Diversity of Caryophyllids

...carnations, cacti, chenopods...

[Tues lab –
you will finish mayapples, poppies, lotus lily, sycamores in lab]
Succulents & Carnivores & Weeds

The caryophyllid group is a strange mixture of plants including cacti, carnations, and some carnivorous families.

Specialists of deserts, salt environments, nutrient poor sites, and weedy areas – often with interesting physiological adaptations.
Caryophyllaceae - pink family

Huge family, widespread but characteristic of temperate and warm temperate regions of the Northern Hemisphere.

In Wisconsin we have 18 genera and 63 species

Caryophyllaceae includes the pinks, catchflies, and carnations of garden fame

Dianthus deltoides
Maiden pink
Caryophyllaceae - pink family

Many of the species are **introduced** (either by Native Americans or Europeans or later)

- either **naturalized** – well-established, often widespread plant that is not originally in our flora
- or **adventive** – only casually established, not persistent.

*Gypsophila paniculata*
Baby’s-breath invasive on Lake Michigan dunes
Caryophyllaceae - pink family

- Herbs, simple, opposite, entire leaves; nodes usually swollen
- Inflorescence a **dichasium** - determinate inflorescence - or **cyme** (compound dichasium)

Note 3 way split, middle branch is oldest flower
The dichasium inflorescence is terminated (i.e., determinate) by the oldest flower and flanked by two lateral younger flowers.
Caryophyllaceae - pink family

- Some fused sepals, others not
- Petals often differentiate into a limb and claw, the apex is often notched

**Free central** placentation = free standing placental column in single locular pistil on which ovules are attached, or **axile**, or both at same time!

Capsule opens by valves or teeth
<table>
<thead>
<tr>
<th>Silene vulgaris</th>
<th>Silene gallica</th>
<th>Silene secundiflora</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silene latifolia</td>
<td>Silene colorata</td>
<td>Silene nicaeensis</td>
</tr>
</tbody>
</table>
Caryophyllaceae - pink family

Minuartia michauxii
(= Arenaria stricta)
sand rockwort
Caryophyllaceae - pink family

*Cerastium*

mouse-ear chickweed

5- styles!
Caryophyllaceae - pink family

*Stellaria longifolia*
long leaved stitchwort

3 styles!

*Stellaria meadia*
common stitchwort
Caryophyllaceae - pink family

Silene latifolia - white campion

Silene vulgaris - bladder campion with vespid wasp pollinator

Silene – also called “catch-fly”
Caryophyllaceae - pink family

European species becoming invasive

*Saponaria officinalis* - bouncing bet, soapwort
Caryophyllaceae - pink family

(1) Male phase & (2) female phase

Dichogamy
Why does it change color?

*Saponaria officinalis* - bouncing bet, soapwort
Phytolaccaceae - pokeweed family

Family that is chiefly tropical and subtropical in distribution

In Wisconsin we have 2 species of Phytolacca - one native

Shrub with alternative simple leaves

Inflorescence typically an indeterminate raceme

Phytolacca americana - pokeweed
• simplest inflorescence type is indeterminate

• oldest flowers at the base

• younger flowers progressively closer to the apical meristem of the shoot

= a raceme
Phytolaccaceae - pokeweed family

- No petals
- 2x as many stamens as sepals
- fused carpels but only 1 ovule per carpel
- berry fruited, bird dispersed, and a source of dye

Phytolacca americana - pokeweed
Alice Tanksley Brown's Poke Salet

Alice Tanksley Brown grew up in Mississippi, a state rich in pokeweed. She remembers Dr. Pruett telling her mother, “Widow, if you give your children a mess of poke in the spring and some sassafras tea, you’ll save yourself doctor bills for a year.” The good doc was probably referring to pokeweed's leaves purgative powers as they contain toxic alkaloids that should not be eaten in large amounts. Most recipes call for the green to be parboiled, at least once and sometimes twice, and for the water to be discarded.

The genus is poisonous, containing a dense array of chemicals used in a variety of medicinal treatments.
Phytolaccaceae - pokeweed family

Phytolacca acinosa – Indian pokeweed

our non-native species – achenes!
Phytolacca acinosa – Indian pokeweed
Portulacaceae - purslane family

Family comprises small **succulent** herbs with small flowers except for cultivated species.

*Portulaca oleracea*
Common purslane

*Portulaca grandiflora*
Rock rose (Argentina)
Portulacaceae - purslane family

*Portulaca oleracea* – little hogweed, purslane

Prostrate herb, leaves succulent; has been cultivated as a salad [‘oleracea’ = edible]

Flowers are small, yellow, 5-merous

Capsule opens via a cap or lid
“herbal minute with Brigitte Mars” @ http://www.youtube.com/watch?v=C9bFtKMSnXs
Montiaceae – spring beauty family

CA 2  CO 5  A 5+  G (3)

- 2 sepals, 5 showy petals, 5 stamens
- 3 fused carpels (note the 3 stigma)
- **Basal** placentation
- Fruit is a capsule “with a lid”
Montiaceae – spring beauty family

