

Systematic Botany. Lecture 32–34

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Outline

Woody angiosperms

Salicaceae—willow family

Fagaceae—beech family

Betulaceae—birch family

Elaeagnaceae—Russian olive family

Woody gymnosperms

Pinaceae—pine family

Cupressaceae—cypress family



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Woody angiosperms

Salicaceae—willow family



General features of Salicaceae

- ▶ ≈ 1010 species
- ▶ Distributed across all climatic zones, most genera are in tropics, most species in temperate regions
- ▶ Poplar (*Populus*) and willow (*Salix*) are important component of temperate riparian forests

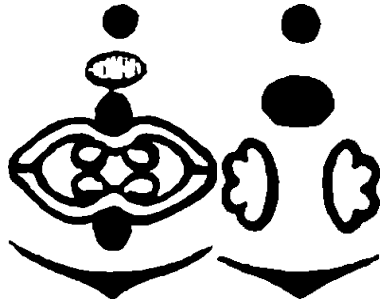
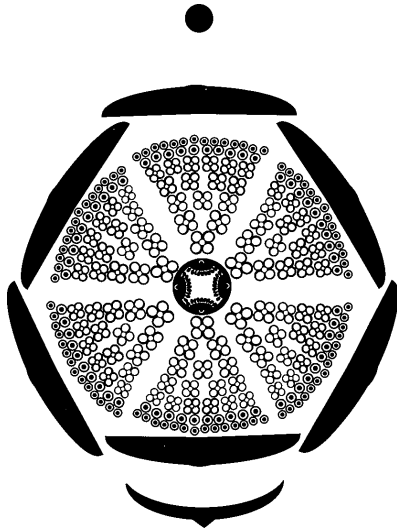


Morphology of Salicaceae

- ▶ Trees, usually with alternate simple leaves with stipules and salicoid teeth
- ▶ In many genera, flowers are more and more reduced—from flowers with numerous stamens and both sepals and petals to apetalous flowers with several stamens
- ▶ Flowers often have disk—flattened nectariferous structure
- ▶ Pistil of two carpels
- ▶ Fruit is a capsule
- ▶ Seeds often with hairs



Salicaceae: *Azara* and *Salix* (female, male)



$$*K_{0-6}C_{0-8}A_{2-\infty}\underline{G_{(2-4)}}$$

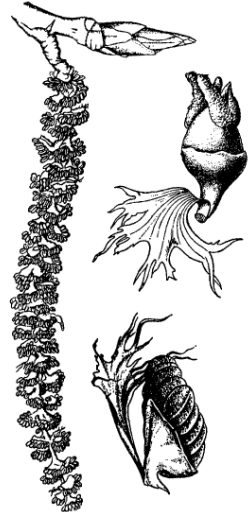
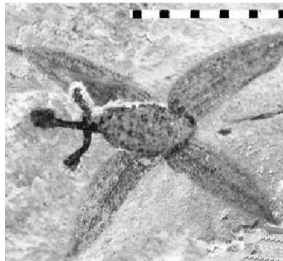
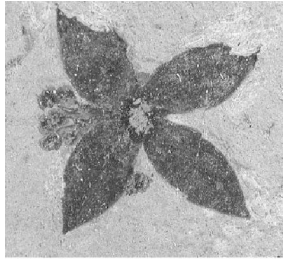


Representatives of Salicaceae

- ▶ Willow (*Salix*), almost 300 species of trees and shrubs, important component of Northern flora
 - ▶ Subgenus *Salix*
 - ▶ *S. amygdaloides*
 - ▶ *S. alba**
 - ▶ *S. babylonica**
 - ▶ *S. fragilis**
 - ▶ *S. lucida*
 - ▶ *S. serissima*
 - ▶ Subgenus *Longifoliae*
 - ▶ *S. exigua*
 - ▶ Subgenus *Chamaetia*
 - ▶ *S. pedicellaris*
 - ▶ Subgenus *Vetrix*
 - ▶ *S. cordata*
 - ▶ *S. eriocephala*
 - ▶ *S. lutea*
 - ▶ *S. discolor*
 - ▶ *S. humilis*
 - ▶ *S. bebbiana*
 - ▶ *S. candida*
- ▶ Poplar, or cottonwood (*Populus*) has ≈ 40 species. Cultivated as a wood source. Aspen (*Populus tremuloides*) is a main component of North Dakota forests.



