Seed Plants

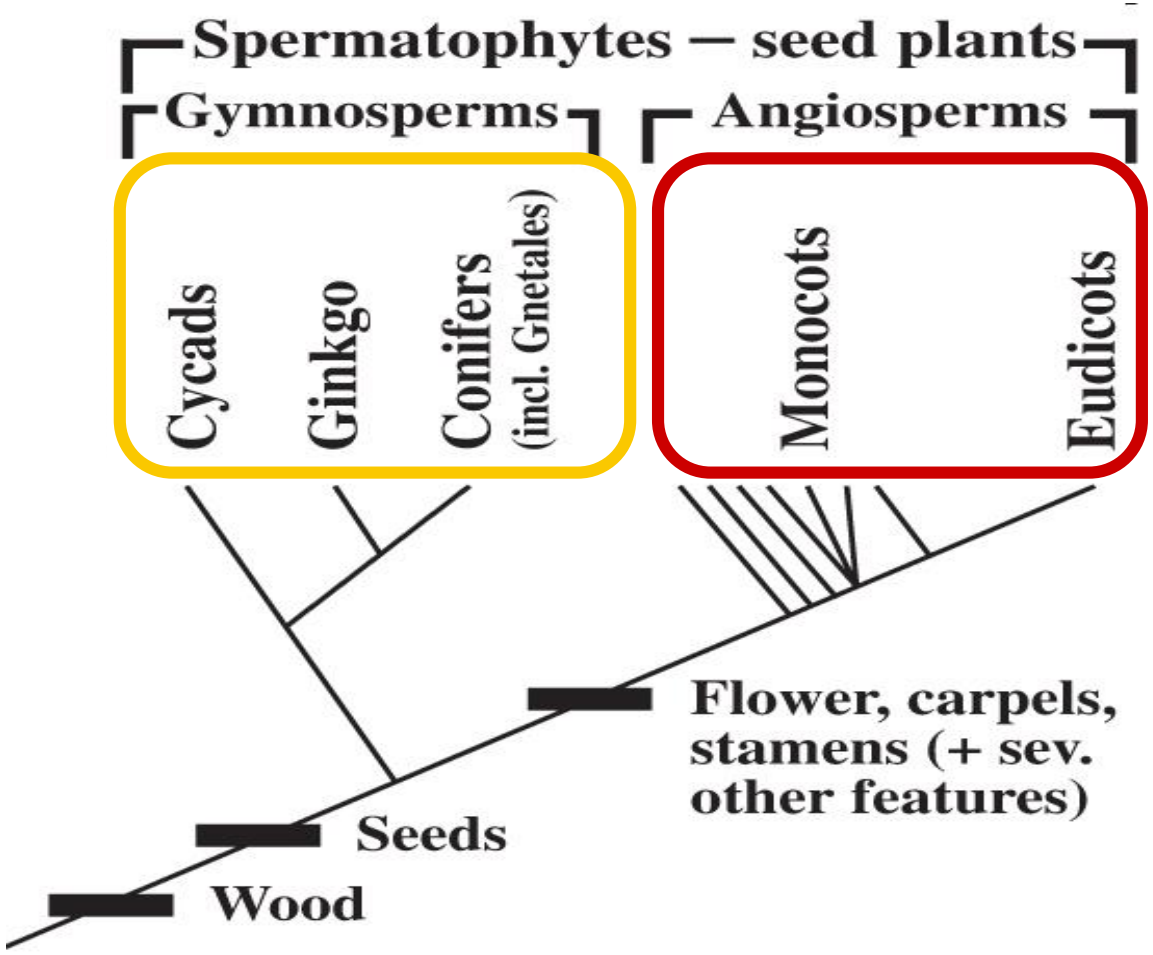
Sperm in Pollen; Propagate by Seeds

Gymnosperms (Conifers)

- Produce seeds
- Sperm dispersed in pollen
- Produce true wood

Angiosperms (Flowering Plants)

- Produce flowers
- Sperm dispersed in pollen
- Produce seeds in fruits
- Produce true wood



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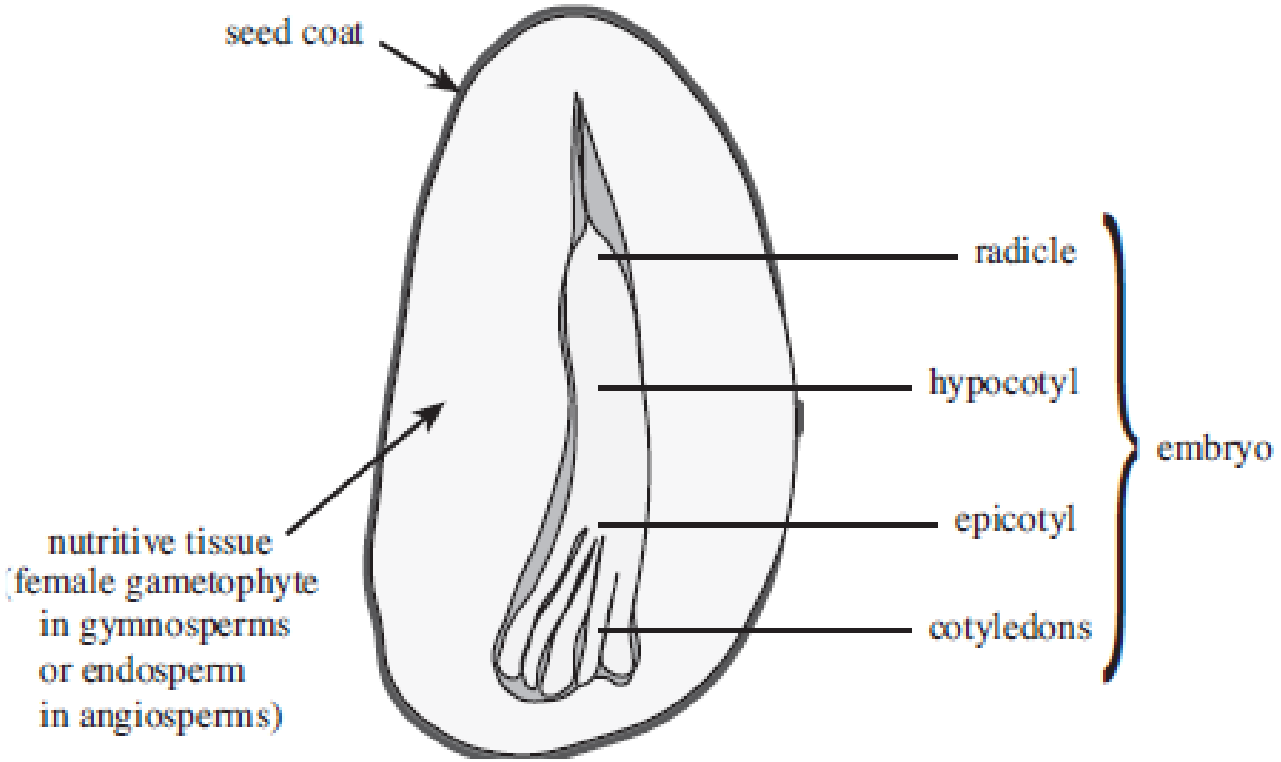
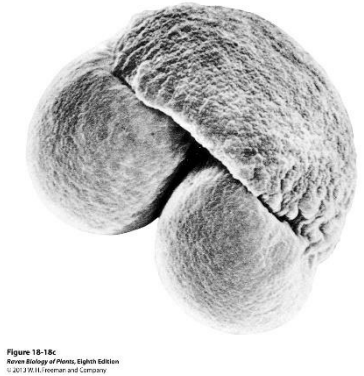
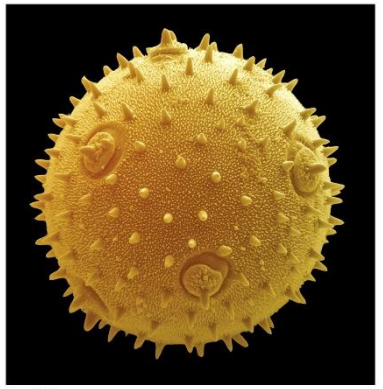
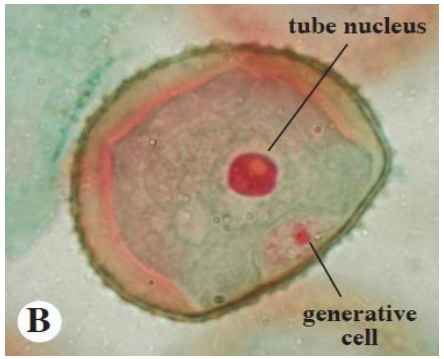
Seed Plants

Specialized Characters (Apomorphies)









Seed

Propagule consisting of an embryo surrounded by nutritive tissue and a protective coat

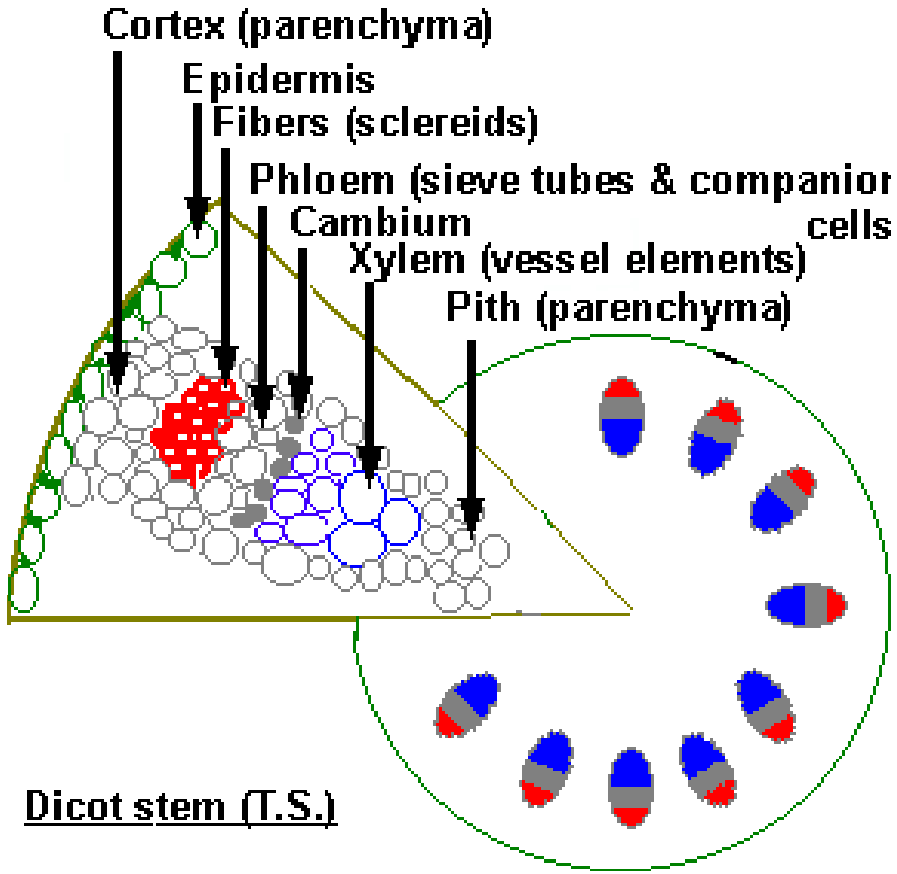
Pollen

Male plant (containing sperm) that is dispersed from the parent plant

Vascular Bundles Transport Food and Water

Each bundle is comprised of **phloem** tissue towards the **outside**, **xylem** tissue towards the **inside**, and **vascular cambium in between.**

