirely enclosed by the cup. — Rich soil, N. Scotia to W. Mass. and Penn., west to Minn., central Neb., and Kan. A large and valuable tree; extremely variable in the size and fringe of the acorns. — Var. *OLIVÆFORMIS*, Gray, is only a narrower-leaved form with unusually small oblong acorns.

4. *Q. lyrata*, Walt. (OVER-CUP OAK. SWAMP POST OAK.) Leaves crowded at the end of the branchlets, obovate-oblong, acute at base, more or less deeply 7–9-lobed, white-tomentose beneath or at length smoothish, the lobes triangular to oblong, acute or obtuse, entire or sparingly toothed; fruit short-peduncled



or sessile; cup round-ovate, thin, with rugged scales, almost covering the depressed-globose acorn (8–10" long). — River swamps, S. E. Mo. to S. Ind., Tenn., N. C., and southward. — A large tree, with flaky bark; intermediate between n. 3 and n. 5.

\* \* *Leaves coarsely sinuate-toothed, but not lobed (except slightly in n. 5), whitish and more or less downy beneath; cup hoary, hemispherical or a little depressed, about half as long as the oblong-ovoid edible acorn.* — CHESTNUT-OAKS.

5. *Q. bicolor*, Willd. (SWAMP WHITE OAK.) Leaves obovate or oblong-obovate, wedge-shaped at base, coarsely sinuate-crenate and often rather pinnatifid than toothed, usually soft-downy and white-hoary beneath, the main primary veins 6–8 pairs, lax and little prominent; fruiting peduncle much longer than the petiole; upper scales of the cup awn-pointed, sometimes forming a mossy-fringed margin; acorn scarcely 1' long. — Borders of streams and swamps, S. Maine to Ont., Minn., and E. Kan., and south in the mountains to N. Ga. — A large tree, with flaky bark.

6. *Q. Michauxii*, Nutt. (BASKET-OAK. COW-OAK.) Leaves (5–6' long) oval or obovate, acute, obtuse or even cordate at base, regularly dentate (commonly not deeply), rather rigid, usually very tomentose beneath; stamens usually 10; fruit short-peduncled; cup shallow, tuberculate with hard and stout acute scales, without fringe; acorn 1½' long. (*Q. Prinus*, var. *Michauxii*, Chapm.) — Borders of streams and swamps, Del. to Fla., and in the west from S. Ind. to Mo., and south to the Gulf. — A large and valuable tree, with gray flaky bark and large sweet edible acorns. Intermediate forms appear to connect with n. 5, of which Dr. Engelmann considered it a subspecies.

7. *Q. Prinus*, L. (CHESTNUT-OAK.) Leaves thick, varying, obovate or oblong to lanceolate, sometimes acuminate, with an obtuse or acute base, undulately crenate-toothed, pale and minutely downy beneath, the main primary ribs 10–16 pairs, straight, prominent beneath; fruiting peduncles shorter than the petioles, often very short; cup thick (6–12" wide), mostly tuberculate with hard and stout scales; acorn large (sometimes 1–1½' long). (Incl. var. *monticola*, Michx.) — Rocky banks and hillsides, E. Mass. to N. Y. and Ont., and south in the mountains to N. Ala. A large tree, with thick and deeply furrowed bark, rich in tannin.

8. *Q. Muhlenbergii*, Engelm. (YELLOW OAK. CHESTNUT-OAK.) Leaves (5–7' long) slender-petioled, often oblong or even lanceolate, usually acute or pointed, mostly obtuse or roundish at base, almost equably and rather sharply toothed; cup subsessile, shallow, thin, of small appressed scales, 5–7" broad; acorn globose or obovate, 7–9" long. (*Q. Prinus*, var. *acuminata*, Michx.) — Dry hillsides and rich bottoms, Mass. to Del., along the mountains to N. Ala., west to Minn., E. Neb., and Tex. — Leaves more like those of the Chestnut than any other; the primary veins very straight, impressed above, prominent beneath. A tall tree, with thin flaky bark.

9. *Q. prinoides*, Willd. Like the last, but of low stature (usually 2–4° high), with smaller more undulate leaves on shorter petioles (3–6" long), and deeper cups with more tumid scales. (*Q. Prinus*, var. *humilis*, Marsh.) — Same range as last. Apparently quite distinct at the east, where it is very low, but running into *Q. Muhlenbergii* at the far west.

\* \* *Leaves coriaceous, evergreen, entire or rarely spiny-toothed.* — LIVE OAKS.