Salicaceae: salicoid teeth; fossil *Pseudosalix* and recent *Populus*



Salix hastata, female and male plants



Aspen, *Populus tremuloides*



Azara flowers



Woody angiosperms

Fagaceae—beech family

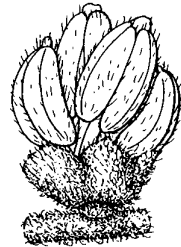


Fagaceae—beech family

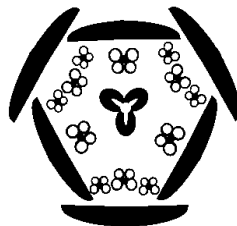
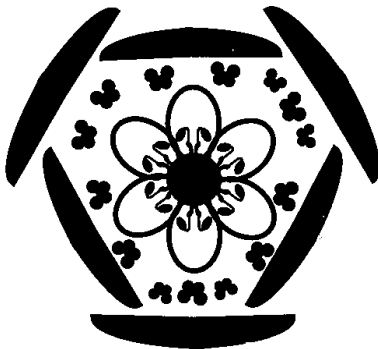
- ▶ \approx 800 species
- ▶ Distributed mostly in broad-leaved forests of North hemisphere
- ▶ Life forms: trees, rarely shrubs with mycorrhizal roots
- ▶ Leaves simple, entire or lobed, alternate, with minute stipules
- ▶ Flowers in catkins, very reduced due to wind pollination, unisexual; carpellate flowers with involucre of multiple fused bracts; perianth scale-like, stamens from 4 to numerous
- ▶ Pistil of 3–6 carpels, ovary inferior, 5 of 6 ovules are aborting
- ▶ Fruit a nut (acorn is a nut + involucre) with one seed with large embryo and no endosperm



Quercus flowers and inflorescences



Fagaceae flowers



$$\begin{aligned} &\text{♀} * P_{6-9} \overline{G_{(6)}} \\ &\text{♂} * P_{6-9} A_{6-12} \end{aligned}$$

Representatives of Fagaceae

Importance: wood producers, sometimes (chestnut) also food plants

- ▶ *Quercus*—oak
- ▶ *Fagus*—beech
- ▶ *Castanea*—chestnut



Woody angiosperms

Betulaceae—birch family

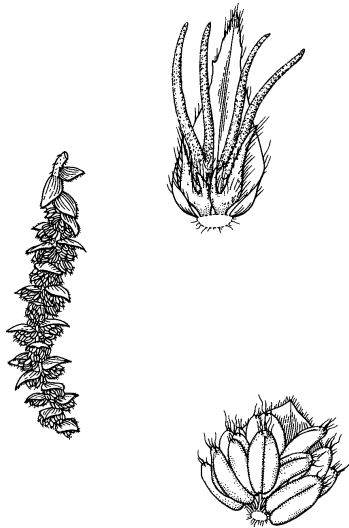


Betulaceae—birch family

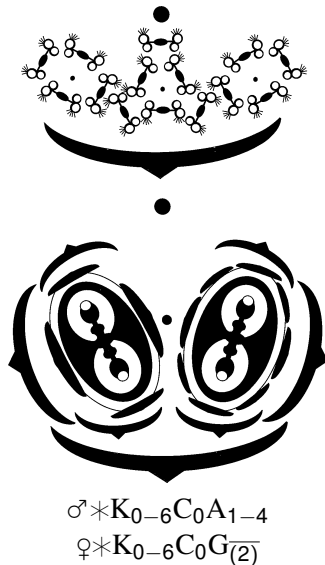
- ▶ \approx 150 species
- ▶ Distributed in Northern hemisphere, frequent from temperate to arctic regions
- ▶ Life forms: trees and shrubs with mycorrhizal roots
- ▶ Leaves alternate, simple, serrate, deciduous, with stipules
- ▶ Flowers in catkins or compact inflorescences, very reduced, unisexual, associated with bracts; perianth minute or absent, stamens 1–4
- ▶ Pistil bicarpellate, ovary inferior, ovules 2, one aborting
- ▶ Fruit a nut or nutlet, with subtended bracts, seeds with large embryo and almost no endosperm



