Evolutionary Trends in Angiosperms (in general)

• Woody plants usually preceded the herbs, vines, and climbers
• Perennials gave rise to biennials…and annuals have derived from both perennials & biennials
• Dicots are considered ________ primitive than monocots

Evolutionary Trends in Angiosperms (in general)...con’t

• Alternate leaves with secretory cells are primitive compared to opposite or whorled leaves without secretory cells.
• Many separate stamens are more primitive than few or united stamens
• Single fruits preceded aggregate fruits formed from several ovaries
• OVERALL: simple structures are not necessarily primitive, but have become __________ as a result of reduction from complex parts.
Within the Division of Magnoliophyta (Anthrophyta)

**Two Classes**

- Dicotyledons (dicots): ____________

- Monocotyledons (monocots) ____________

Dicots...in general (vs. monocots)

- More diverse
- About 50% of species are woody
- Cotyledons: 2 (rarely 1, 3, or 4)
- Leaves: usually net-veined
- Primary vascular bundle: in a ring
- Floral parts (except carpels) sets of 5s or 4s
- Root system: primary & adventitious

Monocots...in general (vs. dicots)

- Less diverse
- Less than 5% of species are woody
- Cotyledons: 1
- Leaves: usually parallel-veined
- Primary vascular bundle: scattered or in 2 or more rings
- Floral parts (except carpels) sets of 3s or 4s
- Root system: adventitious (characteristic of ferns, too)
- Probably evolved from early forms of dicots in the evolutionary history of angiosperms
Some... Woody (tree/shrub/vine) Families

- Aceraceae
- Anacardiaceae
- Annonaceae
- Betulaceae
- Caprifoliaceae
- Cornaceae
- Ericaceae
- Fagaceae
- Grossulariaceae
- Hippocastanaceae
- Juglandaceae
- Magnoliaceae
- Moraceae
- Oleaceae
- Salicaceae
- Smilacaceae
- Ulmaceae

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“Combo” Families: woody & herb

- Fabaceae [alternate name: Leguminosae]
  - "legumes family"
    - alfalfa
    - birdfoot treefoil
    - partridge pea
    - round-headed lespedeza
    - s. partridge pea
    - slimflower scurfpea
    - white clover
    - yellow sweet clover
    - wild blue indigo
  - black locust*

- Rosaceae
  - "rose family"
    - rough avens*
    - white avens*
    - Am. plum
    - black cherry
    - black chokeberry
    - black raspberry
    - blackberry
    - prairie rose
    - sweet (American) crab apple

Kingdom Plantae
Division Magnoliophyta (Anthrophyta)
   1 Magnoliopsida-dicots
   2 Liliopsida-monocots
   1 Dicotyledons (Division Magnoliophyta, Class Magnoliopsida)
   2 Monocotyledons (Division Magnoliophyta, Class Magnoliopsida)

<table>
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<tr>
<th>Characteristics</th>
<th>Subclasses</th>
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<tbody>
<tr>
<td>Advancement</td>
<td>Magnoliidae (8o.39f,11,000s)</td>
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<tr>
<td>Carpels</td>
<td>Hamamelidae (11o.24f,3,400s)</td>
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<tr>
<td>Flowers</td>
<td>Caryophyllidae (3o.14f,11,000s)</td>
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<td>Stamens</td>
<td>Dilleniidae (13o.78f,25,000s)</td>
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<td>Pollen</td>
<td>Rosidae (18o.11f,58,000s)</td>
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<td></td>
<td>Asteridae (11o.49f,56,000s)</td>
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<tr>
<td>Advancement</td>
<td>Alismatidae (4o.16f,500s)</td>
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<tr>
<td>Carpels</td>
<td>Arecidae (4o.5f,600s)</td>
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<tr>
<td>Flowers</td>
<td>Commelinidae (6o.16f,16,200s)</td>
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<td>Substomatal Cells</td>
<td>Zingiberidae (2o.9f,3,800s)</td>
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<tr>
<td></td>
<td>Liliidae (2o.19f,25,000s)</td>
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Characteristics helpful in "subclass" classification

• **Advancement**: 1 or more features vs. relatively primitive
• **Carpels**: apocarpous vs. syncarpous
• **Flowers**: primitive to well developed
• **Pollen**: monosulcate vs. tricolpate (for dicots)
• **Stomatal subsidiary cells**: 0→4 (for monocots)

• **CARPELS**

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<th>Carpels separate in single individual pistils</th>
<th>Fused Carpels resulting in compound ovary</th>
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• **POLLEN**

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<th>globe symmetrical, usually 3 germinal apertures</th>
<th>boat-shaped, 1 long germinal furrow, 1 germinal aperture</th>
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</table>

| onion | grass | Lilium | Artemisia |

• **STOMATAL SUBSIDIARY CELLS**: 0→4 (for monocots)

Summary thoughts on classification...for now

• Many _________________ to examine
• Some characteristics are very “definitive”...others require some “judgement calls” (ex. __________ vs. __________)
• Classification into a subclass, order, family, and even genus is _________________