Plant Identification/Taxonomy

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Why do Scientists Classify?

Imagine grocery stores…

How are they laid out?

What would happen if they were not in an orderly manner?

We must classify things daily;

how is your life arranged

(or not)?

Why do Scientists Classify?

>1.5 million known species on Earth

Need to be organized!
(Easier to study!)

Classification
= process of grouping things based on their similarities / differences

Why do Scientists Classify?

Taxonomy

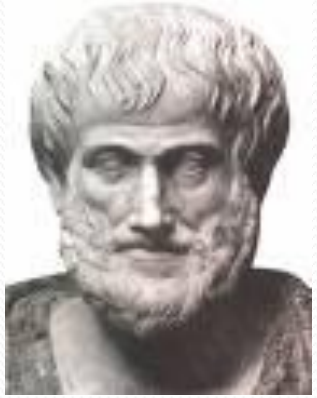
= scientific study of how living things are classified

Useful because:

- once classified, scientists will know a lot about an organism;
- practical reasons, too

Early Classification Systems

Aristotle (4th century B.C.)



-observed animals

-watched appearance, behavior, movement

-fly, swim, and walk/crawl/run

-observed similarities and differences

-used differences to divide into smaller subgroups

Linnaeus

Carolus (Carl) Linnaeus (1707-1778)

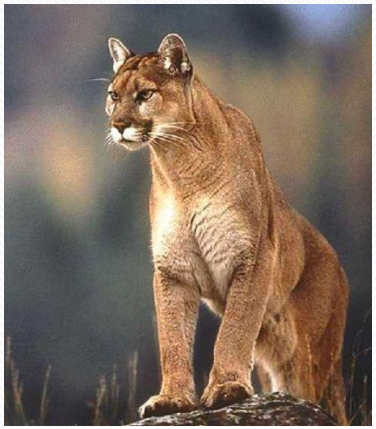
-used observations as basis of his system

-placed organisms based on observable features

Devised naming system for organisms:

Binomial Nomenclature

Linnaeus



- Binomial Nomenclature
  = two-part naming system
  that uses Latin words

- *Genus species* *Felis concolor*
  Genus is capitalized; species is NOT.
  If you can't italicize, underline the genus and species!

- Scientific vs. Common Name: common names vary (e.g., mountain lion, cougar, puma, panther, catamount), scientific names don't

Scientific Names

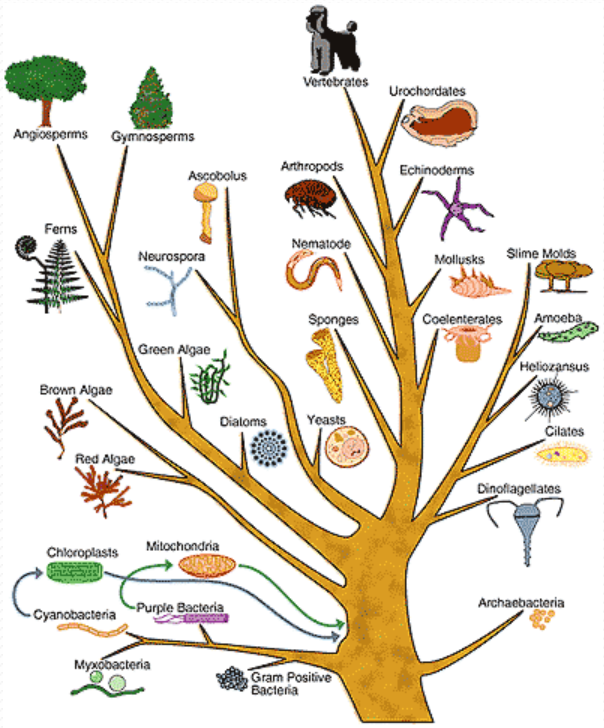
- The first word is the genus and the second word is the species followed by the species author or authority --
- ***Acer rubrum*** **Linnaeus**

- If there are additional words, they indicate the variety, subspecies, or cultivar.
- ***Acer rubrum*** **Linnaeus** ***var. drummondii*** **(Hooker & Arnott ex Nuttall) Sargent**

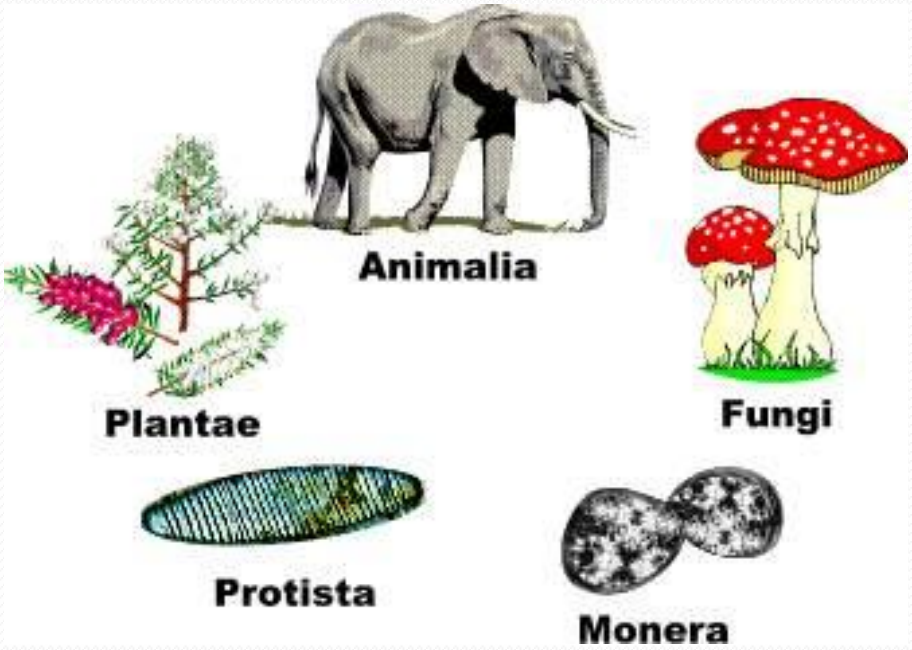
Classification Today

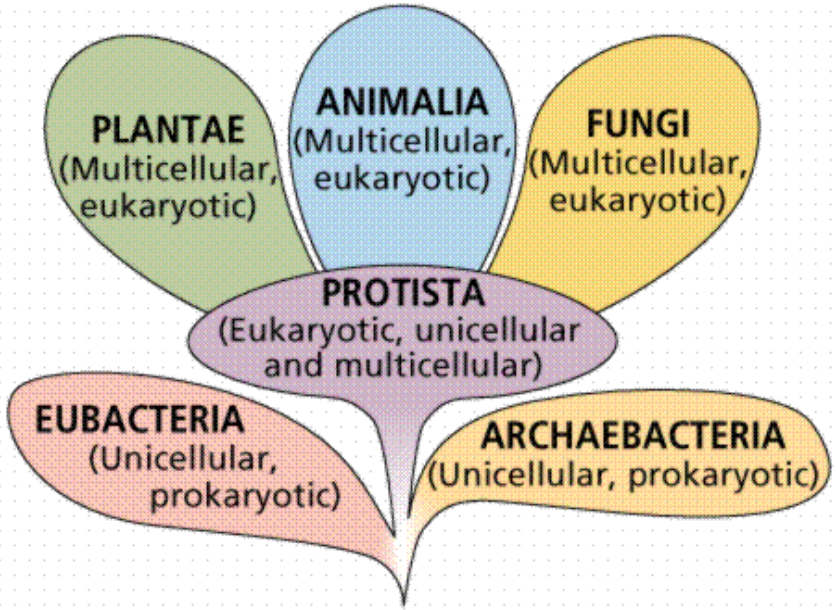
Species with similar evolutionary histories are classified more closely together.

