Evolution IV

Angiosperms

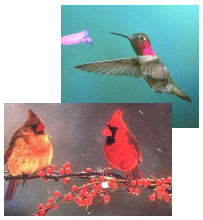
March 14, 2008

~ 400 families and 250,000 species of Angiosperms

Specialization for (and co-evolution with) fruit dispersers and pollinators may account for angiosperm diversity


20,000 bee species


180,000 moth species

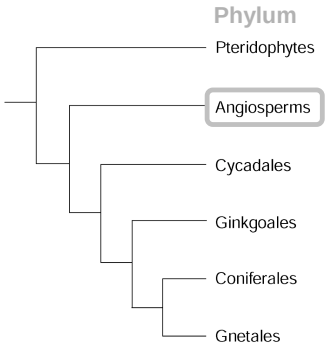

10,000 bird species


17,000 butterfly species


… and a lot of other creatures (and insect groups)

Reading: Dispersal & Pollination Ecology (Chapter 23)

Angiosperms



Unlike in algae/bryophyta or ferns/gymnosperms there are some missing links in early angiosperm evolution

Some important dicot families

Asteraceae (Sunflower)
#2: 20,000 species

Composite flower: Sterile ray flowers, disc flowers in female, male and unopened phases

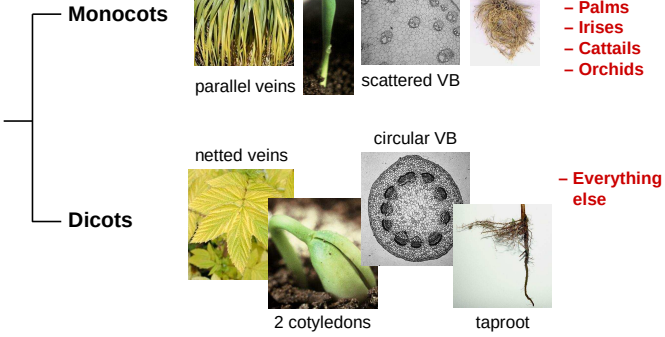
Fabaceae (Legumes)
#3: 18,000 species

Legume: one carpel that splits along two seams

Brassicaceae (Mustard)
3,000 species

Raceme with "Cross bearing" flowers: Formerly named *Cruciferae* or Crucifers

Two major taxonomic groups of Angiosperms



Some important dicot families

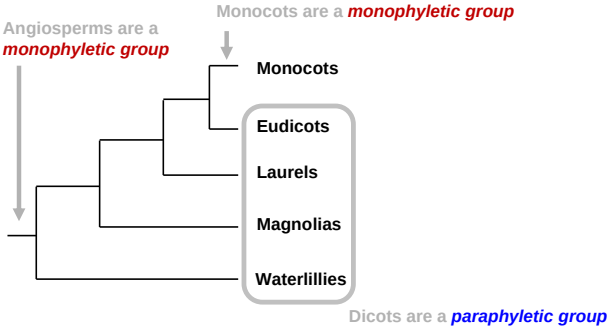
Rosaceae (Rose)
3,000 species

• Five free petals
• Lots of stamen

Solanaceae (Nightshade)
3,000 species

• Five petals fused to conical funnel

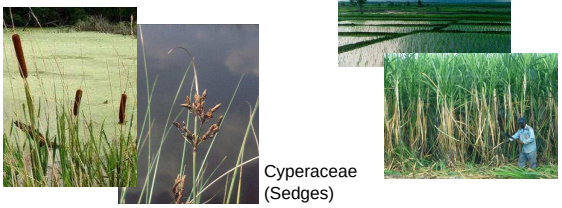
Evolutionary relationships



Dicots are a ***paraphyletic group***
This is a monophyletic group (Angiosperms) minus a few misfits (Monocots)

Some important monocot families

Poaceae (Grasses)



Typhaceae (Cattails)

Cyperaceae (Sedges)

Some important monocot families

Amaryllidaceae (Daffodil, Amaryllis, Snowdrops)

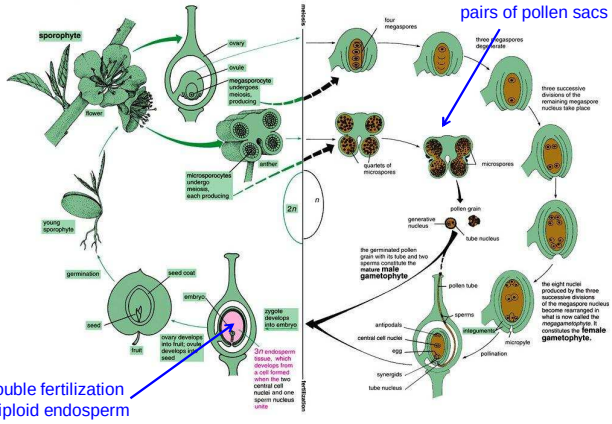
Iridaceae (Irises)

Orchidaceae (Orchids)
#1: 35,000 species

Liliaceae (Lillis)

Life cycle generally similar to Gymnosperms

Stamens with two pairs of pollen sacs



Double fertilization
Triploid endosperm

Some important monocot families

Arecaceae (Palms)

Musaceae (Bananas)

Bromeliacea (Pineapple, also many epiphytes)

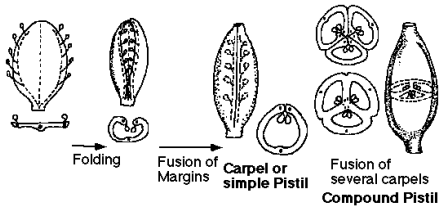
With 10 plant families you can classify ~1/3 of the world's species, including many with economic importance

Characteristics of Angiosperms

1. Carpels close to form an ovary
2. Fruits (develop from carpels)
3. Double fertilization that leads to formation of endosperm (3N)
4. Flowers with petals and sepals
5. Stamens with two pairs of pollen sacs
6. Wood and bark cells: sieve tubes and vessels

Evolutionary Milestones:

Carpel closes to form ovary

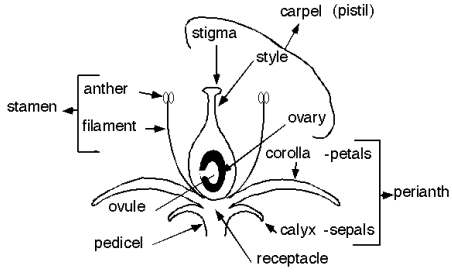


Review Questions

- Name 4 characteristics that distinguish the angiosperms from other plant groups?
- Name 4 characteristics that distinguish dicots from monocots
- Why are monocots incapable of secondary growth? Did they "fail to invent the capability" or "loose the capability" for secondary growth during evolution?
- What is a monophyletic, paraphyletic, and polyphyletic group?
- Monophyletic, paraphyletic or polyphyletic: angiosperms, gymnosperms, dicots, monocots, algae, land plants, hardwoods, softwoods?
- Name 5 major families of dicots and 3 major families of monocots
- Name a few representative species for each of the above families

Evolutionary Milestones:

Sophisticated flowers and insect pollination



Self Study Questions

- Name 5 different methods of pollination (pollination agents, pollinator species groups)
- What is the difference between pollination and fertilization?
- Once the pollen has reached the stigma, describe the steps involved towards fertilization and development of the embryo
- What are *apomixis* and *parthenocarpy*?
- What does *monoecious* and *dioecious* mean?
- Describe 5 different methods of dispersal (dispersal agents)