10. *Q. virens*, Ait. (LIVE OAK.) Leaves small, oblong or elliptical, hoary beneath as well as the branchlets; peduncle usually conspicuous, 1–3-fruited; cup top-shaped; acorn oblong; cotyledons completely united into one mass. — Along the coast from Va. to Fla. and Tex. Becoming a large tree at the south, and formerly extensively used in ship-building.

§ 2. *MELANOBALANUS*. Bark dark, furrowed; leaves deciduous, their lobes and teeth acute and bristle-pointed (at least in youth); stamens mostly 4–6; cup-scales membranaceous; styles long and spreading; abortive ovules near the top of the perfect seed; inner surface of nut tomentose; fruit maturing the second year, sessile or on short thick peduncles; wood porous and brittle. — BLACK OAKS.

\* *Leaves pinnatifid or lobed, slender-petioled, not coriaceous, the lobes or teeth conspicuously bristle-pointed.*

+ *Mature leaves glabrous on both sides or nearly so, oval, oblong or somewhat obovate in outline, from moderately sinuate-pinnatifid to deeply pinnatifid, turning various shades of red or crimson in late autumn; large trees, with reddish coarse-grained wood; species closely related and apparently readily hybridizing.*

11. *Q. rubra*, L. (RED OAK.) Cup saucer-shaped or flat, with a narrow raised border (9–12" in diameter), of rather fine closely appressed scales, sessile or on a very short and abrupt narrow stalk or neck, very much shorter than the oblong-ovoid or ellipsoidal acorn, which is 1' or less in length; leaves rather thin, turning dark red after frost, moderately (rarely very deeply) pinnatifid, the lobes acuminate from a broad base, with a few coarse teeth; bark of trunk dark gray, smoothish. — Common both in rich and poor soil, westward to E. Minn. and E. Kan. Timber coarse and poor. — Var. *RUNCINATA*, A. DC., is a form with regular nearly entire lobes and the fruit nearly a half smaller; found near St. Louis.

12. *Q. coccinea*, Wang. (SCARLET OAK.) Cup top-shaped, or hemispherical with a conical base (7–9" broad), coarsely scaly, covering half or more of the broadly or globular-ovoid acorn, the scales somewhat appressed and glabrate, or in western localities yellowish-canescens and squarrose as in var. *tinctoria*; leaves in the ordinary forms, at least on full-grown trees, bright green, shining above, turning red in autumn, deeply pinnatifid, the slender lobes divergent and sparingly cut-toothed; buds small; acorns 6–9" long; bark of the trunk gray, the interior reddish. — Moist or dry soil; common, from S. Maine to Del., Minn., N. Mo., and south in the mountains.

Var. *tinctoria*, Gray. (QUERCITRON, YELLOW-BARKED, or BLACK OAK.) Leaves with broader undivided lobes, commonly paler and somewhat pubescent beneath, turning brownish, orange, or dull red in autumn; cup-scales large and loosely imbricated or squarrose when dry, yellowish gray, pubescent; bark of trunk darker-colored and rougher on the surface, thicker, and internally orange, much more valuable for the tanner and dyer; buds longer and more pointed; cup sometimes less top-shaped. (*Q. tinctoria*, Bartram.) — Dry or gravelly uplands, S. Maine to S. Minn., E. Neb. and Tex. Intermediate forms connect this with the type. The bark is largely used in tanning.



Var. *ambigua*, Gray. (GRAY OAK.) Found along our northeastern borders to Lake Champlain and northward, figured and briefly characterized by Michaux as with the foliage of *Q. rubra* and the fruit of *Q. coccinea*. It was considered by Dr. Engelmann as a form of *Q. rubra* with cups hemispherical or even turbinate.

13. *Q. palustris*, Du Roi. (SWAMP SPANISH or PIN OAK.) Cup flat-saucer-shaped, sometimes contracted into a short scaly base or stalk, fine-scaled (5-7" broad), very much shorter than the usually globose or depressed acorn, which is 5-7" long; leaves deeply pinnatifid with divergent lobes and broad rounded sinuses. — Low grounds; rather common, from Mass. to Del. and Md., west to Minn., E. Kan., and Ark.

++ Mature leaves soft-downy beneath; cup saucer-shaped, with a somewhat top-shaped base, about half the length of the fully developed small acorn.