*<u>when organisms share a common ancestor, they share an evolutionary history</u>



Kingdoms of Living Things





7 Levels of Classification

Kingdom (broadest level)

Phylum or Division

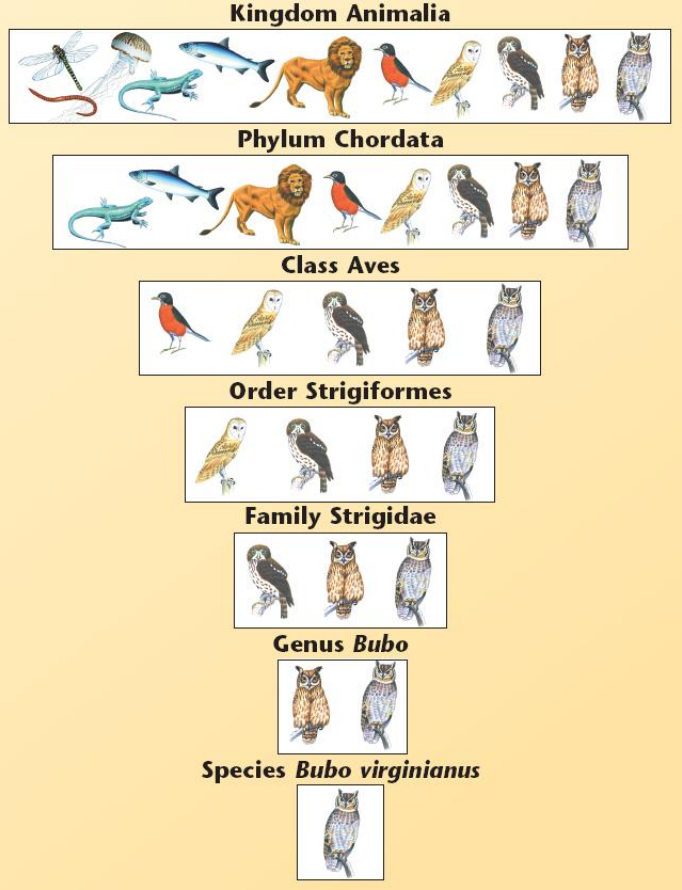
Class

Order

Family

Genus

Species (most specific)



Plant Phyla or Divisions

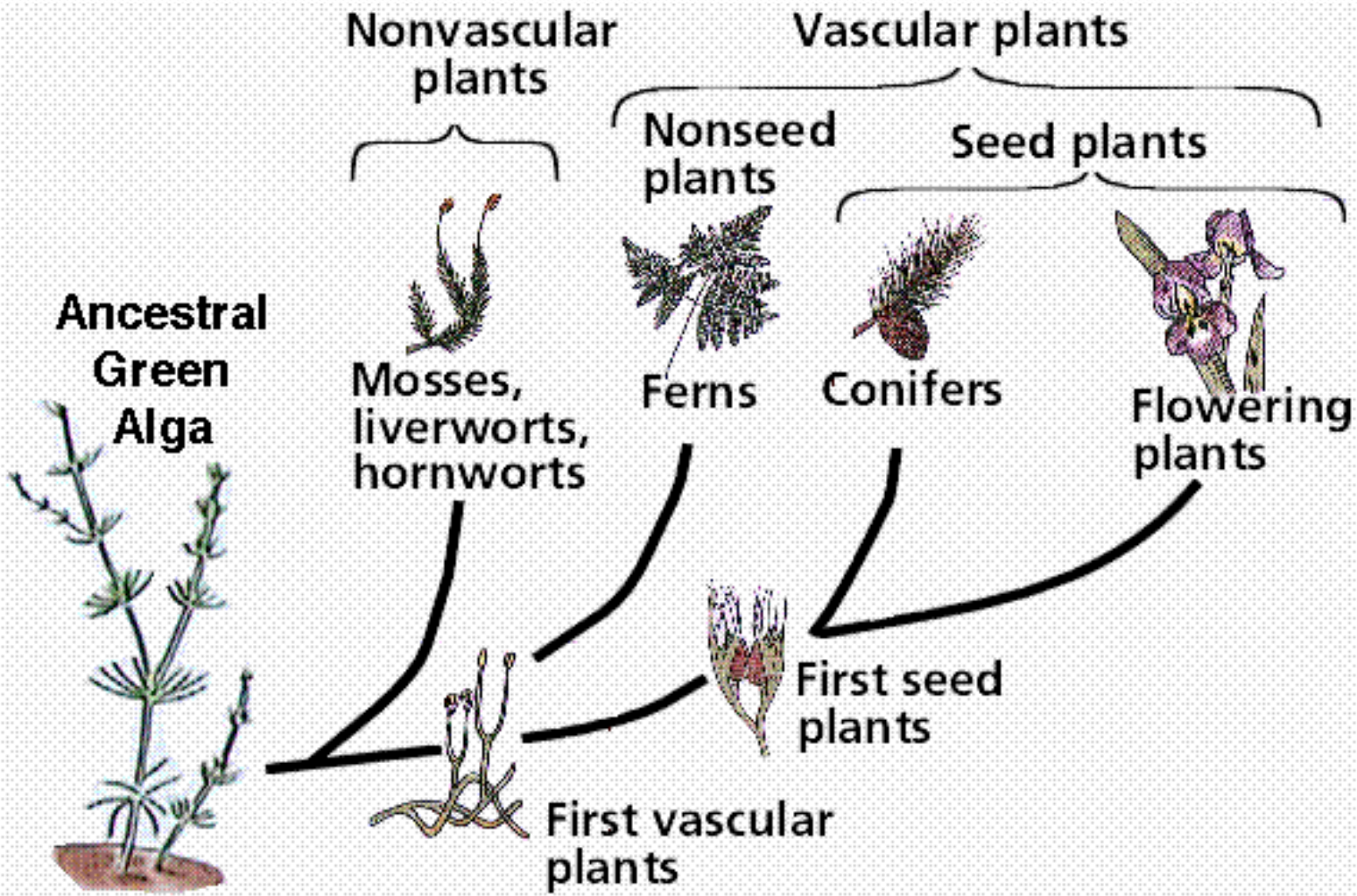
- The four most important divisions of the plant kingdom are….