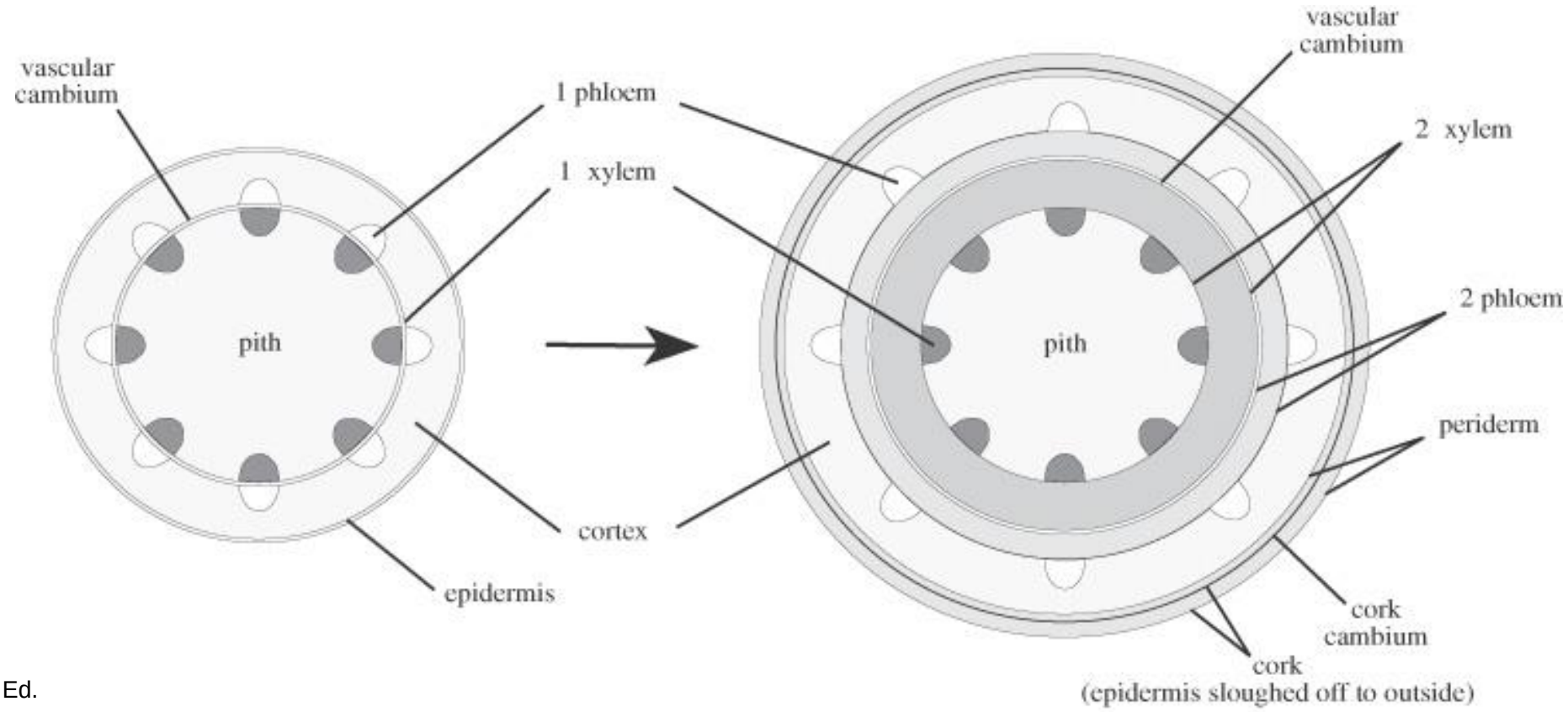
- **Phloem** transports **food**
- **Xylem** transports **water** and dissolved mineral nutrients
- The **vascular cambium** is the meristem that creates more xylem and phloem.



Secondary Growth Stems Growing in Girth

Circular arrangement of vascular bundles enables secondary growth

- Old xylem accumulates on the inside of the stem
- Old phloem is eventually shed on the outside



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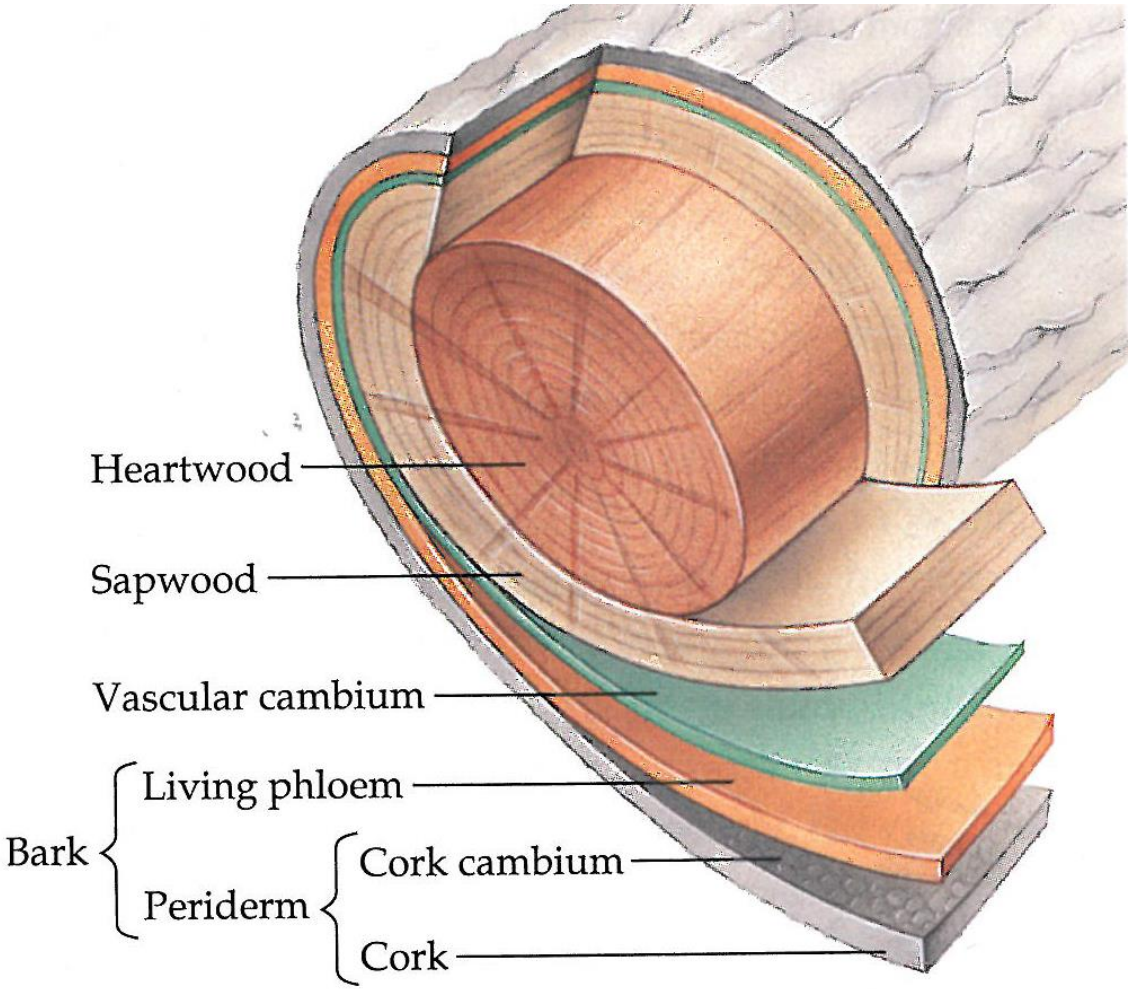
Secondary Growth Wood and Bark



Raven *et al.* *Biology of Plants 7th ed.* 2005

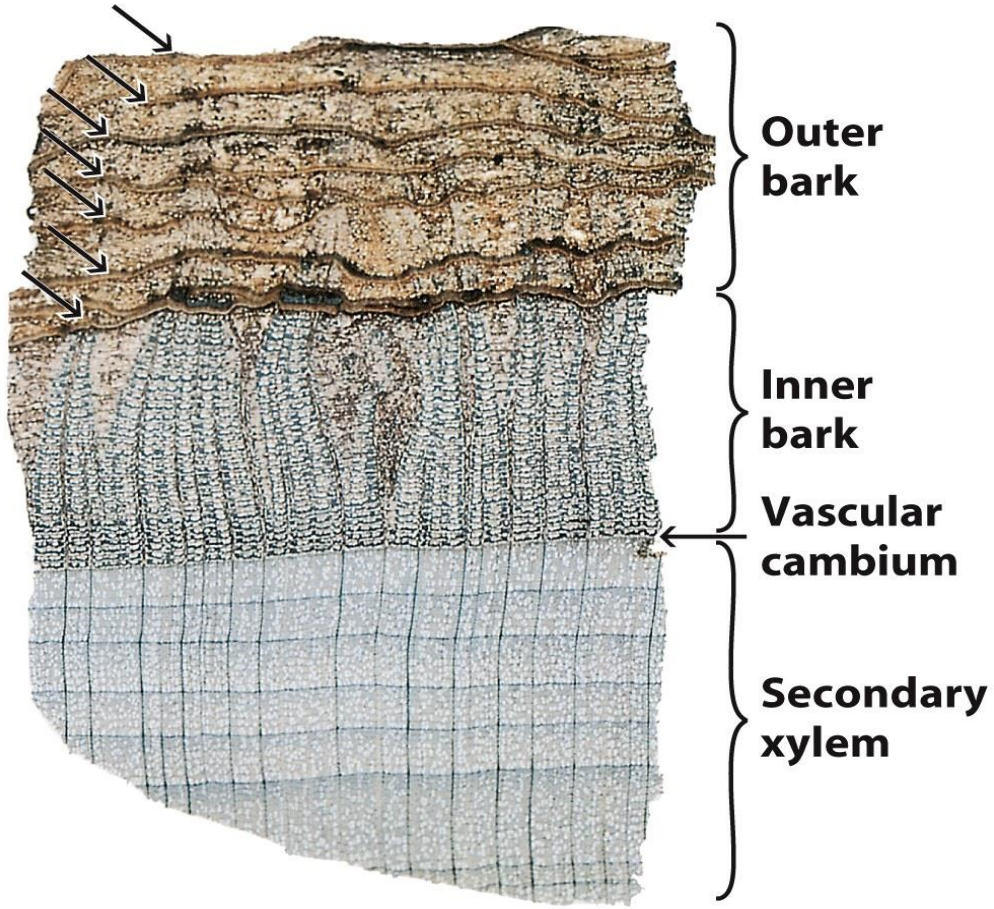


Figure 26-13
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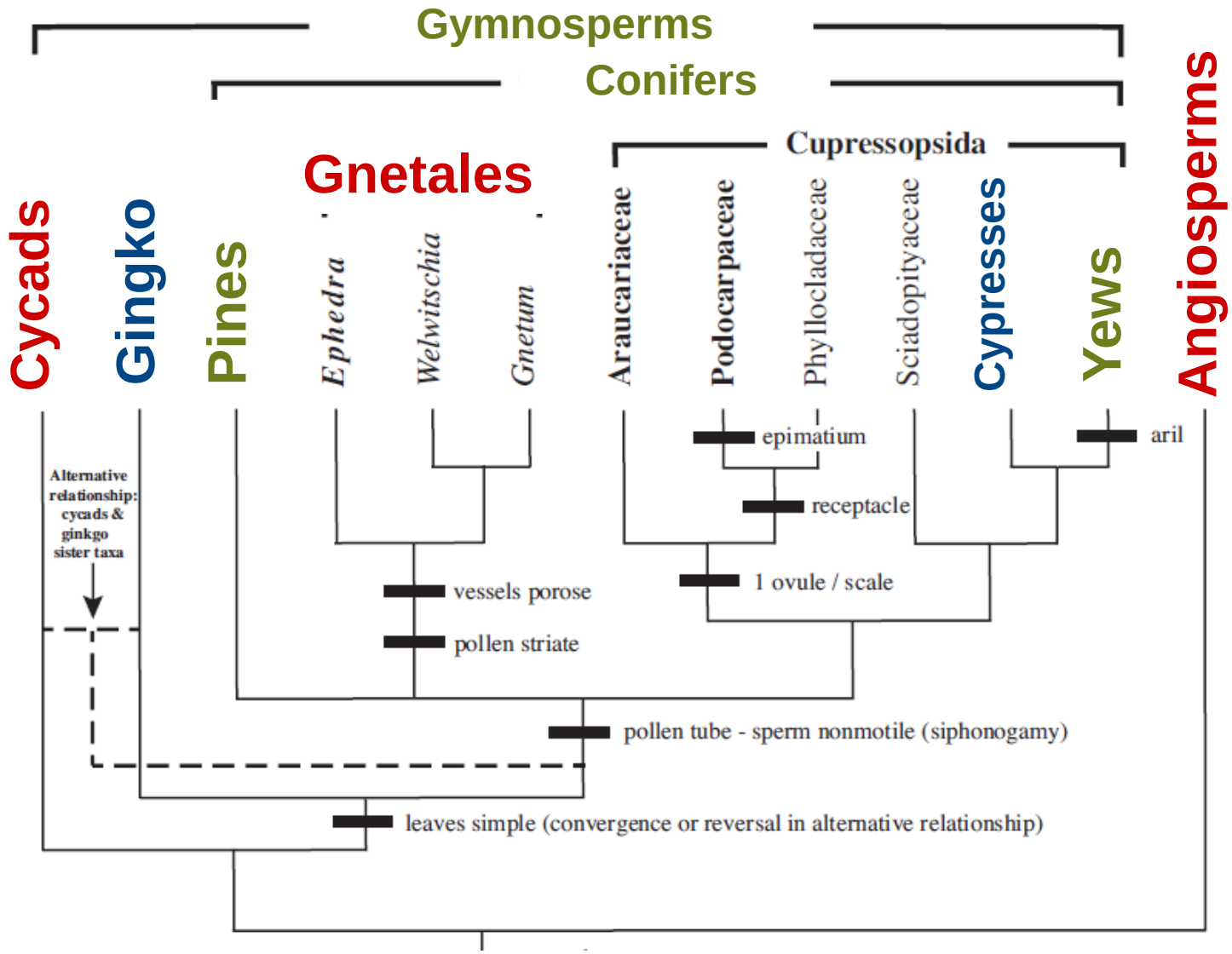
NC COOPERATIVE EXTENSION