Carpinus flowers and inflorescences



Betulaceae flowers and inflorescences



Representatives of Betulaceae

Importance: ornamental, wood, edible nuts (*Corylus*)

- ▶ *Corylus*—hazelnut (in subfamily Coryloideae: naked male flowers and female flowers with perianth)
- ▶ *Betula*—birch
- ▶ *Alnus*—alder



Woody angiosperms

Elaeagnaceae—Russian olive family

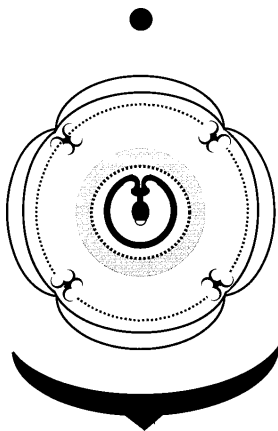


Elaeagnaceae—Russian olive family

- ▶ \approx 50 species
- ▶ Distributed in temperate and subtropical parts of Northern hemisphere
- ▶ Life forms: shrubs or small trees, often thorny, roots nodulated with nitrogen-fixing bacteria
- ▶ Leaves alternate or opposite, simple, entire, without stipules, with specific lepidote trichomes
- ▶ Flowers solitary or in inflorescences, 4-merous, without petals; 4 sepals attached to the hypanthium, stamens also 4.
- ▶ Pistil monomeric, with one basal ovule, ovary superior
- ▶ Fruit consists of dry achene inside of fleshy hypanthium



Elaeagnaceae flower



$$\ast K_{4-5} C_0 A_{4-5} \underline{G_1}$$

Representatives of Elaeagnaceae

Importance: fruits are edible, *Hippophaë* is cultivated as berry plant

- ▶ *Elaeagnus*—Russian olive: we have *E. angustifolia*, Russian olive, and *E. argentea*, silverberry
- ▶ *Shepherdia*—buffaloberry, two species in ND: *Sh. argentea* and *Sh. canadensis*
- ▶ *Hippophaë*—sea-buckthorn



Hippophaë—sea-buckthorn



Some other “woody families” of angiosperms

- ▶ Sapindaceae—*Acer* (maple)
- ▶ Ulmaceae—*Ulmus* (elm)
- ▶ Caprifoliaceae—*Lonicera* (honeysuckle), *Symphoricarpos* (snowberry)
- ▶ Adoxaceae—*Viburnum* (nannyberry)
- ▶ Rhamnaceae—*Rhamnus* (cascara, buckthorn)
- ▶ Cornaceae—*Cornus* (dogwood)
- ▶ Saxifragaceae—*Ribes* (gooseberry, currant)
- ▶ Anacardiaceae—*Toxicodendron* (poison oak, poison ivy)



Woody gymnosperms

Pinaceae—pine family

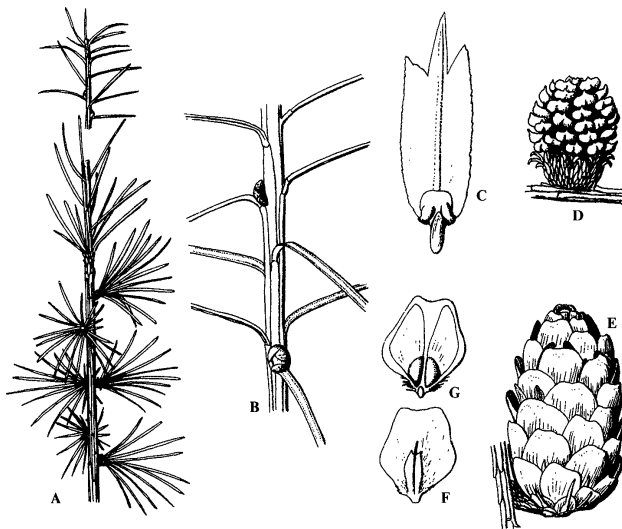


Pinaceae

- ▶ \approx 230 species
- ▶ Distributed mostly in Northern Hemisphere, with centers of diversity in East Asia and Mexico
- ▶ Life forms: trees, rarely shrubs. Have resin.
- ▶ Leaves are needle-like, with 2 vascular buds, often in shortened shoots, **brachyblasts**.
- ▶ Have large cones with paired (seed and bract) scales.
- ▶ Pollen saccate, with two “bags”
- ▶ Seeds winged, embryo with 4–11 cotyledons.