1. Thallophytes: algae, lichens

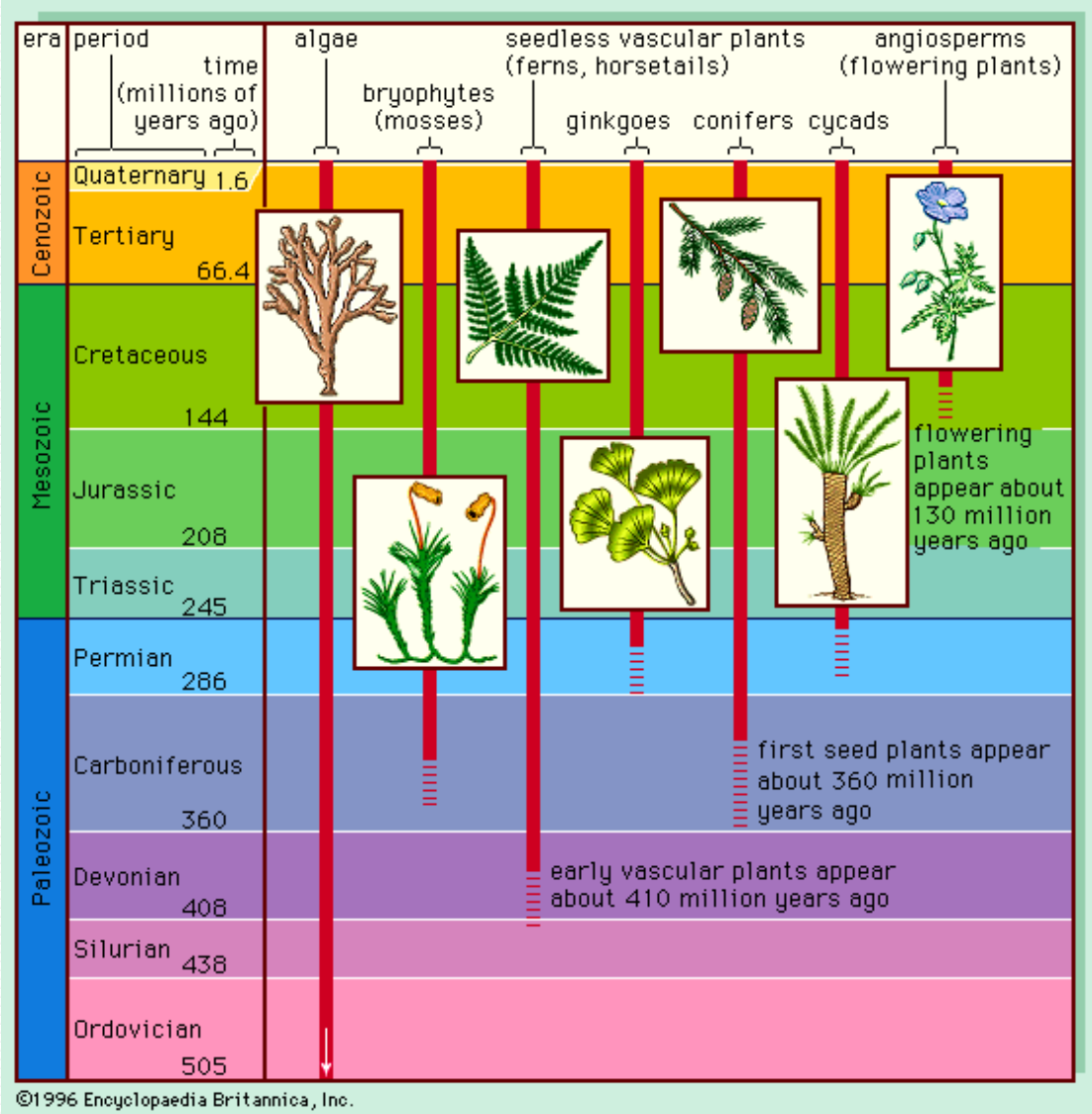

2. Bryophytes: mosses, liverworts


3. <u>Pteriophytes: ferns and fern allies</u>
   (vascular plants without seeds)


4. <u>Spermatophytes: seed-bearing plants</u>
   (vascular plants with seeds)

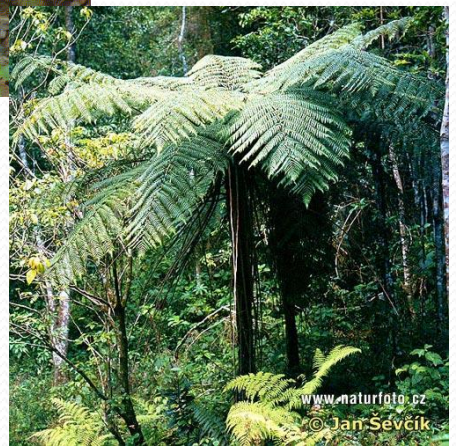

Nonvascular plants
Vascular plants
Nonseed plants
Seed plants
Ancestral Green Alga
Mosses, liverworts, hornworts
Ferns
Conifers
Flowering plants
First seed plants
First vascular plants

Plant Evolution Timeline



Ferns and Ferns Allies

- Lower vascular plants: xylem and phloem allow them to grow larger than algae, mosses, etc.



Spermatophytes

- Includes seed-bearing plants
- The two subdivisions are….

  - Gymnosperms (naked seed)



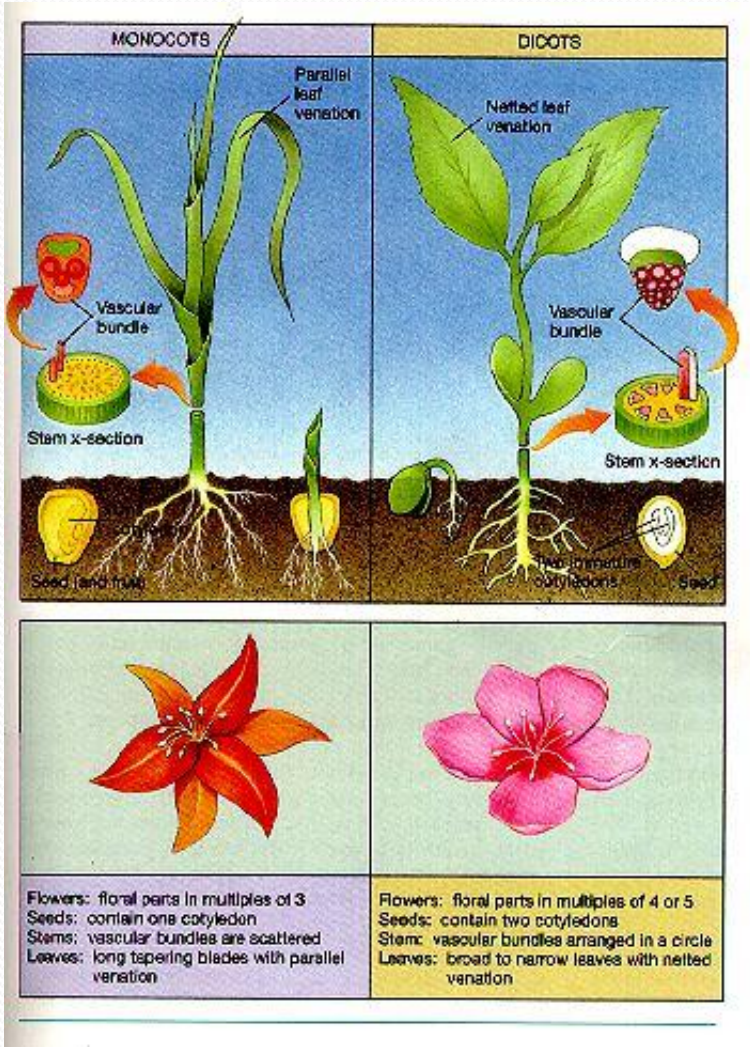
  - Angiosperms (produce fruits)




Angiosperms

- Dicots

- Monocots



Genus

Groups of related species:

Oaks (*Quercus*)

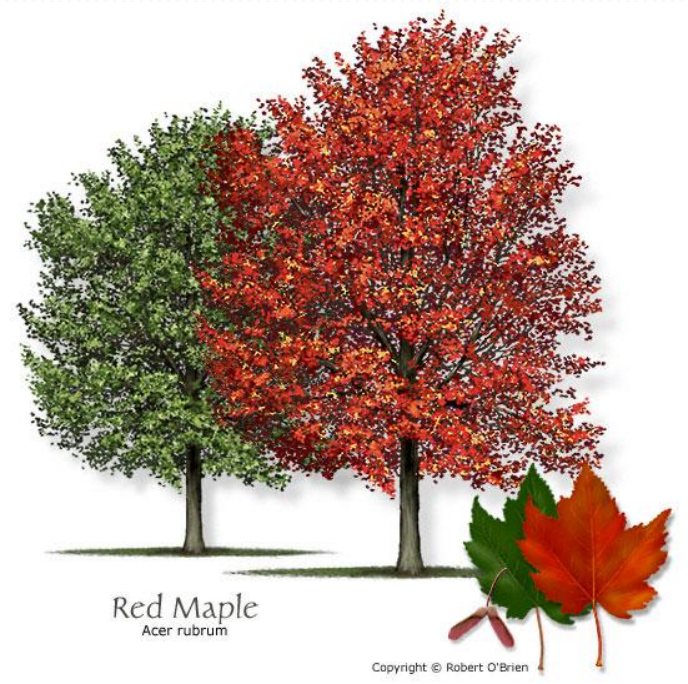
Maples (*Acer*)

Dogwoods (*Cornus*)

Image: UConn Plant Database

Species

- Plants in the same species consistently produce plants with the same characteristics