14. *Q. falcata*, Michx. (SPANISH OAK.) Leaves grayish-downy or fulvous underneath, obtuse or rounded at base, 3-5-lobed above (sometimes entire); the lobes prolonged, mostly narrow and more or less scythe-shaped, especially the terminal one, entire or sparingly cut-toothed; acorn globose, 4-5" long. — Dry or sandy soil, Long Island to Fla., and from S. Ind. to Mo. and Tex. A large or small tree, extremely variable in foliage; bark excellent for tanning.

15. *Q. ilicifolia*, Wang. (BEAR or BLACK SCRUB-OAK.) Dwarf (3-8° high), straggling; leaves (2-4' long) thickish, obovate, wedge-shaped at base, angularly about 5- (3-7-) lobed, white-downy beneath; lobes short and triangular, spreading; acorn ovoid, globular, 5-6" long. — Sandy barrens and rocky hills, N. Eng. to Ohio and Ky.

\* \* Leaves entire or with a few teeth (or somewhat 3-5-lobed at the summit), coriaceous, commonly bristle-pointed; acorns globular, small (not over 6" long).

+ Leaves thick, widening or often much dilated upward and more or less sinuate or somewhat 3-5-lobed; acorns globular-ovoid.

16. *Q. aquatica*, Walter. (WATER-OAK.) Leaves glabrous and shining, obovate-spatulate or narrowly wedge-form, with a long tapering base and an often obscurely 3-lobed summit, varying to oblanceolate; cup saucer-shaped or hemispherical. — Wet grounds, around ponds, etc., Del. to the Gulf, and from Ky. and Mo. to Tex. — Tree 30-40° high; running into many varieties, especially southward; the leaves on seedlings and strong shoots often incised or sinuate-pinnatifid; then mostly bristle-pointed.

17. *Q. nigra*, L. (BLACK-JACK or BARREN OAK.) Leaves broadly wedge-shaped, but sometimes rounded or obscurely cordate at the base, widely dilated and somewhat 3-lobed (rarely 5-lobed) at the summit, occasionally with one or two lateral conspicuously bristle-tipped lobes or teeth, rusty-pubescent beneath, shining above, large (4-9' long); cup top-shaped, coarse-scaly; acorn short-ovoid. — Dry sandy barrens, or heavy clay soil, Long Island to S. Minn., E. Neb., and southward. A small tree (sometimes 30-40° high), of little value.

++ Leaves not dilated upward, generally entire; acorn globose.

18. *Q. imbricaria*, Michx. (LAUREL or SHINGLE OAK.) Leaves lanceolate-oblong, thickish, smooth, and shining above, downy underneath, the down commonly persistent; cup between saucer-shaped and top-shaped. — Rich woodlands, Penn. to Ga., west to S. Wisc., Iowa, E. Neb., and N. Ark. —

Tree 30-90° high. The specific name is in allusion to its early use for shingles.

19. *Q. Phellos*, L. (WILLOW-OAK.) Leaves linear-lanceolate, narrowed to both ends, soon glabrous, light green (3-4' long); cup saucer-shaped. — Bottom lands or rich sandy uplands, Staten Island to N. Fla., west to S. Ky., Mo., and Tex.

In addition to the above, the following hybrids have been recognized: —

*Q. ALBA* × *MACROCARPA*; N. Ill. (Bebb); central Ill. (Hall).

*Q. ALBA* × *STELLATA*; N. Ill. (Bebb); D. C. (Vasey); S. C. (Mellichamp).

*Q. ALBA* × *PRINUS*; near Washington, D. C. (Vasey.)

*Q. IMBRICARIA* × *NIGRA* (*Q. tridentata*, Engelmann); S. Ill. (Engelmann).

*Q. IMBRICARIA* × *PALUSTRIS*; Mo. (Engelmann).

*Q. IMBRICARIA* × *COCCINEA* (*Q. Leana*, Nutt.); Ohio to Mo., and near Washington, D. C.

*Q. PHELLOS* × *RUBRA* (?) or *COCCINEA* (?) (*Q. heterophylla*, Michx.); Staten Island and N. J. to Del. and N. C. (Bartram's Oak.)

*Q. PHELLOS* × *NIGRA* (*Q. Rudkini*, Britt.); N. J. (Rudkin).

*Q. ILICIFOLIA* × *COCCINEA* (?); Uxbridge, Mass. (Robbins.)

