



# Basal Eudicots

... transition from basal angiosperm to advanced eudicot ...

## Basal Eudicots

- 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

*Platanus*  
Proteaceae  
(Basal Eudicot)

## Basal Eudicots

- **tricolpate pollen**: only morphological feature defining eudicots consistently

tricolpate or triporate pollen

*Platanus*  
Proteaceae  
(Basal Eudicot)

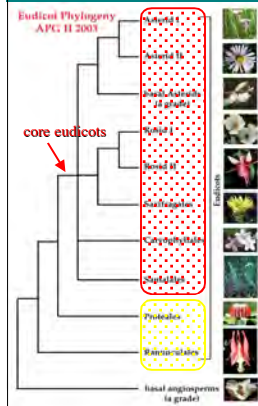
## Basal Eudicots

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

monolete

tricolpate

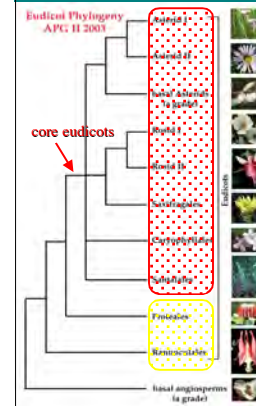
## Basal Eudicots



- basal eudicots are a grade at the base of eudicots - paraphyletic
- morphologically are transitional between basal angiosperms and the core eudicots



## Basal Eudicots



- basal eudicots are a grade at the base of eudicots - paraphyletic
- morphologically are transitional between basal angiosperms and the core eudicots

- examine two orders only:  
Ranunculales - 7 families  
Proteales - 3 families

## Basal Eudicots

\*Ranunculaceae (Ranunculales) -  
buttercup family

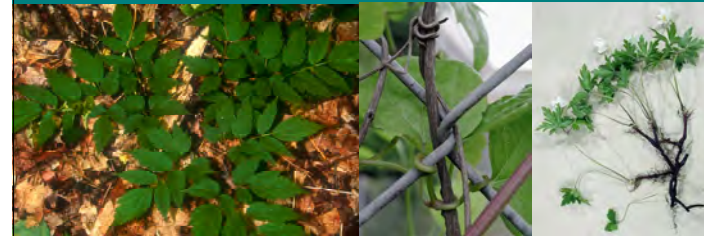
- largest family of the basal eudicots
- 60 genera, 2500 species
- distribution centered in temperate and cold regions of the northern and southern hemispheres



