



Basal Eudicots

Basal Angiosperm Phylogeny
APCIII - 2009

- already looked at basal angiosperms except monocots
- Eudicots are the majority of angiosperms and defined by 3 pored pollen - often called tricolpates

tricolpate or triporate pollen

Placopernium
Proteaceae
(basal Eudicot)

Basal Eudicots

- tricolpate pollen: only morphological feature defining eudicots consistently

tricolpate or triporate pollen

Placopernium
Proteaceae
(basal Eudicot)

Basal Eudicots

- tricolpate pollen: a derived or advanced character state that has evolved essentially once
- selective advantage for pollen germination

monosulcate → tricolpate

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

- perennial herbs, sometimes woody or herbaceous climbers or low shrubs
- leaves, alternate sheathing, usually basal and cauline, often divided or compound, or palmately lobed; no stipules.

marsh marigold

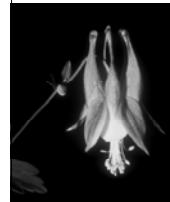


anemone

Basal Eudicots

*Ranunculaceae (Ranunculales) - CA 3+ CO (0)5+ A ∞ G (1)3+
buttercup family

- floral diversity enormous except ∞ stamens and ∞ separate carpels
- insect (bird) pollination! nectar or pollen reward, radial or bilateral symmetry



columbine



anemone

Basal Eudicots

*Ranunculaceae (Ranunculales) - diverse fruit types
buttercup family

Follicles = ∞ seeded
dehiscent fruit

Berries = ∞ seeded
fleshy fruit

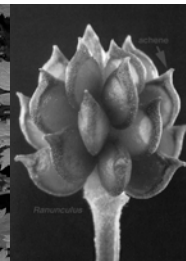
Achenes = 1 seeded
indehiscent, dry fruit



columbine



baneberry



buttercup

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family



Aconitum columbianum - monks' hood



Actaea rubra - red baneberry

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

only sepals!



Anemone patens - pasque flower

Anemone thalictroides - rue anemone

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

Aquilegia canadensis - american columbine



Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

Caltha palustris - marsh marigold



sepals only, follicles

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

Sepals + petals, achenes



Ranunculus - buttercup, crowfoot

Basal Eudicots

*Ranunculaceae (Ranunculales) -
buttercup family

Dioecious - with separate male and female plants,
wind pollinated!



Thalictrum dioicum - early meadow-rue

Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

- 13 genera, 660 species; widespread in temperate regions of Northern hemisphere - ArctoTertiary relict distribution
- small shrubs (*Berberis*) or herbs (rest of family).