Gymnosperm Phylogeny



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Cycads Non-native to NC

Sago Palm

Cycas revoluta

Coontie

Zamia floridana

Gnetales and *Gingko* Non-native to NC

Ephedra sinica

Welwitschia mirabilis

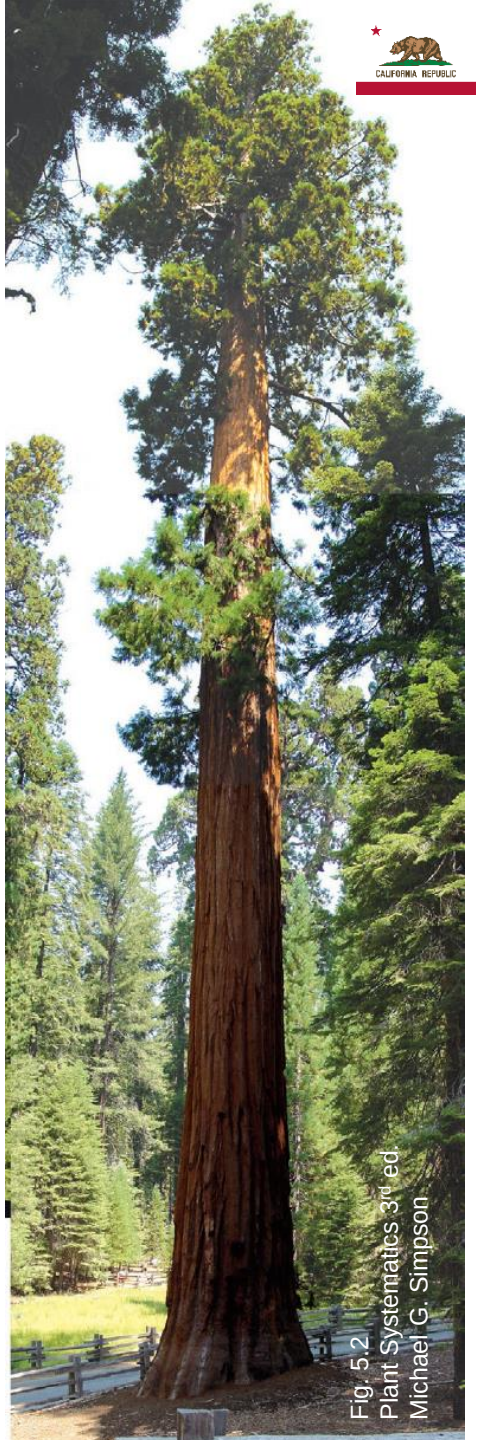
Gingko biloba

Gnetales

Cupressopsida Cypresses, Yews, etc.

150+ Species Worldwide

7_{ish} Species in NC

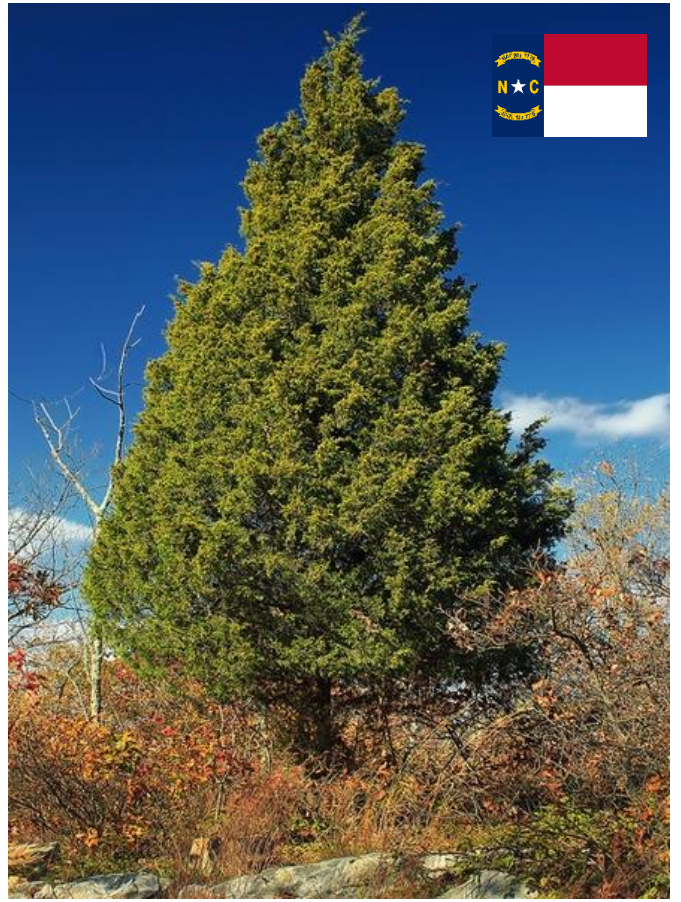


Giant Sequoia

Sequoiadendron giganteum

Bald Cypress

Taxodium distichum



Eastern Red Cedar

Juniperus virginiana

NC COOPERATIVE EXTENSION

Pinaceae Pines, Firs, Spruces, and Hemlocks

220+ Species Worldwide **15_{ish} Species in NC**

Longleaf Pine
Pinus palustris

Fraser Fir
Abies fraseri

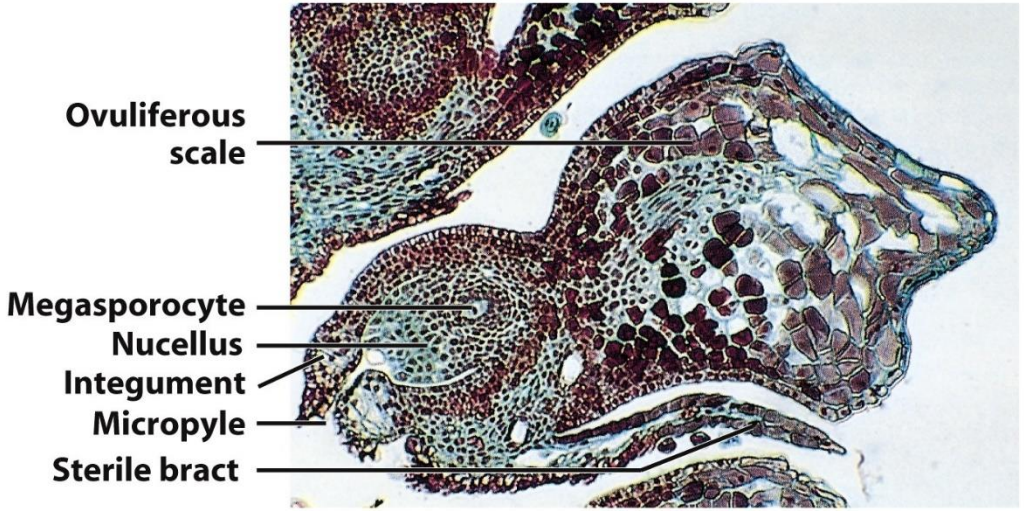
Eastern Hemlock
Tsuga canadensis

Red Spruce
Picea rubens

Gymnosperm Reproduction

Airborne pollen released by male cones

Pollen germinates on open female cone scales; fertilize eggs



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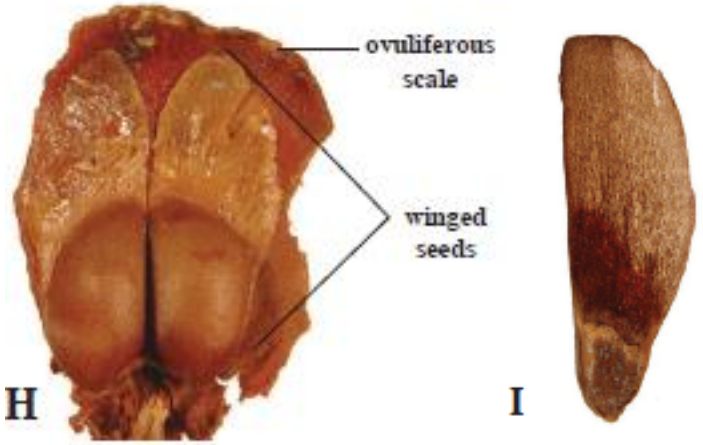
Seeds released from female cones