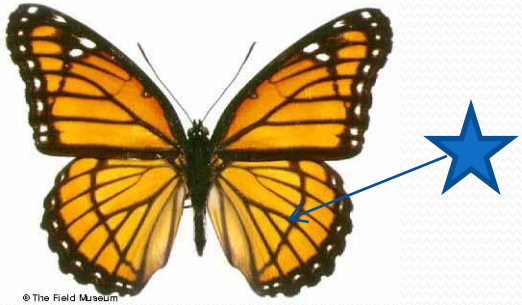
Critical Attributes

Specific characteristics that distinguish groups or individuals--

e.g., maple, ash, dogwood

e.g., oak, black gum

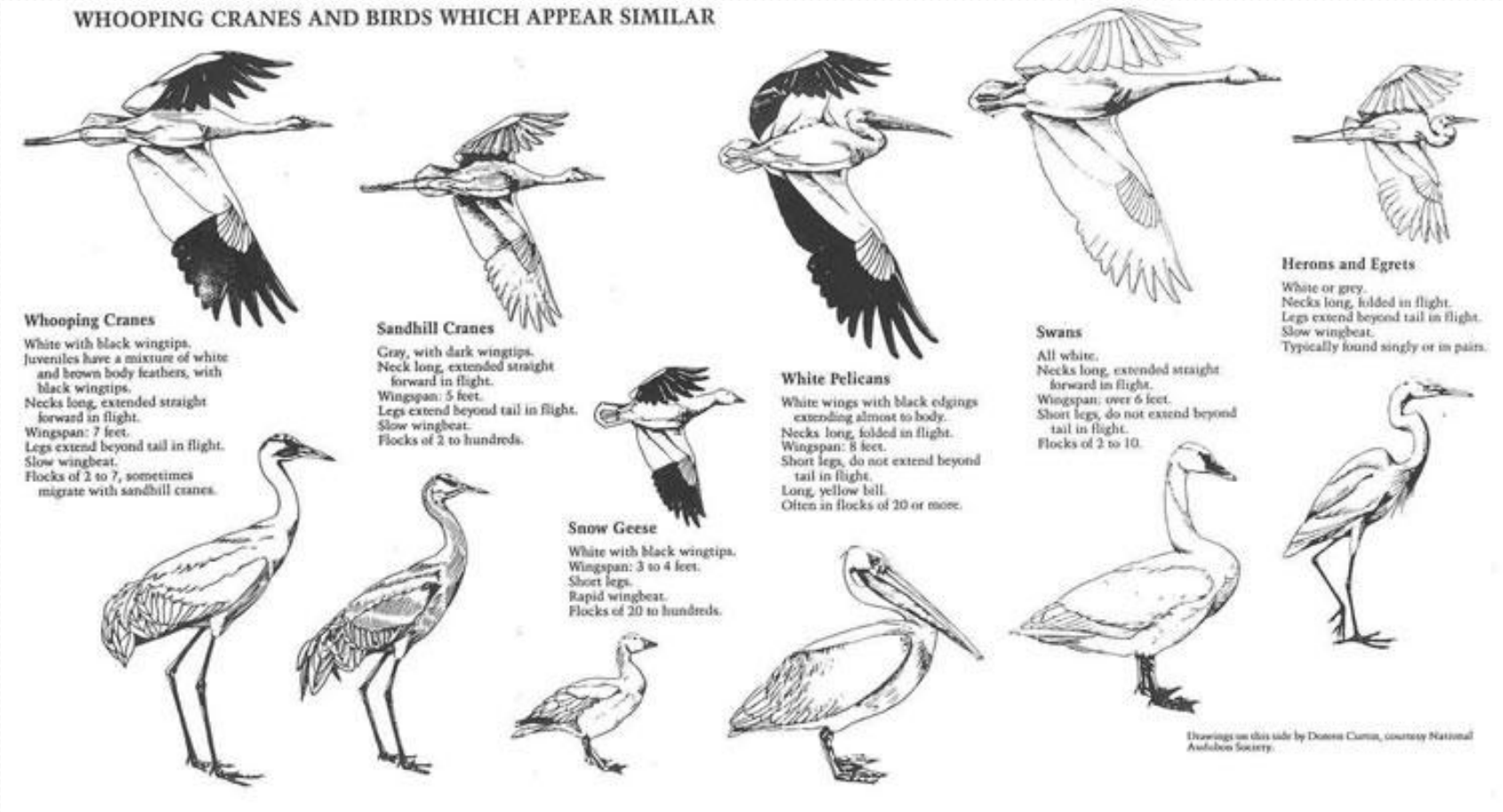
monarch



viceroy

queen

- Key (scientific context): an arrangement of critical attributes among a group of plant, animals, or other entities designed to facilitate identification



Types of Keys

A. Polychotomous key

- multiple discrete choices -- works for small numbers or very distinctive attributes:

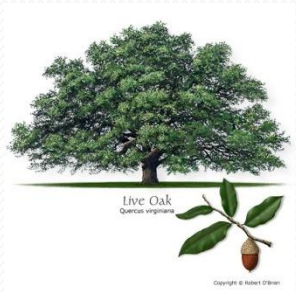
fan-like leaf – palmetto

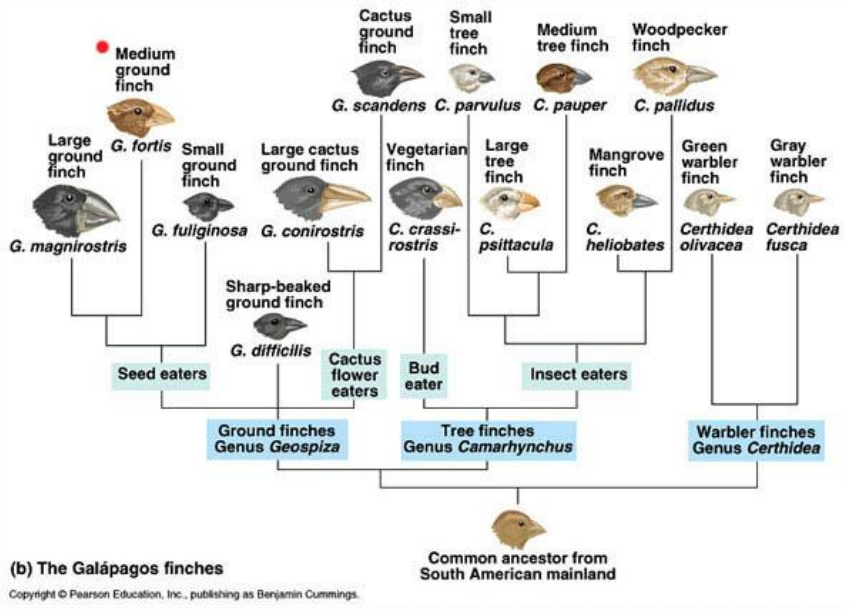
needles/cone – pine

leaf with toothed edges/acorn – oak

B. Dichotomous key

- two discrete choices <u>at a time</u> that lead you to the identification (esp. for complex groups)





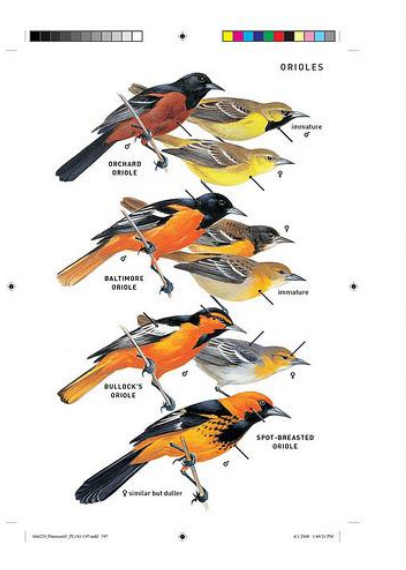
Dichotomous Local Oak Key:

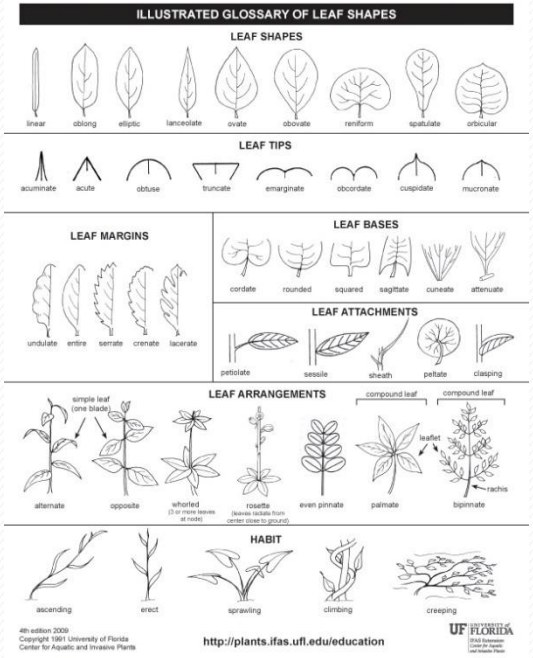
- 1. Leaves usually without teeth or lobes: 2
- 1. Leaves usually with teeth or lobes: 5
- 2. Leaves evergreen: 3
- 2. Leaves not evergreen: 4
- 3. Mature plant a large tree — Southern Live Oak *Quercus virginiana*
- 3. Mature plant a small shrub — Dwarf Live Oak *Q. minima*
- 4. Leaf narrow, about 4-6 times as long as broad — Willow Oak *Q. phellos*
- 4. Leaf broad, about 2-3 times as long as broad — Water Oak *Q. nigra*
- 5. Lobes or teeth bristle-tipped: 6
- 5. Lobes or teeth rounded or blunt-pointed, no bristles: 7
- 6. Leaves mostly with 3 lobes — Blackjack Oak *Quercus marilandica*
- 6. Leaves mostly with 7-9 lobes — Southern Red Oak *Quercus falcata*
- 7. Leaves with 5-9 deep lobes — White Oak *Quercus alba*
- 7. Leaves with 21-27 shallow lobes — Swamp Chestnut Oak *Q. michauxii*