Podophyllum - mayapple

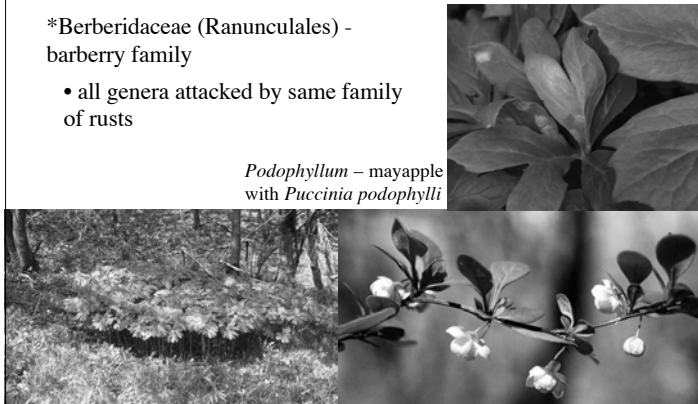
Berberis - barberry

Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

- all genera attacked by same family of rusts

Podophyllum - mayapple
with *Puccinia podophylli*



Podophyllum - mayapple

Berberis - barberry

Basal Eudicots

*Berberidaceae (Ranunculales) - CA 6 CO 6/9 A 6/9 G 1
barberry family

- 3 merous flowers, 1 superior carpel,
marginal placentation, berry



Podophyllum peltatum - mayapple

Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

Podophyllum hexandrum
eastern Asia



Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

Berberis vulgaris
European barberry

Berberis thunbergii
Japanese barberry



Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

Caulophyllum thalictroides
Blue cohosh



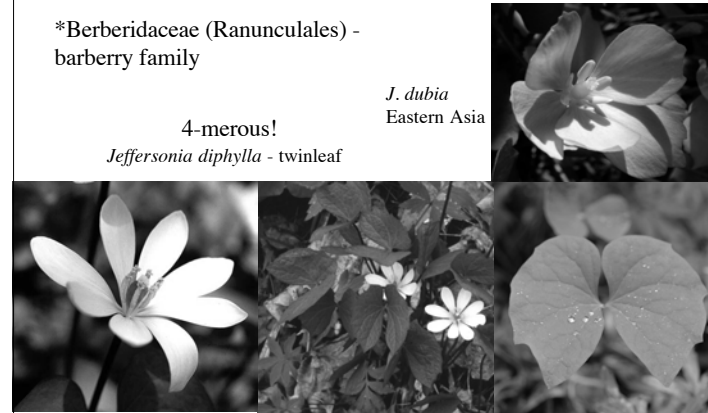
Basal Eudicots

*Berberidaceae (Ranunculales) -
barberry family

4-merous!

Jeffersonia diphylla - twinleaf

J. dubia
Eastern Asia



Basal Eudicots

Menispermaceae (Ranunculales) -
moonseed family

- mainly tropical family, arrow poisons, usually viney
- dioecious; separate carpels each produce one seeded drupes = fleshy with one bony seed



Chondrodendron curare

Menispermum canadense moonseed

Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family

- 25 genera and about 200 species mainly of north temperates
- herbaceous, alternate compound leaves with colored latex, narcotics



celadine



poppy

Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family

CA 2 CO 4/8 A ∞ G (2-∞)

- 2 deciduous sepals, petals crumpled in bud



celadine



poppy

Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family

CA 2 CO 4/8 A ∞ G (2-∞)

- pistil syncarpic forming capsule = dehiscent syncarpic fruit

Papaver somniferum
opium poppy



celadine



Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family



Sanguinaria canadensis - bloodroot

Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family



Eschscholzia - California poppy

Stylophorum - celadine poppy

Basal Eudicots

*Papaveraceae (Ranunculales) -
poppy family

- family Fumariaceae now in Papaveraceae = zygomorphic
poppies with 2 carpels



Dicentra cucullaria - Dutchman's breeches

2 carpellate capsules

Basal Eudicots

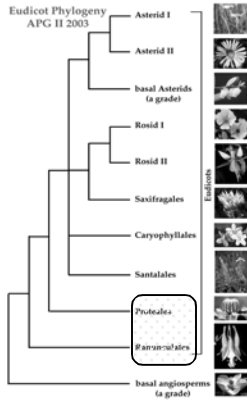
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poppy family

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Corydalis

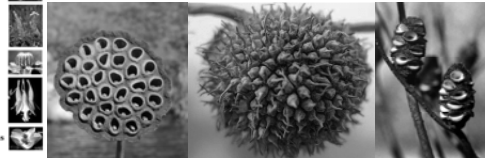
Basal Eudicots



• Proteales - unusual order of 3 families

- Nelumbonaceae - lotus lily family
- Platanaceae - sycamore family
- Proteaceae - macadamia family

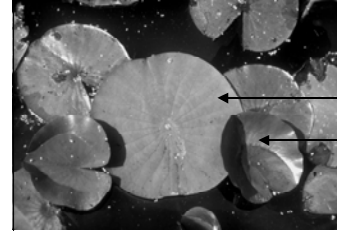
• all 3 share unusual fruiting structures - 1 carpellate fruits in "heads"



Basal Eudicots

Nelumbonaceae (Proteales) -
lotus lily family

one genus and two species -
one North American and the
second East Asian (sacred
oriental lotus lily)



Nelumbo lutea - lotus lily

Nymphaea odorata - water lily

once considered related to
water lilies of Nymphaeaceae -
now known to be convergence

Basal Eudicots

Nelumbonaceae (Proteales) -
lotus lily family

one genus and two species -
one North American and the
second East Asian (sacred
oriental lotus lily)



Nelumbo lutea - lotus lily

Habit is an aquatic, floating or
emergent leaved, perennial
herb. Leaves are simple,
peltate. Inflorescence is a
solitary flower.