Conifer Functional Ecology

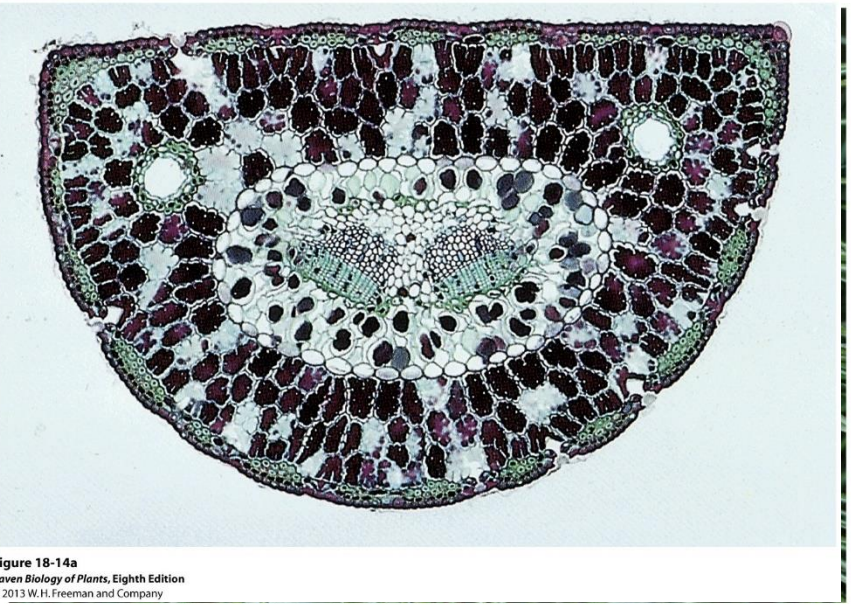


Figure 18-13a
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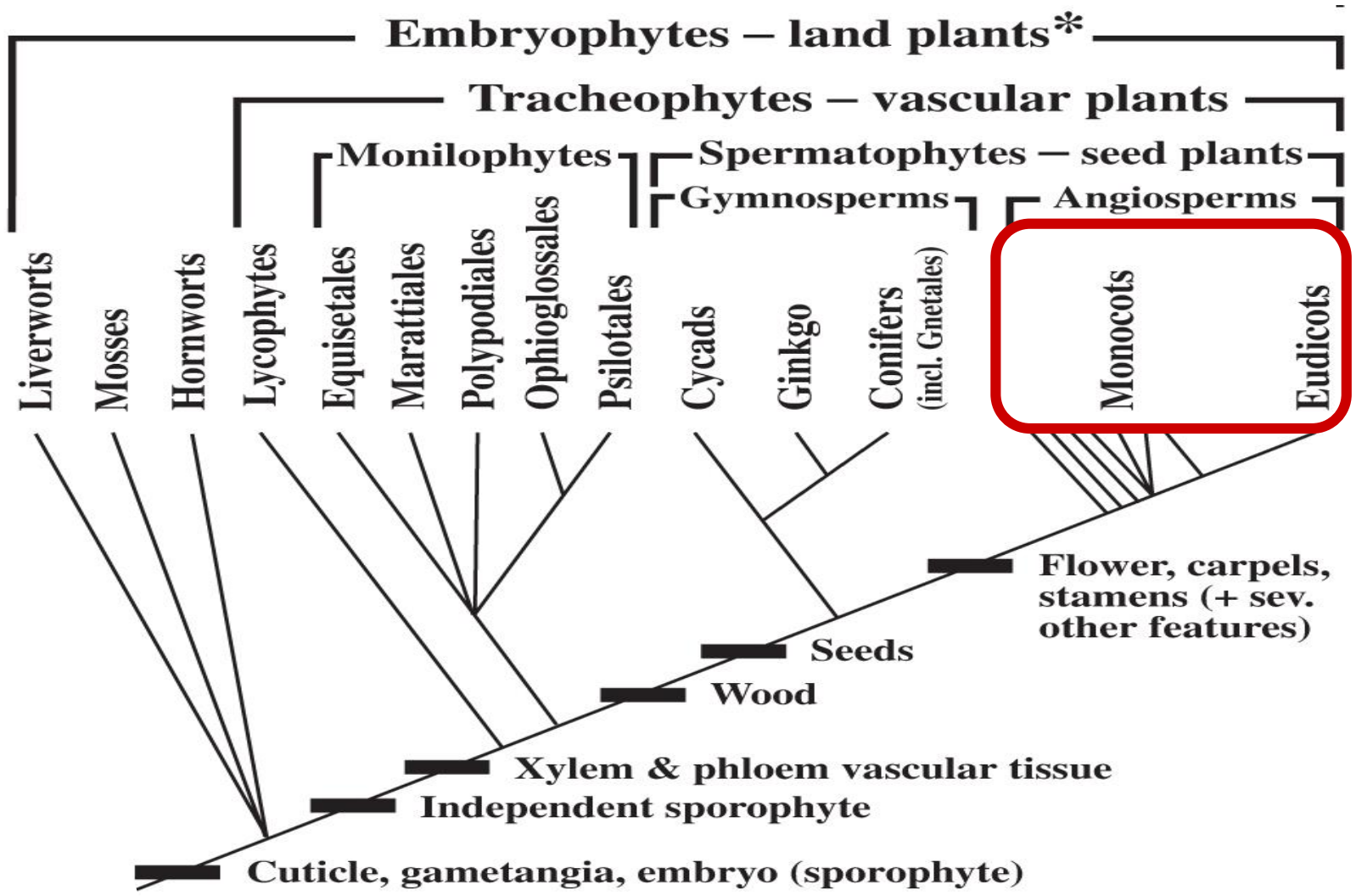
Leaves adapted to limit water loss

Adapted to fire-prone ecosystems

Needles accumulate less snow and ice

Angiosperms

Flowering Plants



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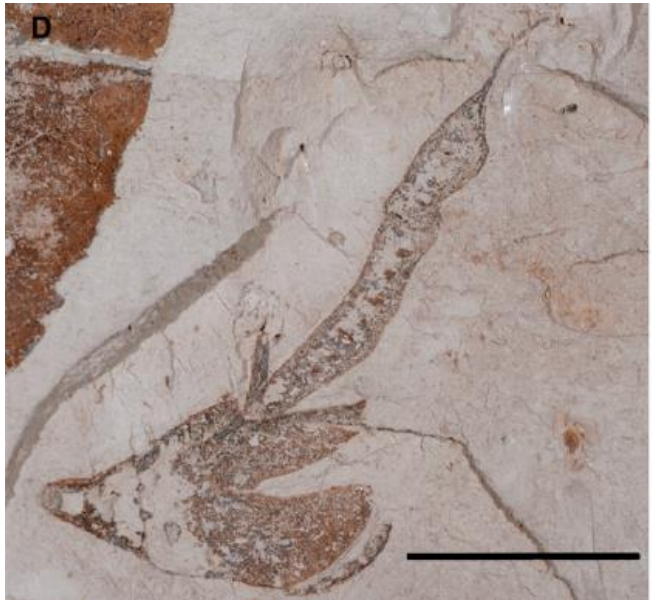
Angiosperm Evolution

- **Evolved 130 million years ago**
- **Rapid evolutionary radiation**



Crepet and Niklas (2009)
American Journal of Botany 96(1): 366-381

Figure 20-8a
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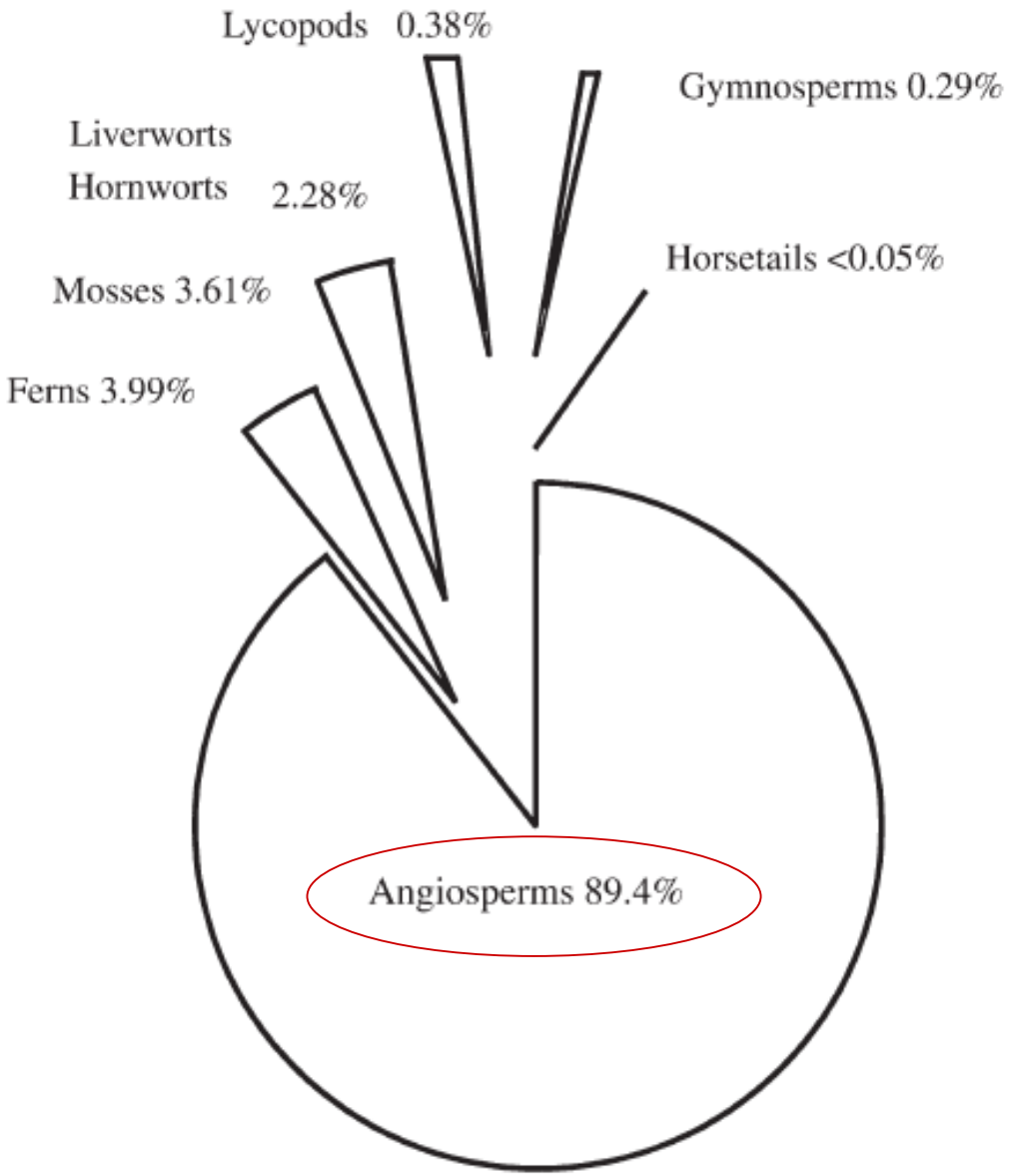
Angiosperm Diversity



- **250-300K species globally**
- **4700 in NC**

Crepet and Niklas (2009)
American Journal of Botany 96(1): 366-381

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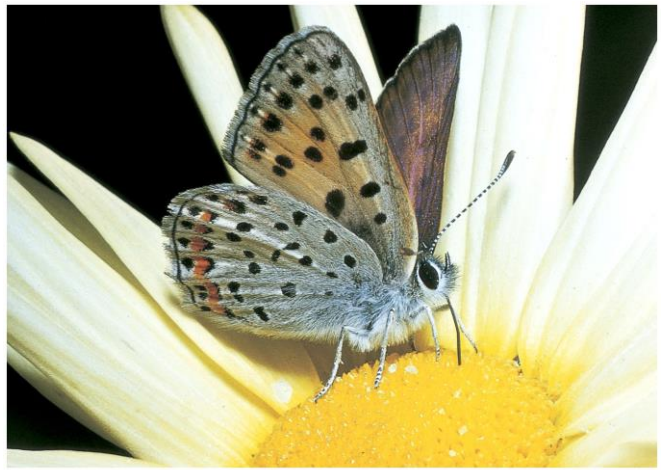
Why did Flowering Plants Conquer the World?

Flowers attract specific pollinators

Fruits aid in dispersal

Pollination Syndromes



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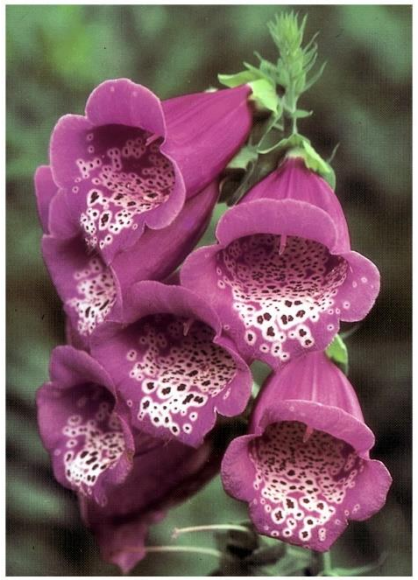

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Figure 20-16
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Figure 20-17
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Figure 20-12b
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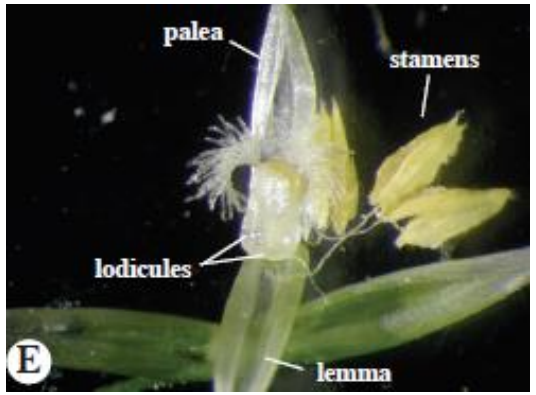