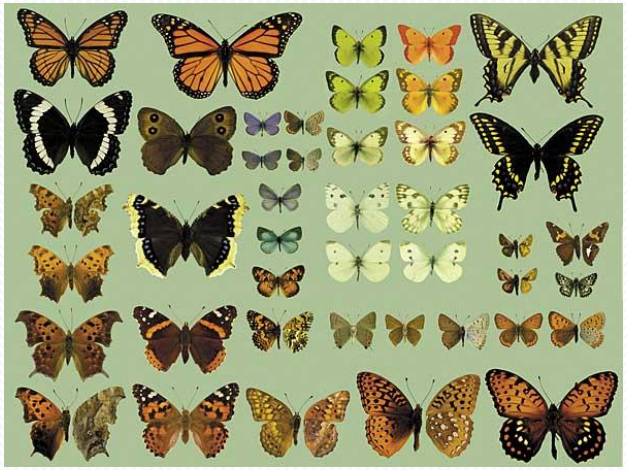
Using the Classification System

Field guides, floras, or manuals help identify organisms.

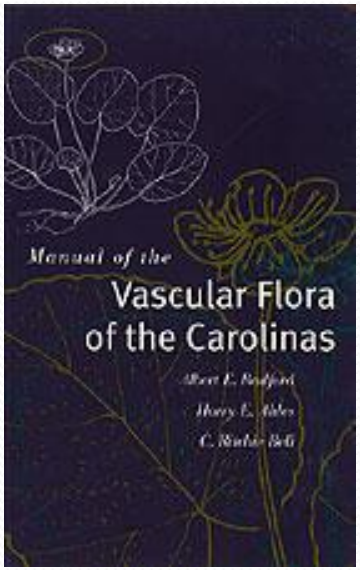
- highlight differences between similar organisms

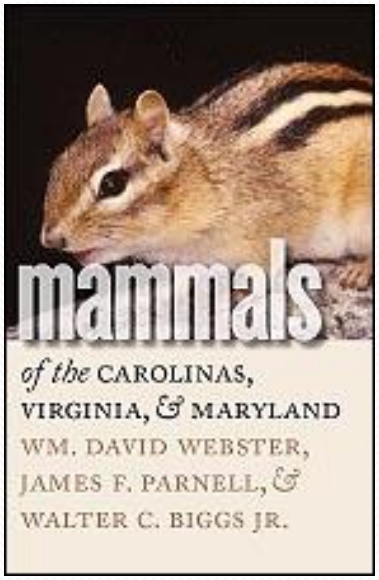


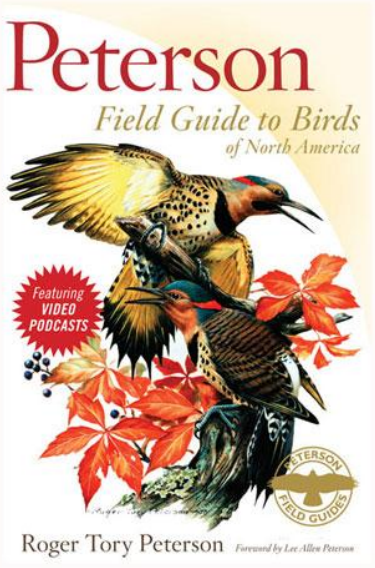


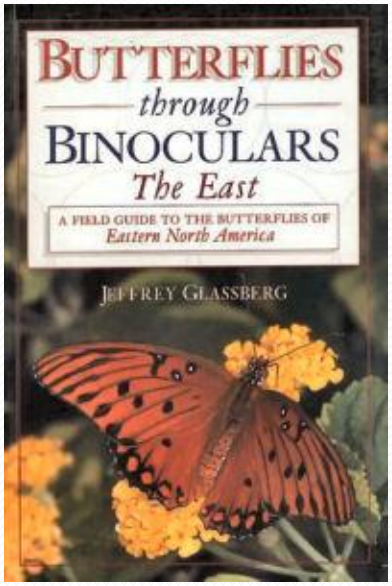


- There are numerous field guides and identification manuals; the challenge is to choose within your level of knowledge so you can accomplish what you need to do.









- http://www.herbarium.unc.edu/WeakleyFlora2010Mar.pdf

Herbarium

- An herbarium is a collection of preserved plant specimens. These specimens may be whole plants or plant parts: these will usually be in a dried form, mounted on a sheet, but depending upon the material may also be kept in alcohol or other preservative.

Practical Applications of Taxonomy

- Mushrooms: members of the same genus (*Amanita*) --

springtime *Amanita* (*Amanita velosa*)

edible

destroying angel (*Amanita ocreata*)

deadly poisonous

- Flowering Plants: members of the same family (*Solanaceae*)

potato
(*Solanum tuberosum*)
edible

tomato
(*Lycopersicon esculentum*)
edible

jimson weed
(Datura stramonium)
poisonous

belladonna
(Atropa belladonna)
poisonous

- Animals:

wolf spider

non-venemous

brown watersnake

non-venemous

black widow spider

venemous

water moccasin

venemous

Plant Characteristics

Identifying Plants

- Physical characteristics are used to identify plants which include….
  - Life Cycle
  - Form
  - Foliage Retention
  - Plant Parts
  - Use & Location

Life Cycle

- Annuals
  - Plants that complete their life cycle in one year.

- Biennials
  - Plants that complete their life cycle in two years.

- Perennials
  - Plants that live more than two years.

Growth Habits

- Tree

-- a perennial woody plant having a main trunk and usually a distinct crown

- Shrub

-- a low, usually several-stemmed woody plant

- Vine

-- a plant whose stem requires support and which climbs by tendrils or twining or creeps along the ground

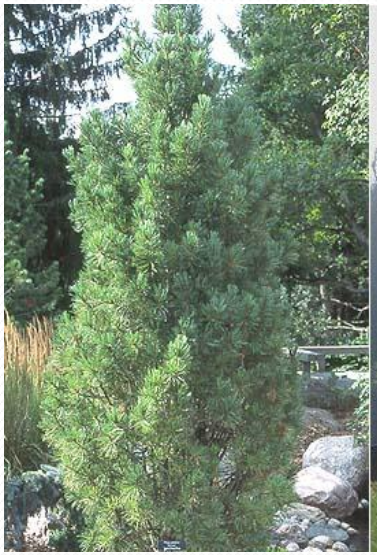
- Herb

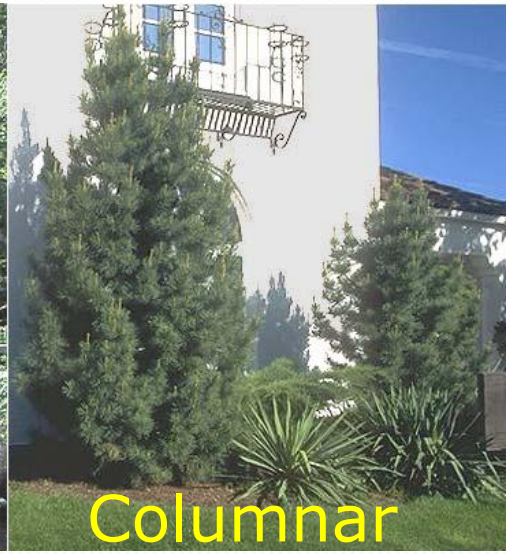
-- a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of a growing season