Claytonia virginica - spring beauty

Claytonia caroliniana - spring beauty
**Montiaceae – spring beauty family**

*Claytonia virginica* - spring beauty

Lower elevation E NAm
S of Tension Zone Great Lakes

*Claytonia caroliniana* - spring beauty

Higher elevation E NAm
N of Tension Zone Great Lakes
Cactaceae - cactus family

A New World family; xeromorphic trees, stem succulents and sometimes epiphytic

In Wisconsin we have 1 genus, *Opuntia*, with 2 recognized species

*Opuntia macrorhiza* – plains prickly-pear

*Opuntia fragilis* – brittle prickly-pear
Cactaceae - cactus family

• Tepals

• Ovary is inferior and consist of 4 fused carpels with **parietal placentation**

• Fruit a **berry** (jam, wine!)

\[ P \infty A \infty G (4) \]

*Opuntia macrorhiza* - plains prickly-pear
Amaranthaceae - amaranth family

• large family (now includes Chenopodiaceae)
• abundant in desert and semi-desert regions & weeds here!
• **halophytic** - salt-loving; tumbleweeds
Amaranthaceae - amaranth family

- large family (now includes Chenopodiaceae)
- abundant in desert and semi-desert regions & weeds here!
- **halophytic** - salt-loving; tumbleweeds
- many species exhibit **xerophytic** adaptations (succulence, C4 or CAM photosynthesis)

*Salicornia virginica* - glasswort  
*Chenopodium album* - lamb’s quarter
Amaranthaceae - amaranth family

C₄ and Crassulacean Acid Metabolism
Flowers very small, greenish, **perfect or imperfect** (both monoecious and dioecious); congested inflorescences; wind pollinated

- Sepals only – persist in fruit
- Pistil with 1 locule and 1 ovule – **achene**
Amaranthaceae - amaranth family

Chenopodium – big & messy!

Chenopodium ambrosioides

Family: Amaranthaceae
Mexican-tee, more...

[Amarina ambrosioides (L.) Spach; more]

Dysphania ambrosioides (L.) Mosyakin & Clemants

Etymology: Dysphania: Greek dysphania for "obscure," referring to the inconspicuous flowers
Plants: annual/perennial forb
Conservation Status: Introduced - adventive
Amaranthaceae - amaranth family

Amaranthus retroflexus - rough amaranth, pigweed, redroot

Froelichia floridana - cottonweed
Polygonaceae - smartweed family

Large, difficult family especially common in northern temperate regions – lots of generic changes!

In Wisconsin we have many *Persicaria* (smartweeds), *Fallopia* (bindweeds, giant knotweeds), *Polygonum* (knotweeds), *Rumex* (sorrels, docks)

*Persicaria amphibia* - water smartweed  *Persicaria hydropiper* - water pepper
Polygonaceae - smartweed family

Herbs, shrubs with swollen nodes; leaves typically alternate and simple

**Ocrea** is a good character for the family – membranous sheath (connate stipule)
Polygonaceae - smartweed family

- Flowers usually bisexual,
- Flowers are small often white to red
- 5 or 6 sepals (tepals) that often become large and membranous in fruit
- No petals
- Fruit is a triangular one-seeded **achene** (derivation of family name)
Polygonaceae - smartweed family

*Rumex acetosella* - sheep or red sorrel

Ubiquitous weed around the world, especially in pastures; distinctive leaf bases (*sagittate* or *hastate*); acetic acid taste (sour = ‘sorrel’ )
Polygonaceae - smartweed family

*Rumex crispus*
Curly dock

*Rumex brittanica*  
(*R. orbicularis*)  
Water dock

One-seeded fruits with 3 persistent sepals or wings

*Polygonella articulata*  
jointweed
Polygonaceae - smartweed family

*Rheum rhabarbarum*
Garden rhubarb - locally adventive
Droseraceae - sundew family

Insectivorous family including snap traps (Venus fly trap) and sticky fly papers (sundews). In Wisconsin we have 4 species of Drosera (sundews) in nutrient poor soils or peat.

Drosera rotundifolia - round leaved sundew

The sticky tentacles are modified leaves with gland tipped hairs that capture the insects. Digestion and then absorption of amino acids follows.
“sundew time lapse”  @ http://www.youtube.com/watch?v=frmyzIhD29Q
Droseraceae - sundew family

Different species vary in leaf shape

Flowers are small in a terminal raceme

*Drosera anglica* - English sundew *(threatened in WI)*

*Drosera intermedia* - narrow-leaved sundew *(threatened in WI)*
Droseraceae - sundew family

Unusual origin of *Drosera anglica*

- All *Drosera* are 2n = 20
- *D. anglica* is 2n = 40
- *D. anglica* is hybrid of *D. rotundifolia* and *D. linearis*
- *D. anglica* is allopolyploid (tetraploid)
Droseraceae - sundew family

Family shows **divergence** in insect capture

*Drosera* – Sundews:
sticky flypaper

*Dionaea* –
Venus fly-trap: **steel trap**
Droseraceae - sundew family

*Drosera* – Sundews: sticky flypaper

*Venus fly-trap: steel trap*

*Pitfall trap*

*Family shows divergence in insect capture*

*Nepenthes* (Nepenthaceae) – Asian pitcher plants: Pitfall trap
Droseraceae - sundew family

Family shows convergence in insect capture

*Drosera* – Sundews: sticky flypaper

*Pinguicula* (Lentibulariaceae) – Butterwort: sticky flypaper