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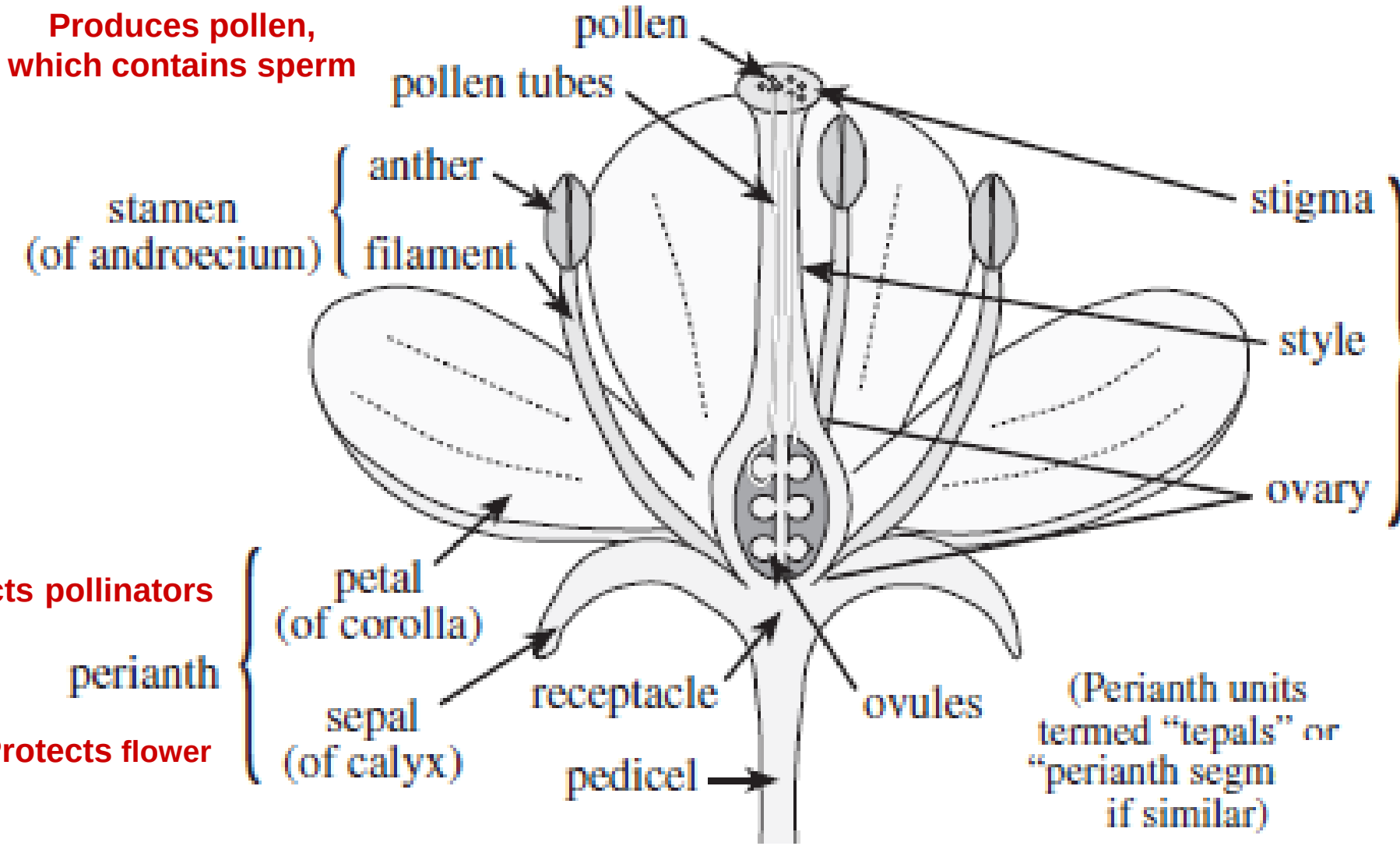
Raven *et al. Biology of Plants 7th ed.* 2005

Floral Morphology



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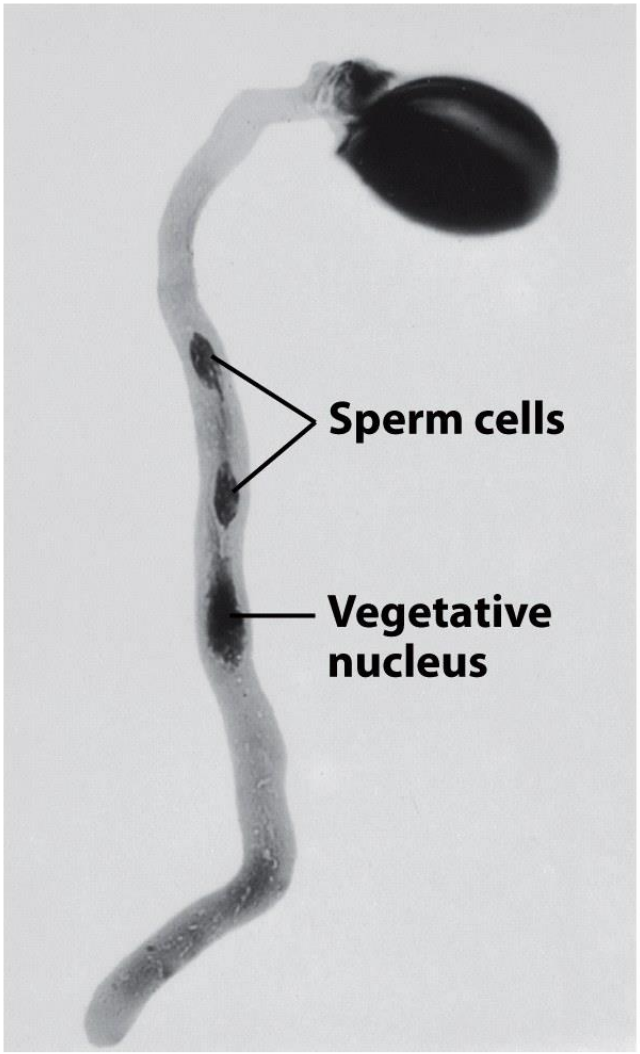
Pollination and Fertilization



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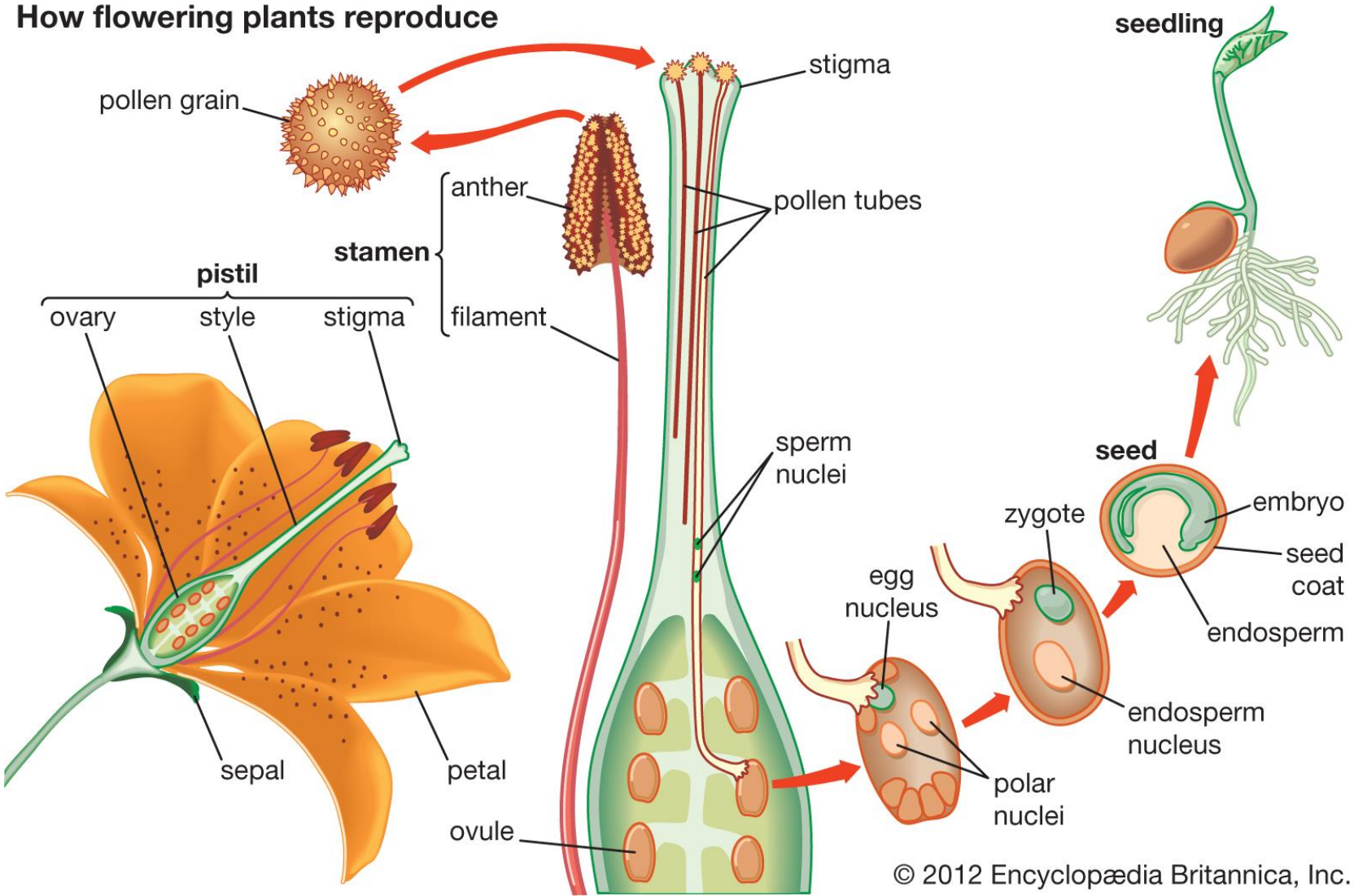
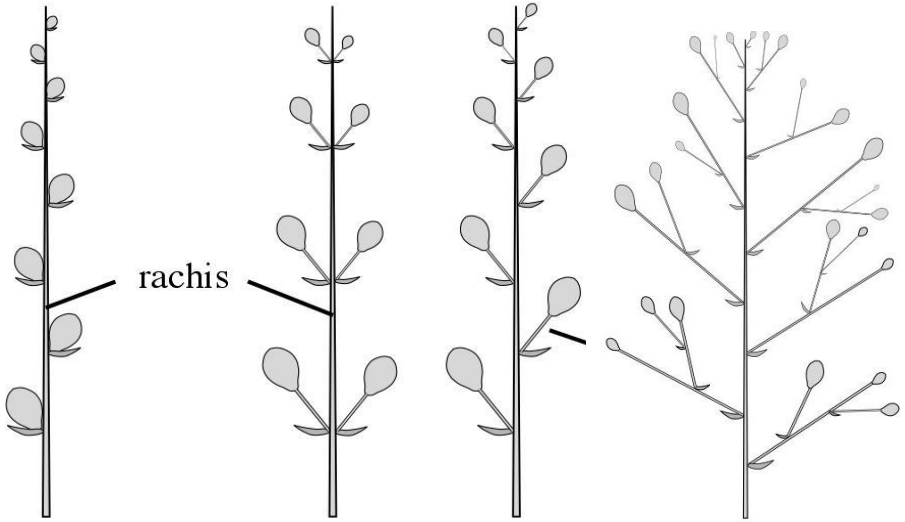
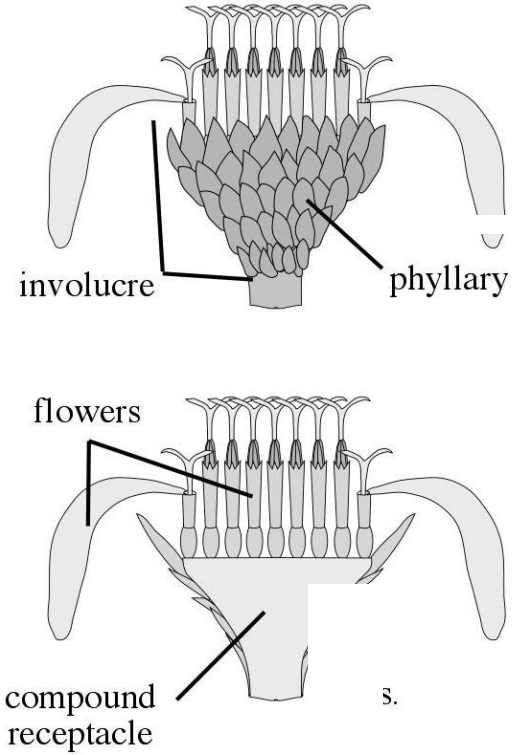
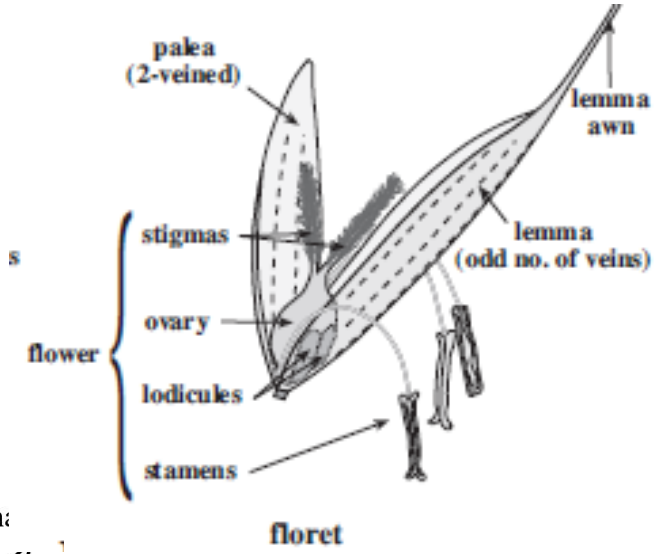