Larix (Pinaceae) shoots and cones



Representatives of Pinaceae

Importance: wood and ornamental

- ▶ Subfamily Pinoideae: leaves in brachyblasts
 - ▶ *Pinus*—pine:
 - ▶ Subgenus *Strobus*—soft pines, mostly 5-leaved, e.g. *P. sibirica*, *P. strobus*, *P. bungeana* and 1-leaved *P. monophylla*
 - ▶ Subgenus *Pinus*—hard pines: 3-leaved like *P. ponderosa*, or 2-leaved like *P. sylvestris* or *P. mugo*
 - ▶ *Cedrus*—true cedar
 - ▶ *Larix*—larch
 - ▶ *Pseudolarix*—false larch
- ▶ Subfamily Abietoideae: leaves on normal shoots
 - ▶ *Abies*—fir
 - ▶ *Picea*—spruce
 - ▶ *Pseudotsuga*—Douglas-fir



Pseudolarix amabilis (Pinaceae), spring



Woody gymnosperms

Cupressaceae—cypress family

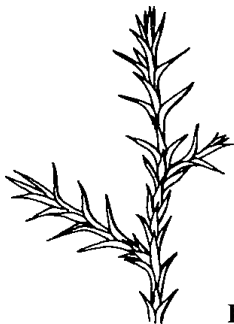
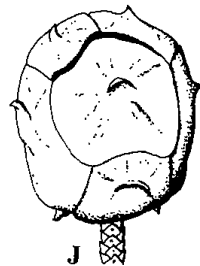
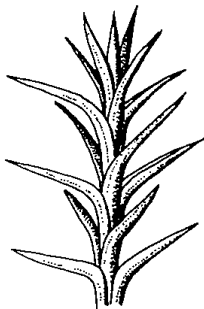


Cupressaceae—cypress family

- ▶ \approx 130 species
- ▶ Distributed across all Earth
- ▶ Life forms: trees, sometimes shrubs and even creepy shrubs. Part of genera (formerly belong to Taxodiaceae family) are deciduous but with branchlets instead of leaves. No resin ducts (but resin is present).
- ▶ Leaves are dimorphic, needle-like and scale-like, alternate or opposite. Often have juvenile leaves.
- ▶ Cones are small, with fused big (sometimes, in junipers, even fleshy) bract scales and reduced seed scales.
- ▶ Pollen is not saccate, seeds not winged or with asymmetric wings, embryo with 2–5 cotyledons.



Cupressus leaves (I) and cones (J)

**I****J**

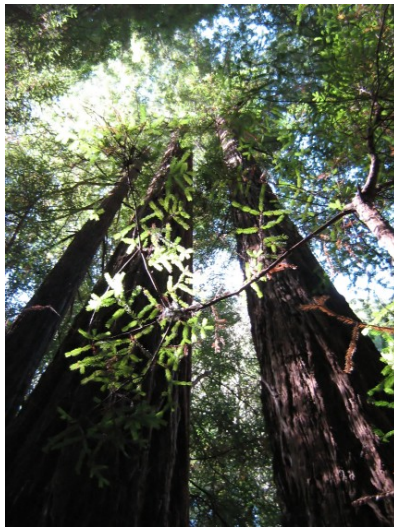
Representatives of Cupressaceae

Importance: wood, ornamental

- ▶ Subfamily Taxodiodeae
 - ▶ *Sequoia*—coastal red cedar
 - ▶ *Sequoiadendron*—mountain red cedar
 - ▶ *Taxodium*—bald cypress
- ▶ Subfamily Cupressoideae
 - ▶ *Cupressus*—cypress
 - ▶ *Juniperus*—juniper
 - ▶ *Thuja*—red cedar



Sequoia sempervirens (Cupressaceae)



For Further Reading



A. Shipunov.

Systematic Botany [Electronic resource].

2011—onwards.

Mode of access:

http://ashipunov.info/shipunov/school/biol_448



Van Bruggen, Th.

The vascular plants of South Dakota.

1996. 3rd ed.

University of South Dakota, Vermillion, SD.