Basal Eudicots

Nelumbonaceae (Proteales) -
lotus lily family

$P \infty$ $A \infty$ $\underline{G} [\infty]$

- undifferentiated perianth - tepals
- filamentous stamens (vs. laminar in water lilies)



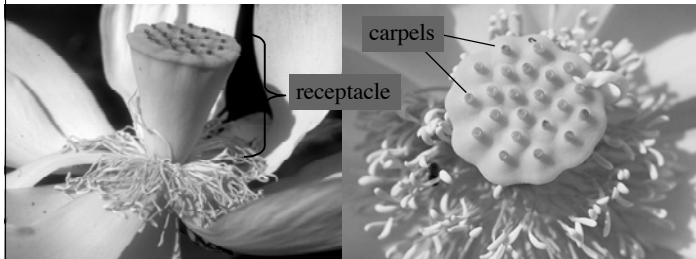
Nelumbo lutea - lotus lily

Basal Eudicots

Nelumbonaceae (Proteales) -
lotus lily family

$P \infty$ $A \infty$ $\underline{G} [\infty]$

- separate, superior one-seeded carpels but held in the cavities of the obconical receptacle



Nelumbo lutea - lotus lily

Basal Eudicots

Nelumbonaceae (Proteales) -
lotus lily family

$P \infty$ $A \infty$ $\underline{G} [\infty]$

- “fruit” is a woody receptacle cone with a nut-like seed laying loose in each cavity



Nelumbo lutea - lotus lily

Basal Eudicots

Platanaceae (Proteales) - sycamores

1 genus with 10 species of northern hemisphere trees, distinctive bark

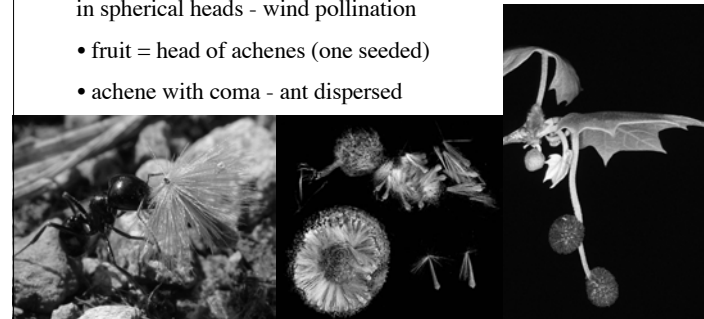
Platanus occidentalis - sycamore



Basal Eudicots

Platanaceae (Proteales) - sycamores

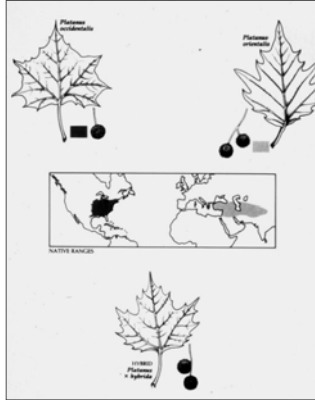
- monoecious, female flowers apocarpic in spherical heads - wind pollination
- fruit = head of achenes (one seeded)
- achene with coma - ant dispersed



Basal Eudicots

Platanaceae (Proteales) - sycamores

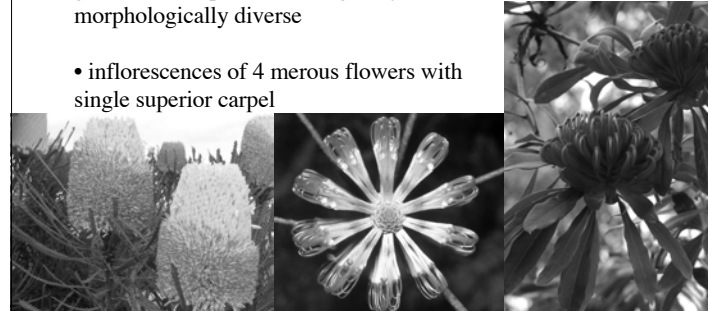
- European plane tree - *Platanus x hybrida* - important urban shade tree



Basal Eudicots

Proteaceae (Proteales) - proteas

- large southern hemisphere family of 75 genera, 1400 species - ecologically and morphologically diverse
- inflorescences of 4 merous flowers with single superior carpel



Basal Eudicots

Proteaceae (Proteales) - proteas

- large southern hemisphere family of 75 genera, 1400 species - ecologically and morphologically diverse

- infructescence - often woody “cone” with single seeded fruits; serotinous