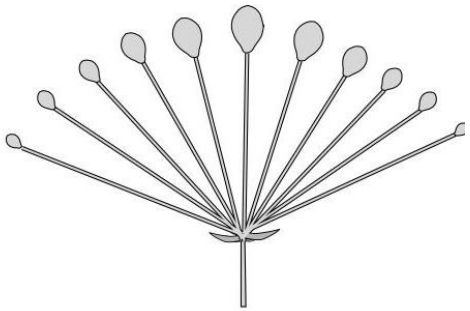
Simpson *Plant Systematics* 2006

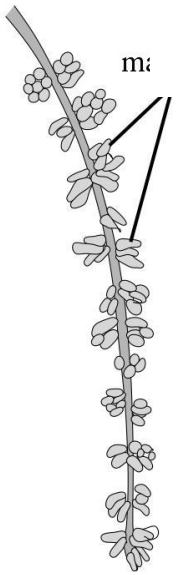
Inflorescences Groups of Flowers

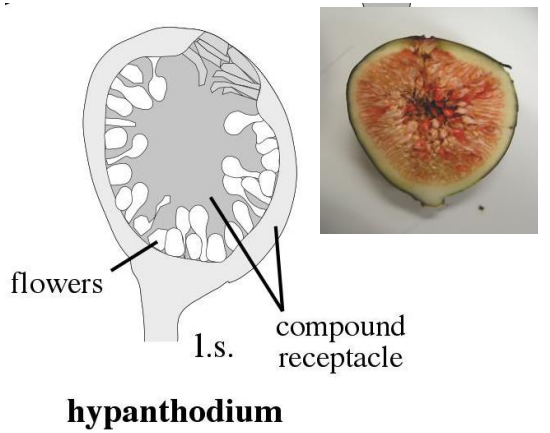












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Floral Sexual Diversity

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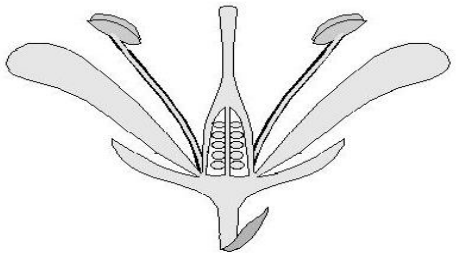
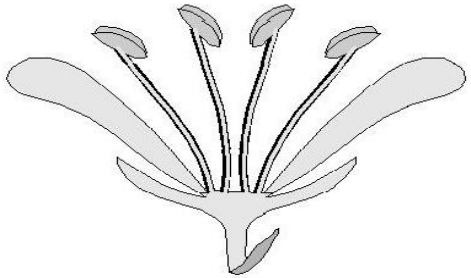
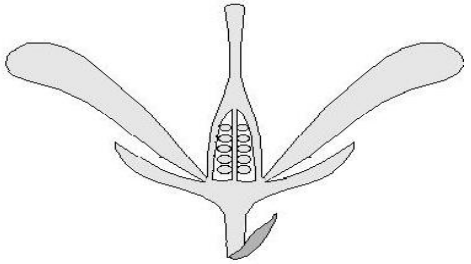


perfect/bisexual



staminate



pistillate

unisexual

♂

♀

- A flower is **perfect** if it is bisexual (has both stamens and pistils)
- A flower is **complete** if it has all four parts: (sepals, petals, stamens, & pistils).

Floral Sexual Diversity

Plants with unisexual flowers can be:

Monoecious

♂

♀

Pecan

Carya illinoensis

Separate male & female flowers

on the same plant

or*

Dioecious

♂

♀

American Holly

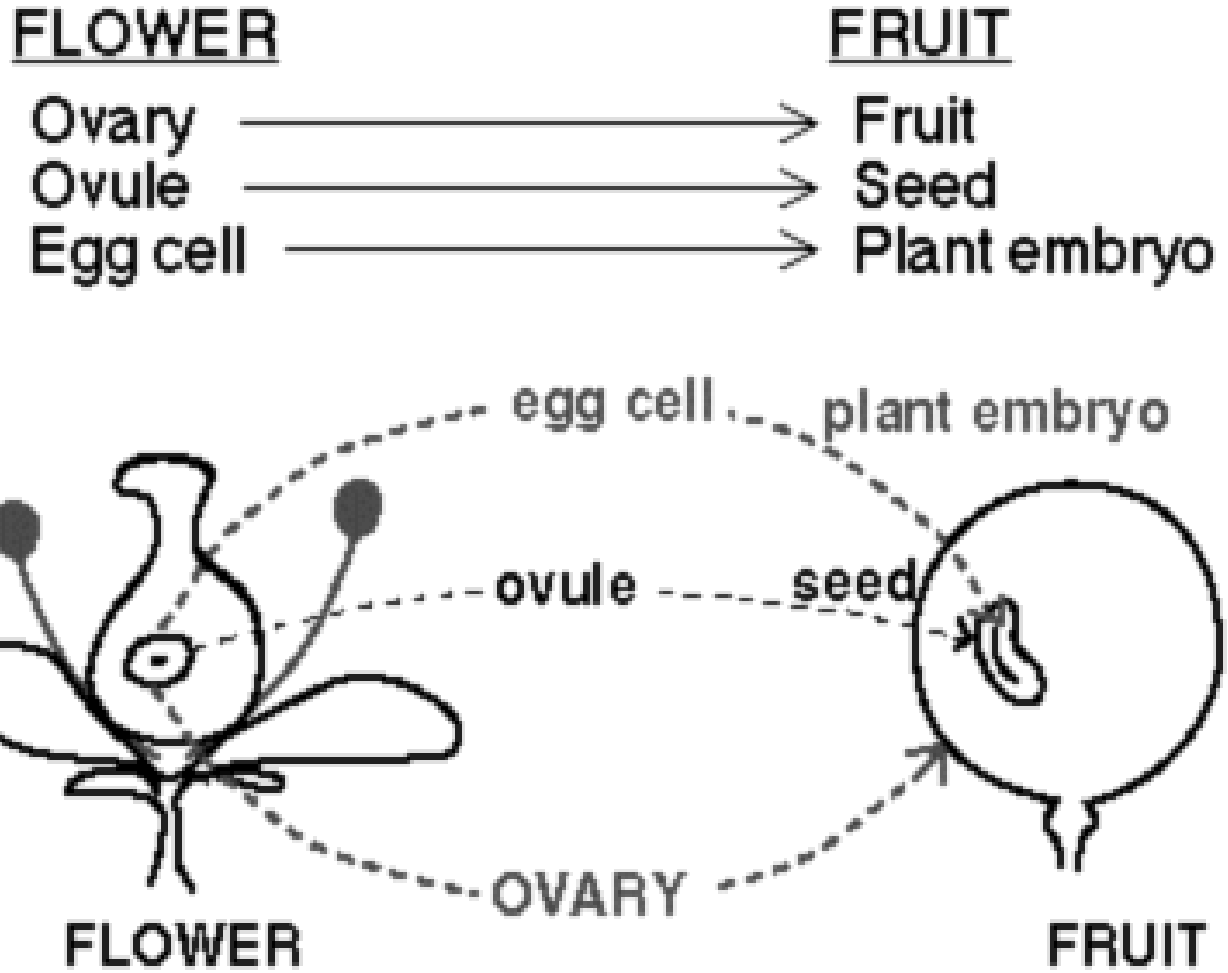
Ilex opaca

Separate male & female flowers

on separate male & female plants

sometimes *and

Fruit Set



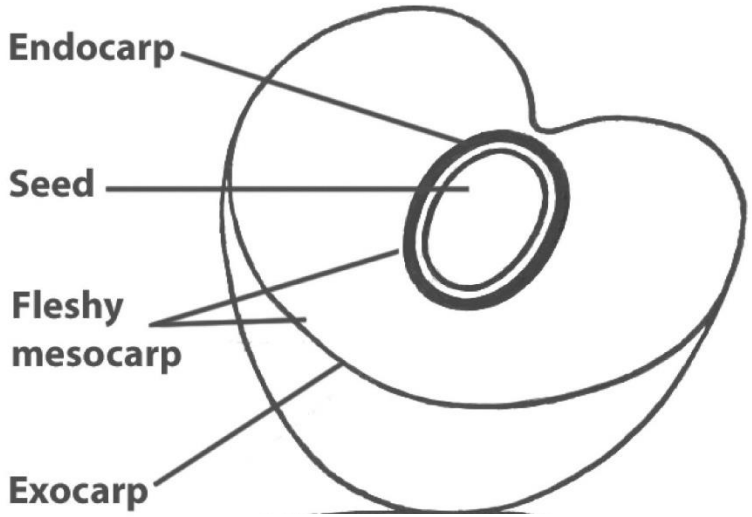


Figure 20-21b
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Figure 20-21a
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Priscilla Millen, Univ. of Hawaii

Fruit Dispersal

Figure 20-29b
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Exozoochory
Animal (External)

Endozoochory
Animal (Internall)

Figure 20-28b
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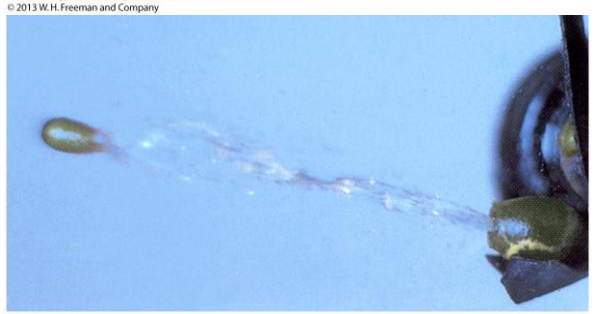

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Hydrochory
Water

Autochory
Self dispersal

Anemochory
Wind

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Fruit Classification

1) Number and fusion of flowers

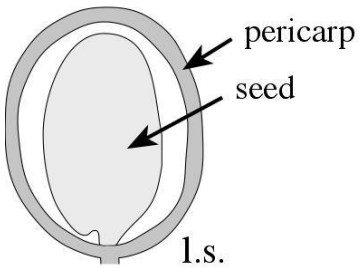
- **Simple fruits:** derived from one ovary of one flower
- **Aggregate fruits:** derived from many ovaries of one flower
- **Multiple fruit:** derived many ovaries from many flowers fused together

2) Dry or fleshy?

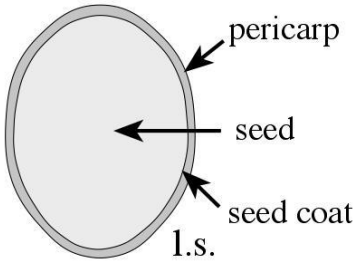
3) Split at maturity (dehiscent or indehiscent)?