Growth Forms

- Columnar
- Spreading
- Weeping
- Round
- Oval
- Pyramidal

Growth Forms





Growth Forms

Foliage Retention

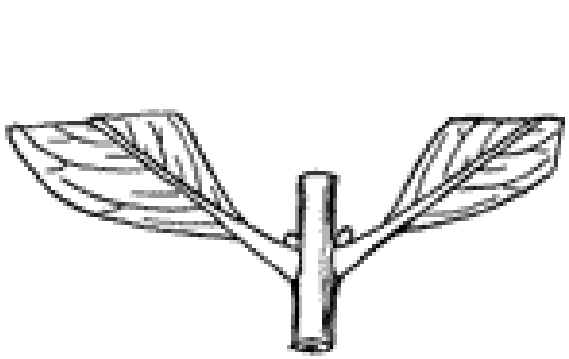
- Deciduous

- Evergreen

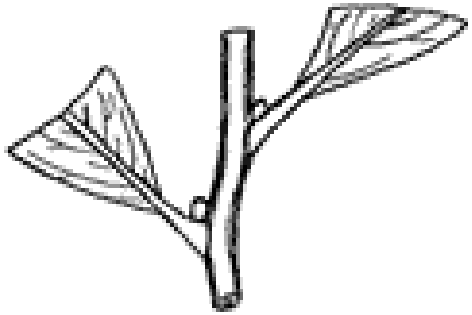
Plant Parts – Leaf

- Arrangement
- Shapes
- Color
- Vein Pattern
- Form – Simple or Compound
- Margin
- Surface