## Basal Eudicots

\*Ranunculaceae (Ranunculales) -  
buttercup family

- perennial herbs, sometimes woody or herbaceous climbers or low shrubs



baneberry

clematis

anemone

## 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.

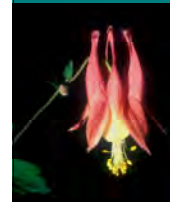


anemone

## 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

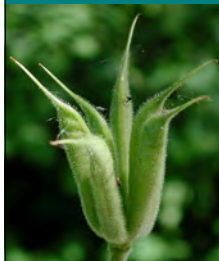
## Basal Eudicots

\*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

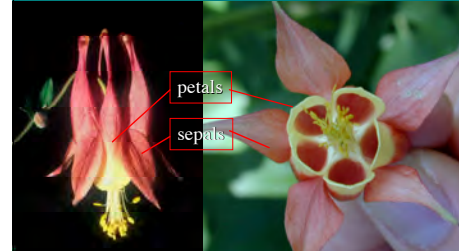


*Anemone thalictroides* - rue anemone

## Basal Eudicots

\*Ranunculaceae (Ranunculales) -  
buttercup family

*Aquilegia canadensis* - american columbine



## Basal Eudicots

\*Ranunculaceae (Ranunculales) -  
buttercup family

*Caltha palustris* - marsh marigold



sepals only, follicles

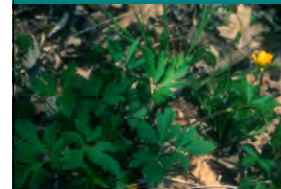


## Basal Eudicots

\*Ranunculaceae (Ranunculales) -  
buttercup family

Sepals + petals, achenes

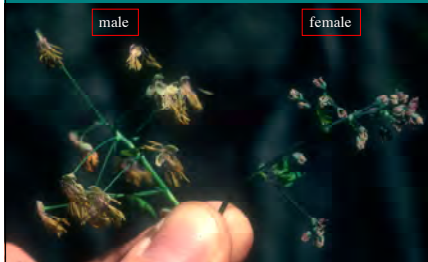
*Ranunculus* - buttercup, crowfoot



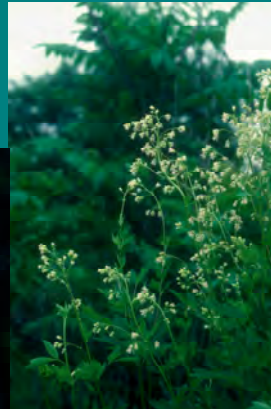
## Basal Eudicots

\*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

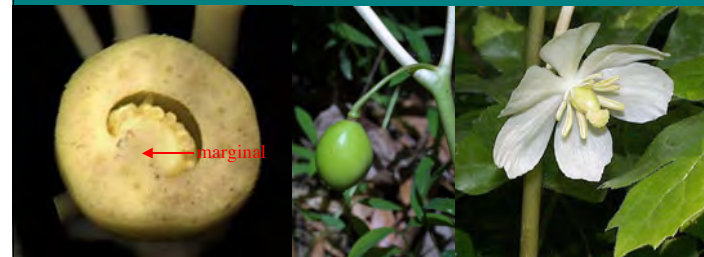


## Basal Eudicots

\*Berberidaceae (Ranunculales) -  
barberry family

CA 6 CO 6/9 A 6/9 G 1

- 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

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\*Papaveraceae (Ranunculales) -  
poppy family

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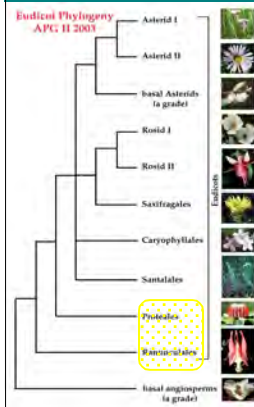


*Corydalis* sp.  
Fumariaceae  
Gerald D. Clark

*Corydalis*



## Basal Eudicots



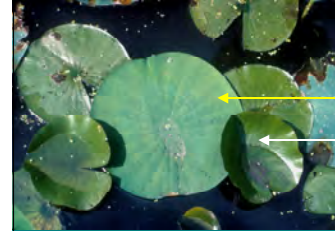
- Proteales - unusual order of 3 families
- **Nelumbonaceae** - lotus lily family
- **Platanaceae** - sycamore family
- **Proteaceae** - macadamia family
- all 3 share unusual fruiting structures - 1 carpellate fruits in "heads"



## 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**

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

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



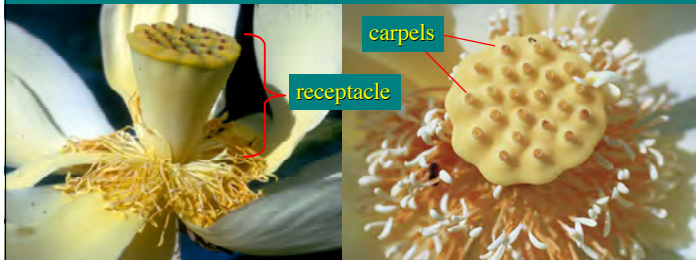
*Nelumbo lutea* - lotus lily

## Basal Eudicots

Nelumbonaceae (Proteales) -  
lotus lily family

$P \infty$   $A \infty$   $G [\infty]$

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



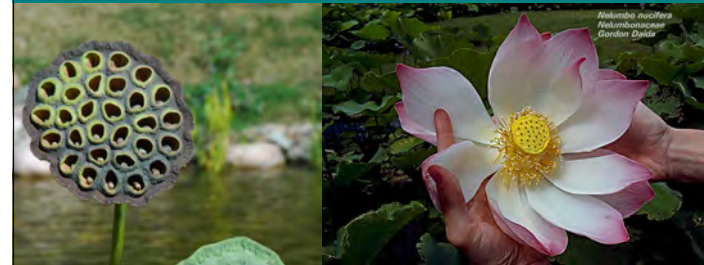
*Nelumbo lutea* - lotus lily

## Basal Eudicots

Nelumbonaceae (Proteales) -  
lotus lily family

$P \infty$   $A \infty$   $G [\infty]$

- “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

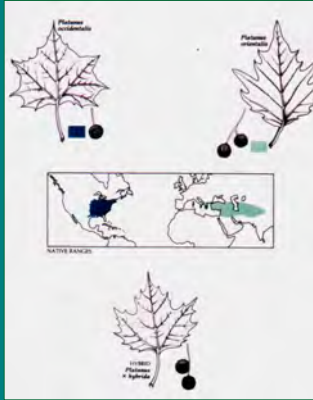
- **monoecious**, female flowers apocarpic in spherical heads - wind pollination
- fruit = head of achenes (one seeded)
- achene with coma - ant dispersed



## 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**