4) Other features

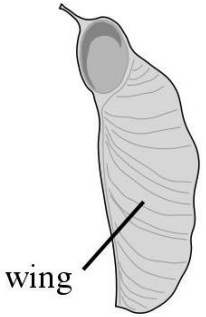
Simple, Dry, Indehiscent Fruits



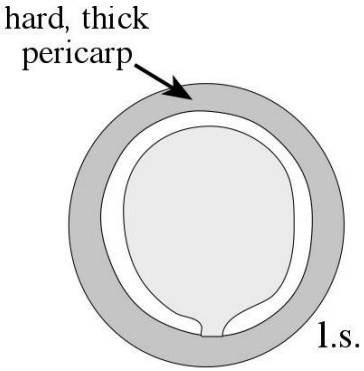
achene



grain / caryopsis



samara



nut

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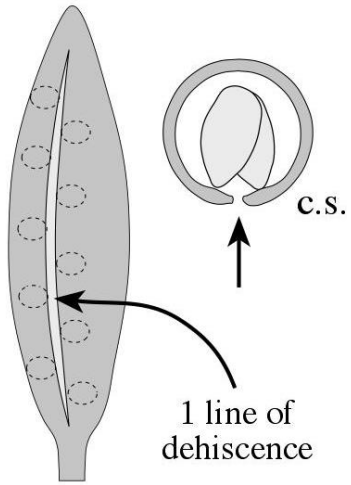
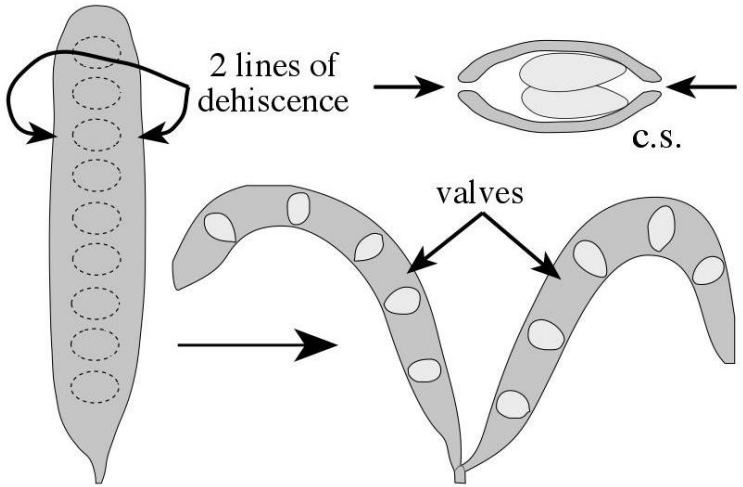
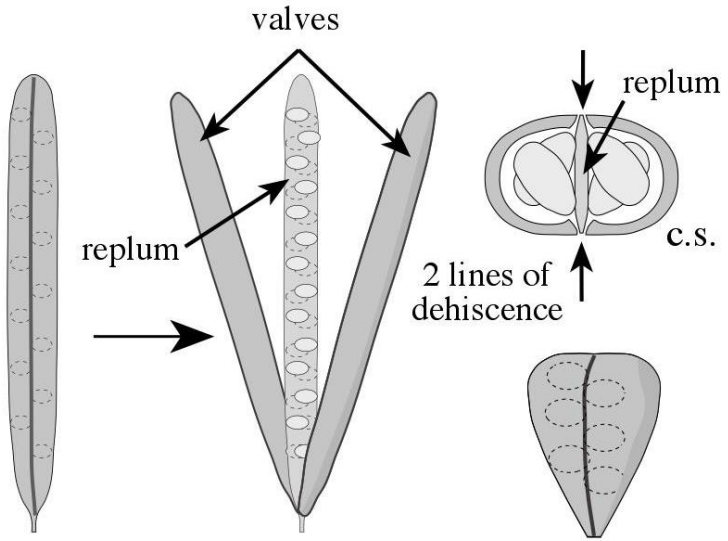
Simple, Dry, Dehiscent Fruits



follicle



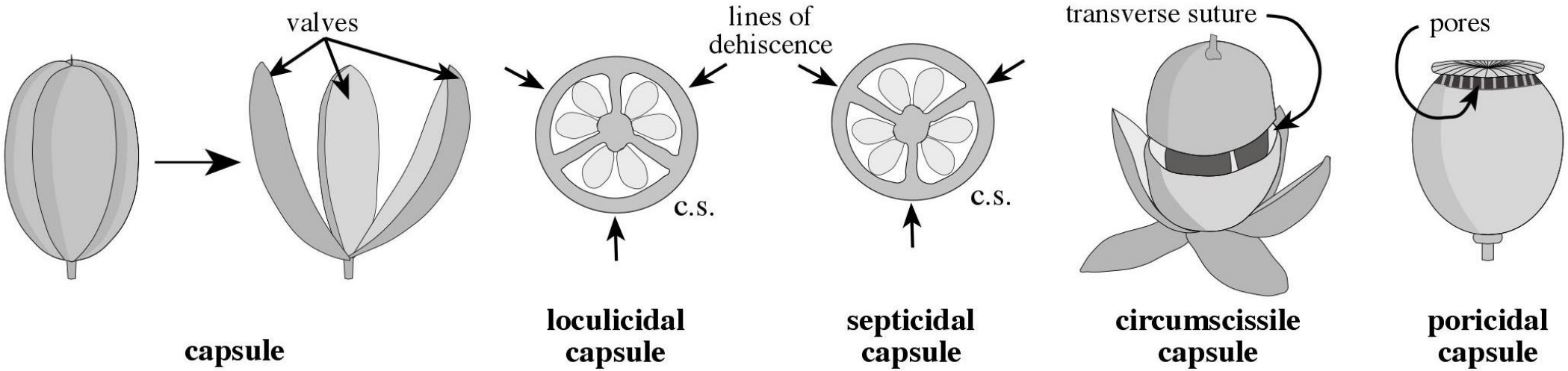
legume



silique

silicle

Simple, Dry, Dehiscent Fruits



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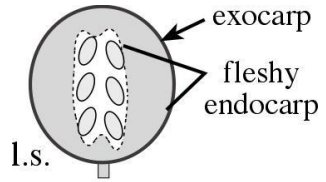
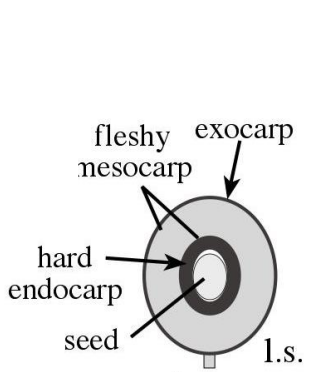
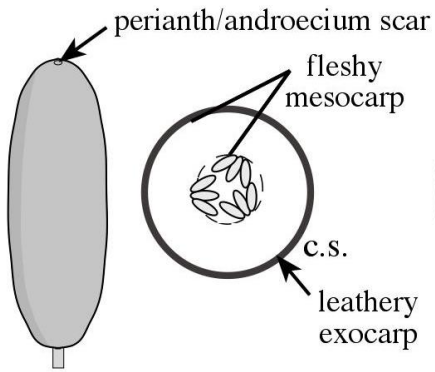
Simple, Fleshy Fruits