## 7. CASTANEA, Tourn. CHESTNUT.

Sterile flowers interruptedly clustered in long and naked cylindrical catkins; calyx mostly 6-parted; stamens 8-20; filaments slender; anthers 2-celled. Fertile flowers few, usually 3 together in an ovoid scaly prickly involucre; calyx with a 6-lobed border crowning the 3-7-celled 6-14-ovuled ovary; abortive stamens 5-12; styles linear, exerted, as many as the cells of the ovary; stigmas small. Nuts coriaceous, ovoid, enclosed 2-3 together or solitary in the hard and thick very prickly 4-valved involucre. Cotyledons very thick, somewhat plaited, cohering together, remaining underground in germination. — Leaves strongly straight-veined, undivided. Flowers appearing later than the leaves, cream-color; the catkins axillary near the end of the branches, wholly sterile or the upper ones androgynous with the fertile flowers at the base. (The classical name, from that of a town in Thessaly.)

1. *C. sativa*, Mill., var. *Americana*. (CHESTNUT.) A large tree; leaves oblong-lanceolate, pointed, serrate with coarse pointed teeth, acute at base, when mature smooth and green both sides; nuts 2 or 3 in each involucre, therefore flattened on one or both sides, very sweet. (*C. vesca*, var., of the Manual.) — Rocky woods and hillsides, S. Maine to Del., along the mountains to N. Ala., and west to S. Mich., S. Ind., and Tenn.

2. *C. pumila*, Mill. (CHINQUAPIN.) A spreading shrub or small tree; leaves oblong, acute, serrate with pointed teeth, whitened-downy beneath; involucre small, often spiked; the ovoid pointed nut scarcely half as large as a common chestnut, very sweet, solitary, not flattened. — Rich hillsides and borders of swamps, S. Penn. to Fla., west to S. Ind. and Tex.

## 8. FAGUS, Tourn. BEECH.

Sterile flowers in small heads on drooping peduncles, with deciduous scale-like bracts; calyx bell-shaped, 5-7-cleft; stamens 8-16; filaments slender; anthers 2-celled. Fertile flowers usually in pairs at the apex of a short peduncle, invested by numerous awl-shaped bractlets, the inner coherent at base



to form the 4-lobed involucre; calyx-lobes 6, awl-shaped; ovary 3-celled with 2 ovules in each cell; styles 3, thread-like, stigmatic along the inner side. Nuts sharply 3-sided, usually 2 in each urn-shaped and soft-prickly coriaceous involucre, which divides to below the middle into 4 valves. Cotyledons thick, folded and somewhat united; but rising and expanding in germination. — Trees, with a close and smooth ash-gray bark, a light horizontal spray, and undivided strongly straight-veined leaves, which are open and convex in the tapering bud and plaited on the veins. Flowers appearing with the leaves, the yellowish staminate flowers from the lower, the pistillate from the upper axils of the leaves of the season. (The classical Latin name, from *pháγω*, to eat, in allusion to the esculent nuts.)

1. **F. ferruginea**, Ait. (AMERICAN BEECH.) Tree 75–100° high; leaves oblong-ovate, taper-pointed, distinctly and often coarsely toothed; petioles and midrib soon nearly naked; prickles of the fruit mostly recurved or spreading. — N. Scotia to Fla., west to Wisc., E. Ill., Mo., and Tex.

#### ORDER 104. SALICACEÆ. (WILLOW FAMILY.)

*Diœcious trees or shrubs, with both kinds of flowers in catkins, one to each bract, without perianth; the fruit a 1-celled and 2–4-valved pod, with 2–4 parietal or basal placenta, bearing numerous seeds furnished with long silky down.* — Style usually short or none; stigmas 2, often 2-lobed. Seeds ascending, anatropous, without albumen. Cotyledons flattened. — Leaves alternate, undivided, with scale-like and deciduous, or else leaf-like and persistent, stipules. Wood soft and light; bark bitter.

1. **Salix**. Bracts entire. Flowers with small glands; disks none. Stamens few. Stigmas short. Buds with a single scale.  
2. **Populus**. Bracts lacerate. Flowers with a broad or cup-shaped disk. Stamens numerous. Stigmas elongated. Buds scaly.

#### 1. **SALIX**, Tourn. WILLOW. OSIER. (By M. S. BEBB, Esq.)

Bracts (scales) of the catkins entire. Sterile flowers of 3–10, mostly 2, distinct or united stamens, accompanied by 1 or 2 small glands. Fertile flowers also with a small flat gland at the base of the ovary; stigmas short. — Trees or shrubs, generally growing along streams, with terete and lithe branches. Leaves mostly long and pointed, entire or glandularly toothed. Buds covered by a single scale, with an inner adherent membrane (separating in n. 14). Catkins appearing before or with the leaves. (The classical Latin name.)