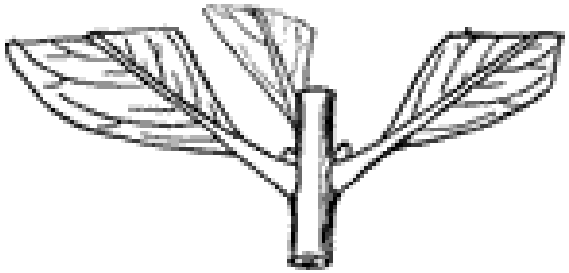
Leaf Arrangement – Simple



opposite

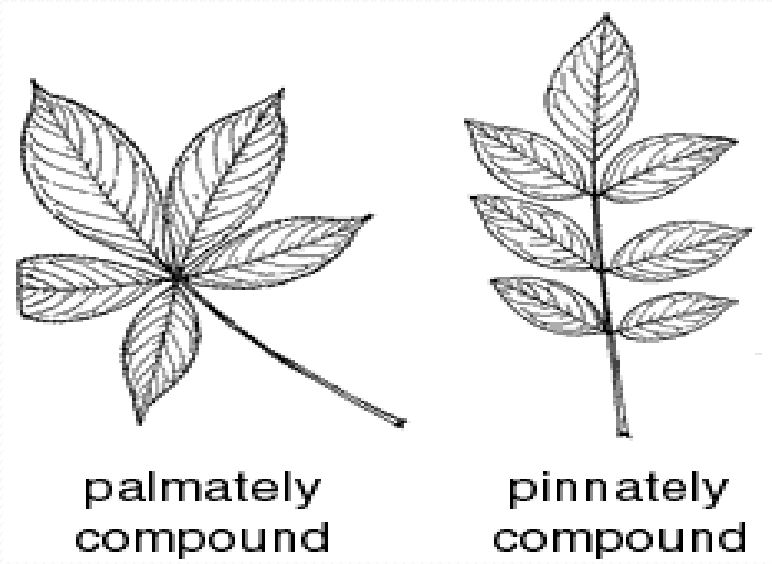


alternate

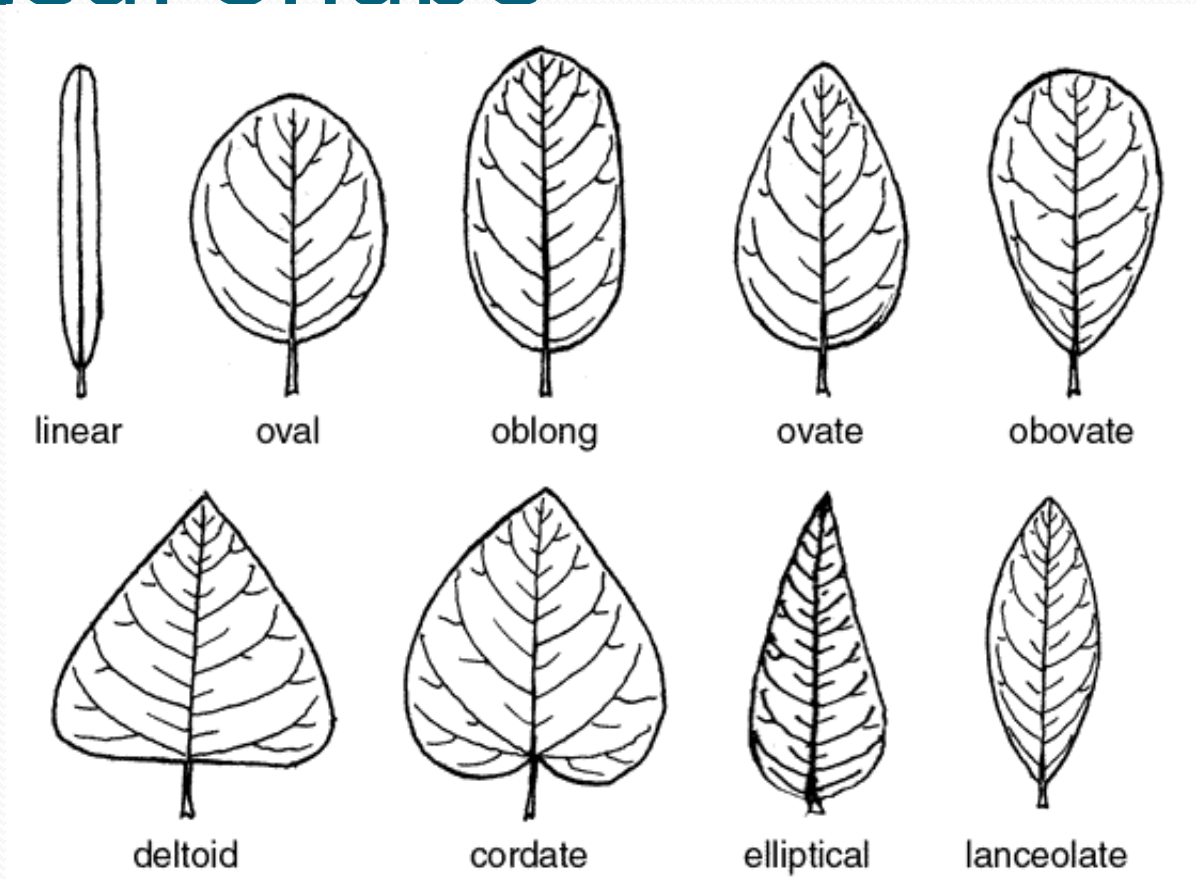


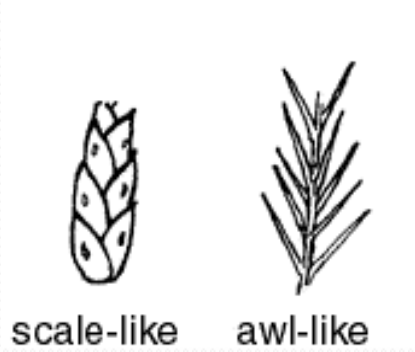
whorled

Leaf Arrangement – Compound



Leaf Shape


linear
oval
oblong
ovate
obovate
deltoid
cordate
elliptical
lanceolate

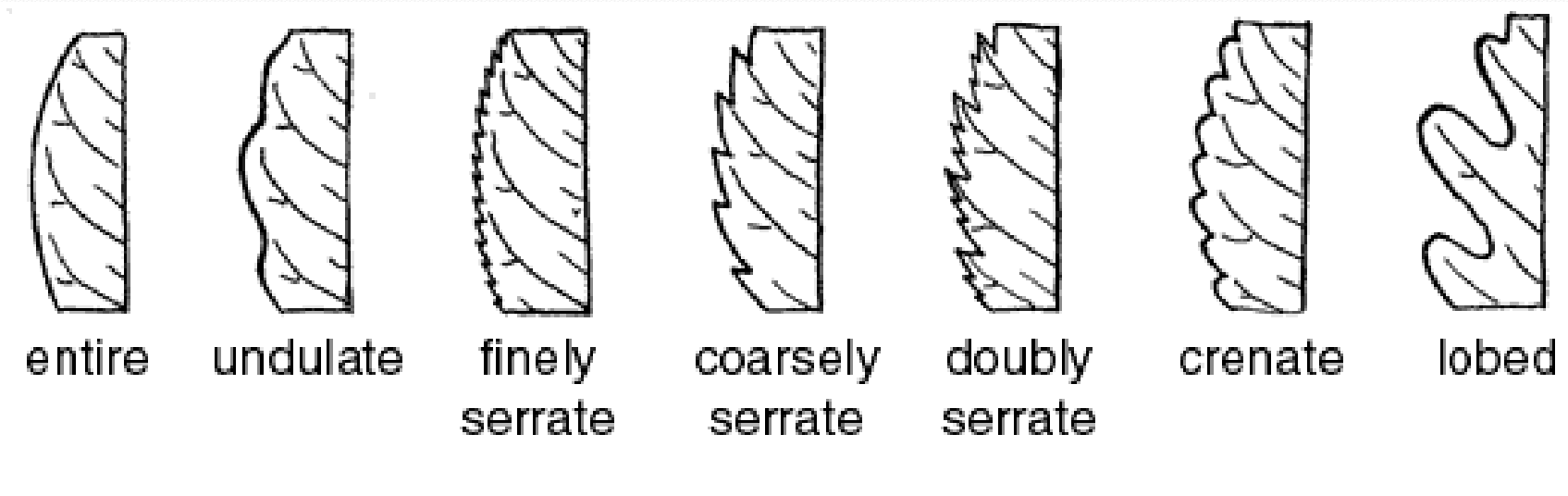

scale-like
awl-like


needle-like

Vein Pattern

- Pinnate
- Palmate
- Parallel
- Dichotomous

Leaf Margin


entire
undulate
finely serrate
coarsely serrate
doubly serrate
crenate
lobed


(C) 2002, Gary Fewless


Ilex vomitoria

Leaf Surface

- There are 8 common leaf surfaces (vestitures):
  - Glabrous
  - Pubescent
  - Villous
  - Tomentose
  - Scabrous
  - Glaucous
  - Rugose
  - Glandular

Leaf Surface – Glabrous

- The surface is smooth, not hairy.

Leaf Surface – Pubescent

- Short, soft hairs cover the surface.

Leaf Surface – Villous

- Long, straight hairs cover the surface.

Leaf Surface – Tomentose

- Covered with wool-like hair.

Leaf Surface – Scabrous

- Covered with short, prickly hairs.

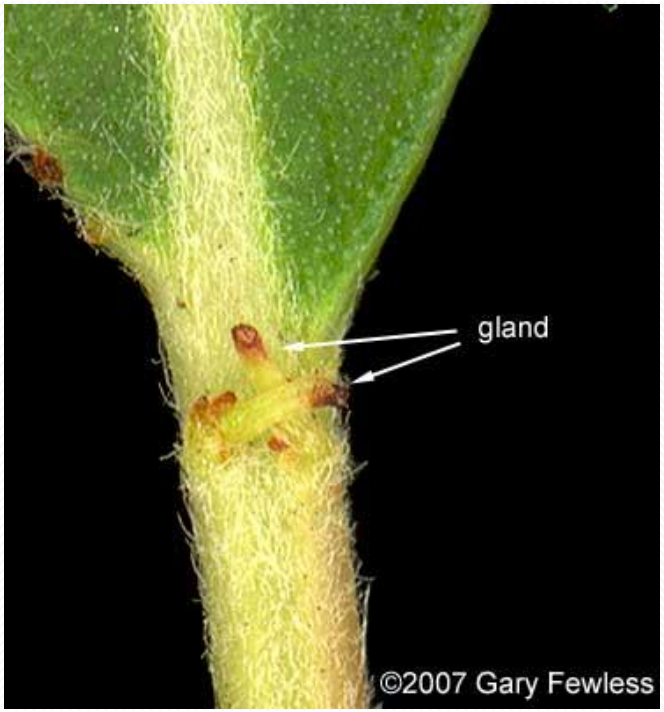
Leaf Surface – Glaucous

- Covered with a bluish-white waxy substance.

Leaf Surface – Rugose

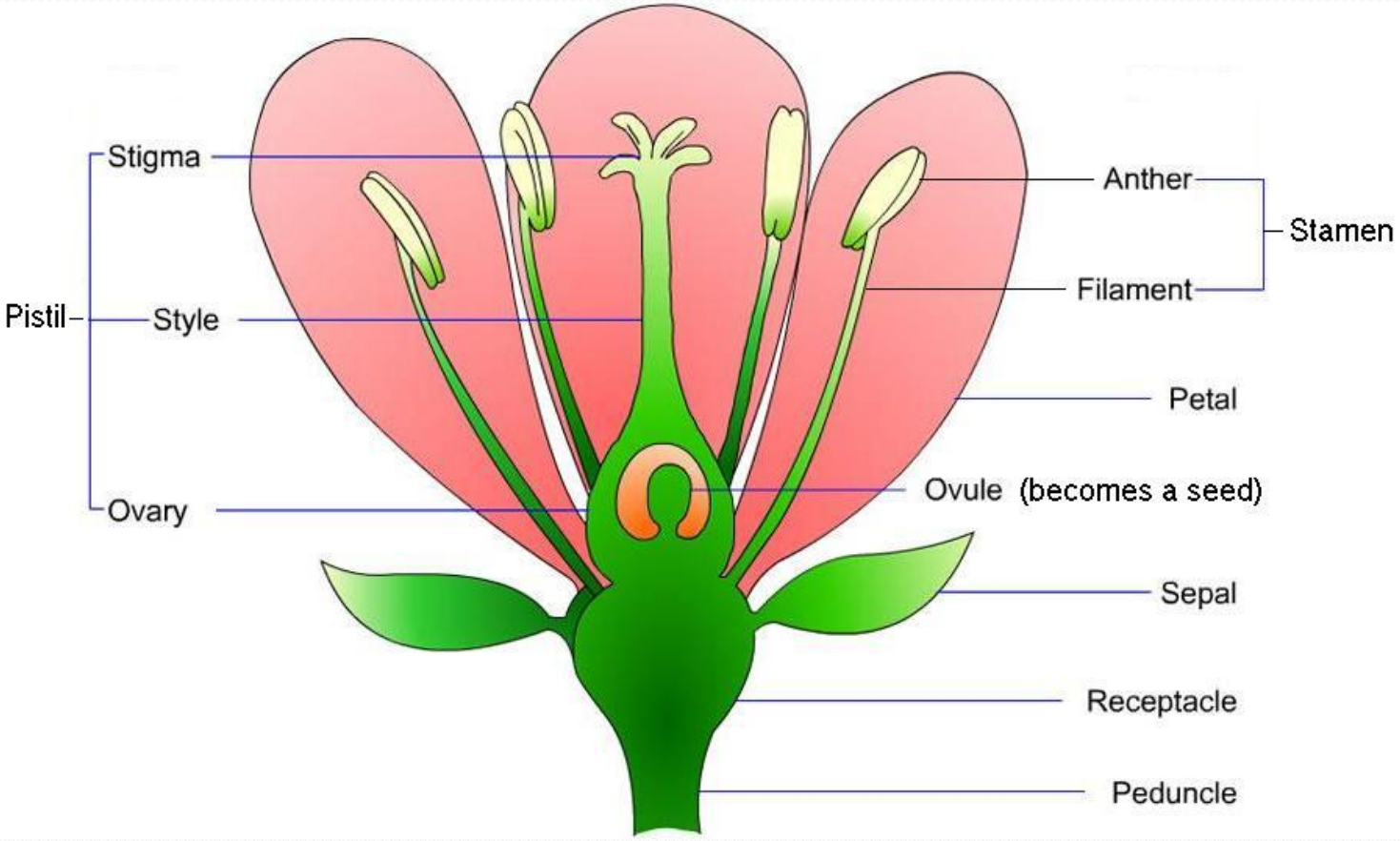
- Surface is wrinkly.