§ 1. *Aments borne on short lateral leafy branchlets; scales yellowish, falling before the capsules mature; filaments hairy below, all free; style very short or obsolete; stigmas thick, notched. Trees or large shrubs; leaves taper-pointed.*

\* *Leaves closely serrate with inflexed teeth; capsules glabrous.*

— *Stamens 3–5 or more.*

++ *Trees 15–50° high, with rough bark and slender twigs; no petiolar glands; sterile aments elongated, narrowly cylindrical; flowers somewhat remotely subverticillate; scales entire, short and rounded, crisp-villous on the inside.*

1. **S. nigra**, Marsh. (BLACK WILLOW.) *Leaves narrowly lanceolate, very long-attenuate from near the roundish or acute base to the usually curved tip,*

often downy when young, at length green and glabrous except the petiole and midrib; stipules large, semicordate, pointed and persistent, or small, ovoid and deciduous; fruiting aments (1½–3' long) more or less dense; capsules ovate-conical, shortly pedicelled. — Banks of streams and lakes, bending over the water; common. — Var. **FALCATA**, Torr. Leaves narrower and scythe-shaped. — Var. **WARDI**, Bebb. Leaves broader, often 1' wide, glaucous and veined beneath; stipules large, round-reniform; aments long, loosely flowered; capsules globose-conical, long-pedicelled. Rocky islands of the Potomac (*Ward*); Falls of the Ohio (*Short*); Mo. The leaves alone are easily mistaken for those of n. 14. — A hybrid of this species with *S. alba*, var. *vitellina*, is found in Wayne Co., N. Y. (*E. L. Hankenson*).

2. **S. amygdaloides**, Anders. *Leaves lanceolate or ovate-lanceolate, 2–4' long, attenuate-cuspidate, pale or glaucous beneath; petioles long and slender; stipules minute, very early deciduous; fertile aments becoming very loose in fruit from the lengthening of the slender pedicels.* — Central N. Y. (*Dudley*) to Mo.; common westward.

++ *A shrub or small bushy tree, 6–15° high, with smooth bark and rather stout polished twigs; petioles glandular; sterile aments thick, oblong-cylindrical, densely flowered; stamens commonly 5; scales dentate, hairy at base, smooth above.*

3. **S. lucida**, Muhl. (SHINING W.) *Leaves ovate-lanceolate or narrower, tapering to a very long acuminate point, at length coriaceous, smooth and shining both sides; stipules small, oblong; fruiting aments often persistent, the capsules becoming rigid and polished, as in the nearly allied S. pentandra of Europe.* — Banks of streams, N. Eng. to Penn., west and northward. A beautiful species on account of its showy staminate aments and large glossy leaves.

— *Stamens mostly 2; capsules subsessile or very shortly pedicelled; leaves lanceolate, long-acuminate.*

**S. FRAGILIS**, L. (CRACK WILLOW.) *Leaves green and glabrous, pale or glaucous beneath, 3–6' long; stipules when present half-cordate; stamens rarely 3–4; capsule long-conical, shortly pedicelled.* — A tall and handsome tree, which was planted at an early day about Boston and elsewhere. — The var. **DECFIENS**, Smith, with yellowish-white or crimson twigs, buds black in winter, and smaller and brighter green leaves, ought perhaps to be excluded, the plant so named by Barratt, etc., being one of the hybrids mentioned below. (Adv. from Eu.)

**S. ALBA**, L. (WHITE W.) *Leaves ashy-gray or silky-white on both sides, except when old, 2–4' long; stipules ovate-lanceolate, deciduous; capsules ovate-conical, sessile or nearly so.* — Var. **CÆRULEA**, Koch; twigs olive; old leaves smooth, glaucous beneath, dull bluish green. — Var. **VITELLINA**, Koch; twigs yellow or reddish; old leaves glabrous above. — A familiar tree of rapid growth, attaining a height of 50–80°. The typical form, with olive twigs and old leaves silky on both sides, is rarely found with us, but the var. **VITELLINA** is common. Pure *S. FRAGILIS* is also scarce, but a host of hybrids between the two, representing *S. viridis*, *Fries*, *S. Russelliana*, *Smith*, etc., are the commonest of introduced willows. These forms are rendered almost inextricable by a further cross, by no means rare, with our native *S. lucida*. (Adv. from Eu.)

**S. BABYLÓNICA**, Tourn. (WEEPING W.) Extensively planted for ornament, and in some places widely spread along river-banks and lake-shores by the drifting of detached limbs. (Adv. from Eu.)