Leaf Surface – Glandular



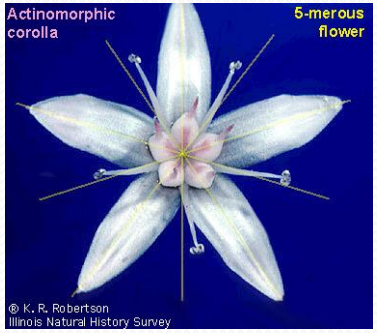
Plant Parts – Flowers

- Color
- Size
- Shape



Flower Shape

- Actinomorphic (radially symetrical)



- Zygomophoric (bilaterally symetrical)

Plant Parts – Bud & Stem

- Shape & Color
- Stem/Leaf Modifications
  - Thorns
  - Spines
  - Prickles

Modified Plant Parts

pointed branch

derived from top layer or epidermal cells

modified leaf margin

Plant Parts – Roots

- Tap
- Fibrous
- Tuber

Plant Parts – Roots


Tap Root

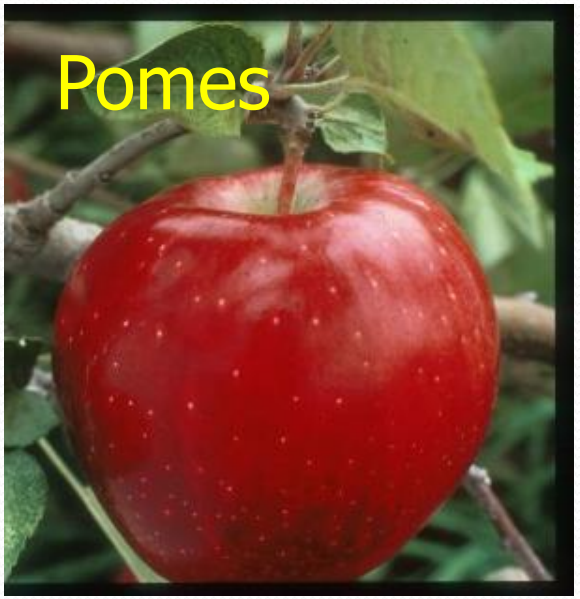

Fibrous Root


Tuberous Root

Plant Parts – Fruit

- Cones
- Nuts (Acorns)
- Pomes (Apple)
- Drupes (Peach)
- Brambles (Raspberries)
- Capsules (Willow)
- Samara (Maple)

Plant Parts – Fruit

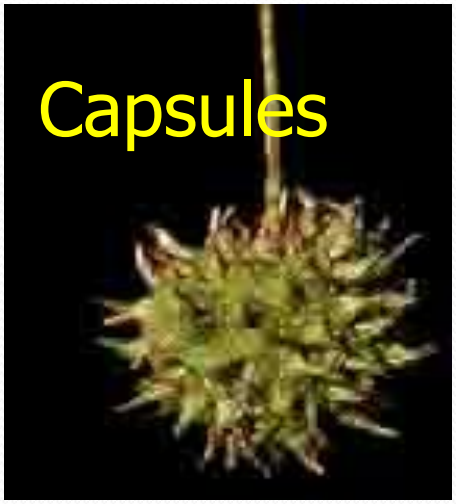


Plant Parts – Fruit


Drupes

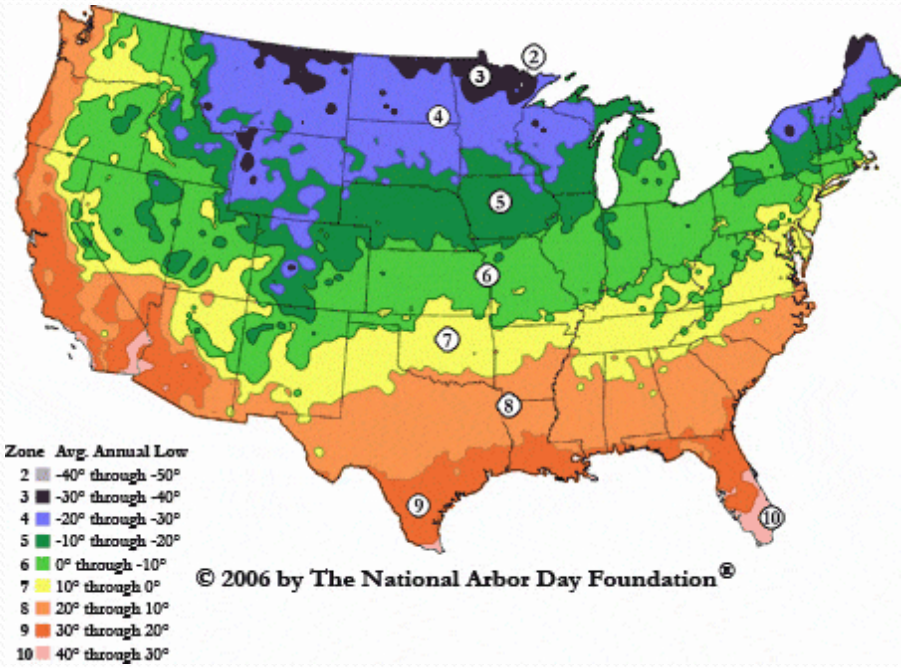
Samara


Brambles


Capsules

Use & Location

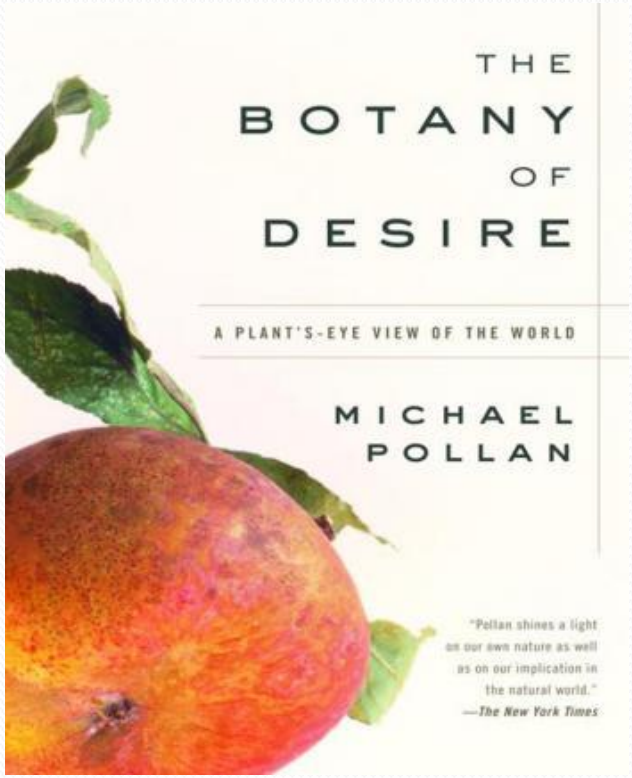
- Not absolute, but helpful.
- Indoor or outdoor.
- Altitude
- Wet or dry
- Hardiness Zone
- Sun, partial shade, or shade.
- Landscape purpose – specimen, border, etc.



- Comprehensive source of botanical terms:
- http://www.ibiblio.org/botnet/glossary/

Interesting Reading

- how we have influenced plants and how they have influenced us:



Questions?

Taxonomy of Selected Vascular Plant Groups

John B. Taggart

Dept. of Environmental Studies

UNCW

January 22, 2011

Fern Allies

- spikemosses

meadow spikemoss

sand spikemoss

- clubmosses

foxtail clubmoss

slender clubmoss

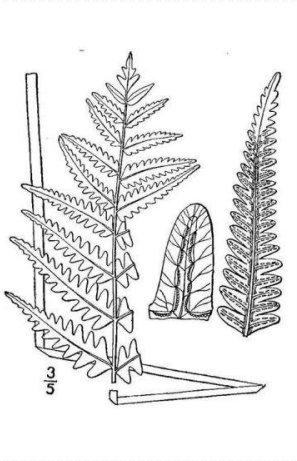
Ferns

Image Courtesy Missouri Botanical Garden

cinnamon **royal** **bracken**

Ferns

Virginia chainfern



netted chainfern

Gymnosperms

- **Pines**

loblolly pine

longleaf pine

pond pine

Gymnosperms

- **Cypresses**

pond cypress

bald cypress

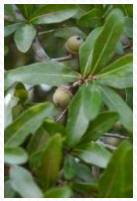
Gymnosperms

- **Cedars**

eastern red cedar

Atlantic white cedar

Angiosperms

- **Dicots**
  - * walnut/hickories  
  - * birches/oaks  
  - * bays (sweet, red, and lobolly)  
  - * legumes  
  - * hollies  

- **Dicots** (con't.)

  * umbellifers (wild carrot)


  * dogwoods


  * azaleas/blueberries/huckleberries


  * composites
    - asters
    - goldenrods
    - etc.



Angiosperms

- **Monocots**

  * grasses

  * sedges

  * rushes

- **Monocots** (con't.)

* orchids

* lilies and associates