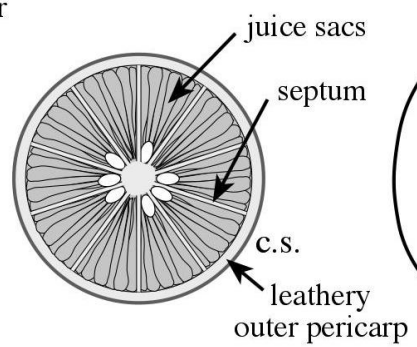
berry



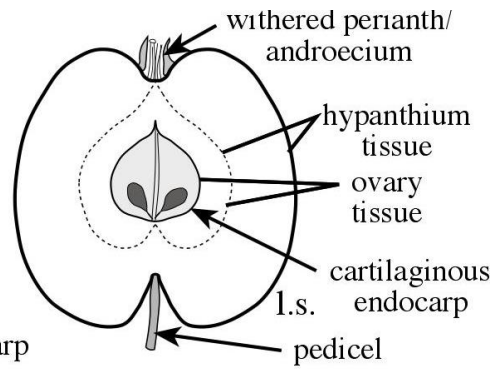
drupe



pepo



hesperidium



pome

Accessory Fruit

Simpson *Plant Systematics* 2006

Flowering Plant Diversity

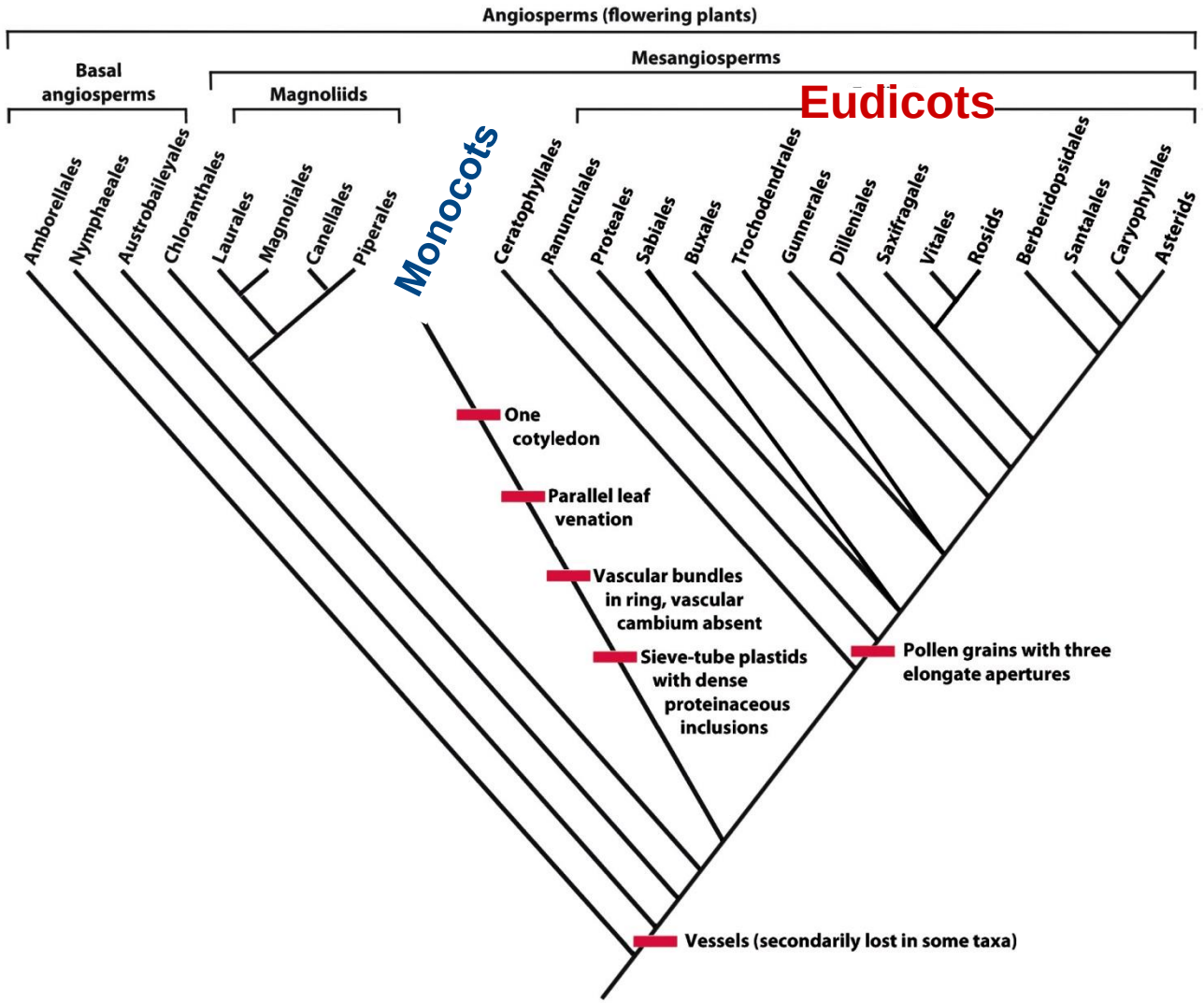


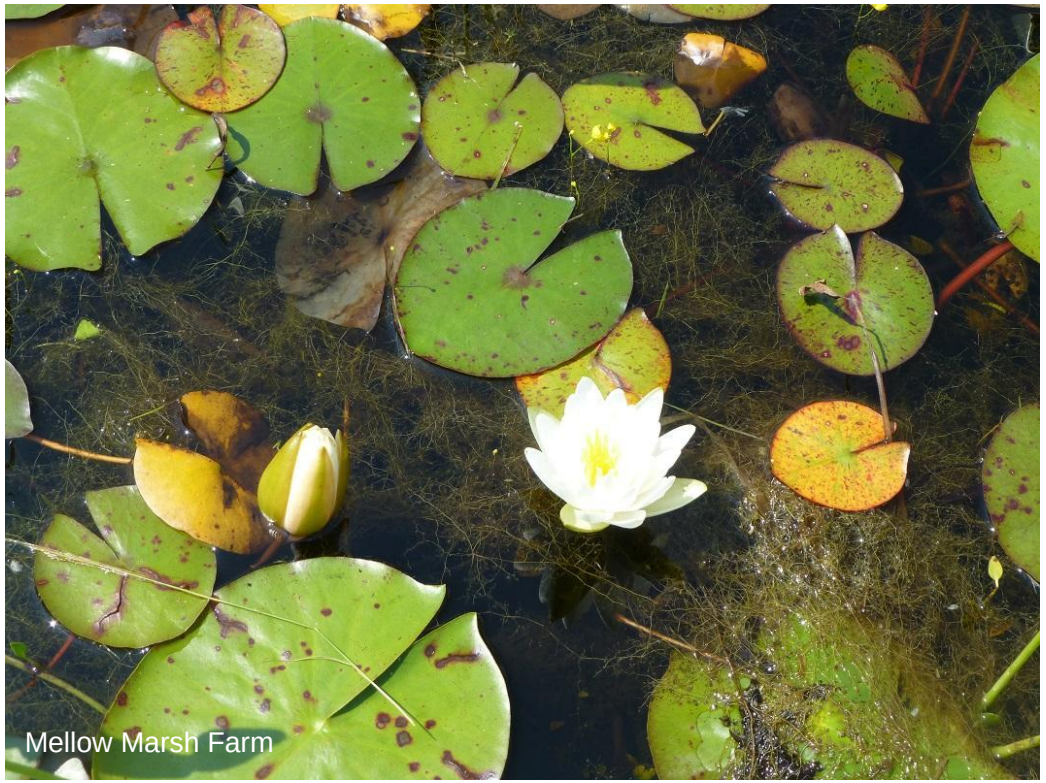
Figure 20-7
Raven Biology of Plants, Eighth Edition

Table 19-1 Main Differences between Monocots and Eudicots

Characteristic	Monocots	Eudicots
Flower parts	In threes (usually)	In fours or fives (usually)
Pollen	Monoaperturate (having one pore or furrow)	Triaperturate (having three pores or furrows)
Cotyledons	One	Two
Leaf venation	Usually parallel	Usually netlike
Primary vascular bundles in stem	Scattered arrangement	In a ring
True secondary growth, with vascular cambium	Rare	Commonly present

Table 19-1
***Raven Biology of Plants*, Eighth Edition**

Angiosperms Basal Angiosperms



American Waterlily

Nymphaea odorata (Nymphaeaceae)

Tulip Poplar

Liriodendron tulipfera (Magnoliaceae)

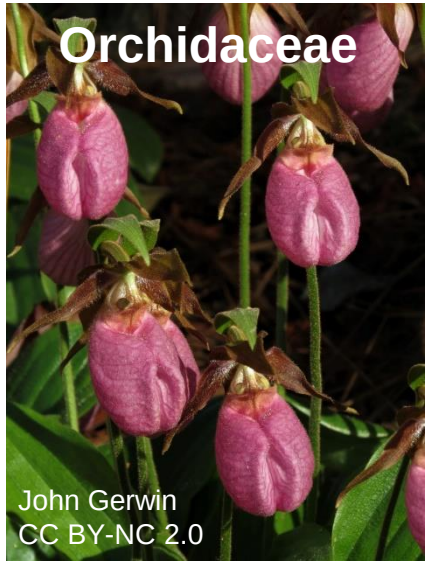
Northern Spicebush

Lindera benzoin (Lauraceae)

NC COOPERATIVE EXTENSION

Angiosperms Eudicots and Monocots

MONOCOTS

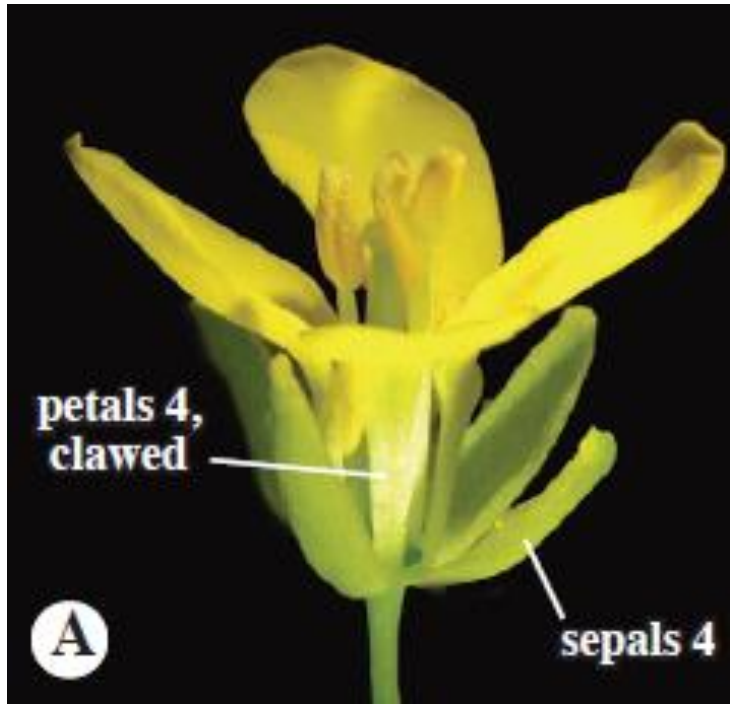


EUDICOTS

Major Plant Families

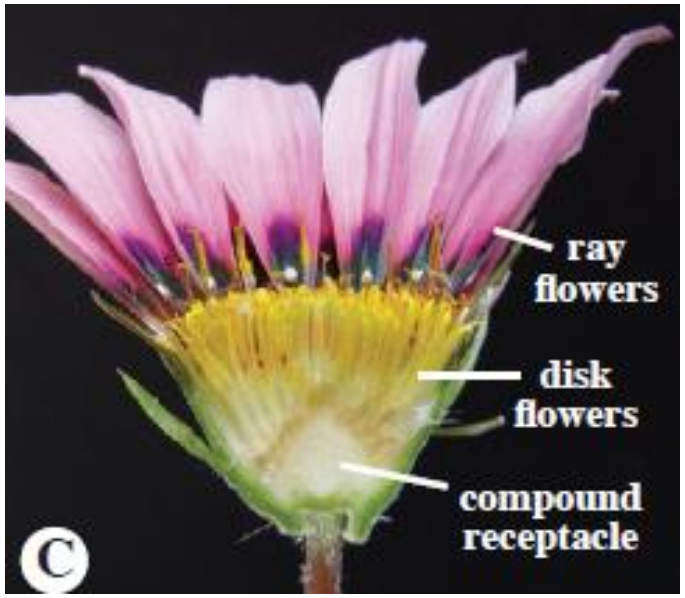
- **Apiaceae** (Queen Anne's Lace)
- **Asteraceae** (Asters)
- **Betulaceae** (Birches)
- **Brassicaceae** (Shepard's Purse)
- **Commelinaceae** (Spiderworts)
- **Cucurbitaceae** (Gourds)
- **Ericaceae** (Rhododendron)
- **Fabaceae** (Legumes)
- **Fagaceae** (Oaks, Beeches)
- **Iridaceae** (Irises)
- **Lamiaceae** (Henbit)
- **Liliaceae** (Lilies)
- **Oleaceae** (Ash, Privet)
- **Poaceae** (Grasses)
- **Polygonaceae** (Knotweeds)
- **Rosaceae** (Roses)
- **Solanaceae** (Nightshade)

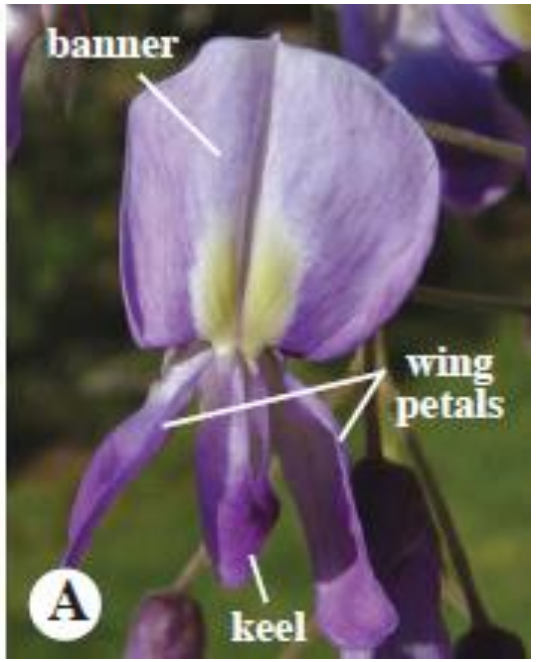
Different Families, Different Flowers



Asteraceae

20,000+ sps. globally
629 sps. in NC



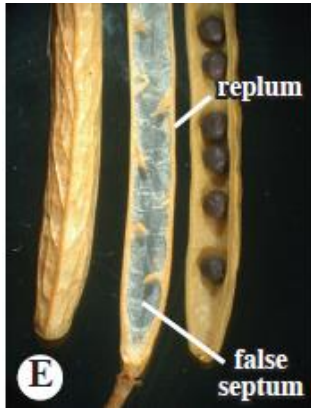


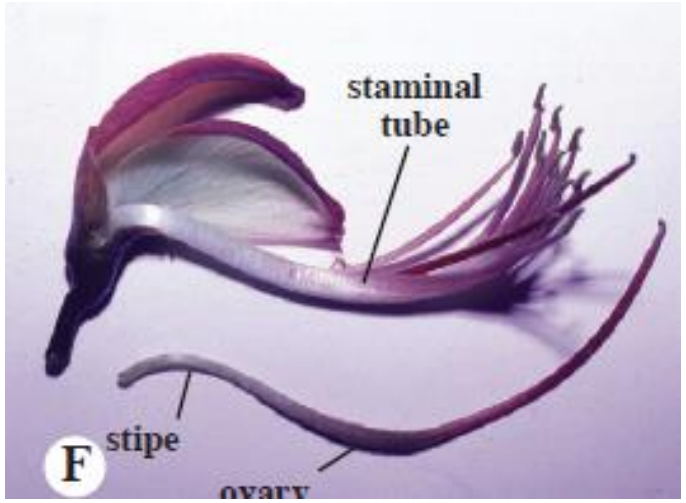
Fabaceae

20,000+ sps. globally
209 sps. in NC

Brassicaceae

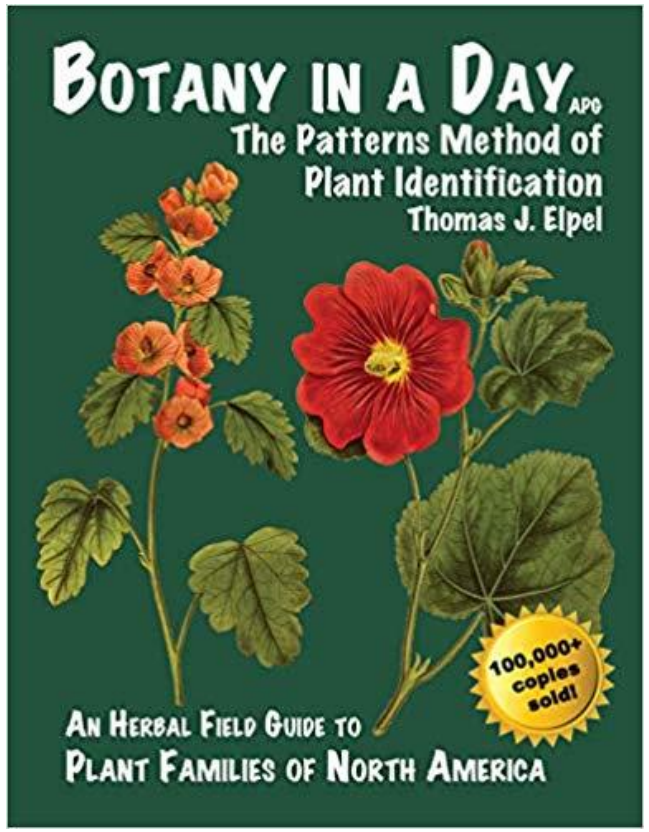
3400 sps. globally
93 sps. in NC





NC COOPERATIVE EXTENSION

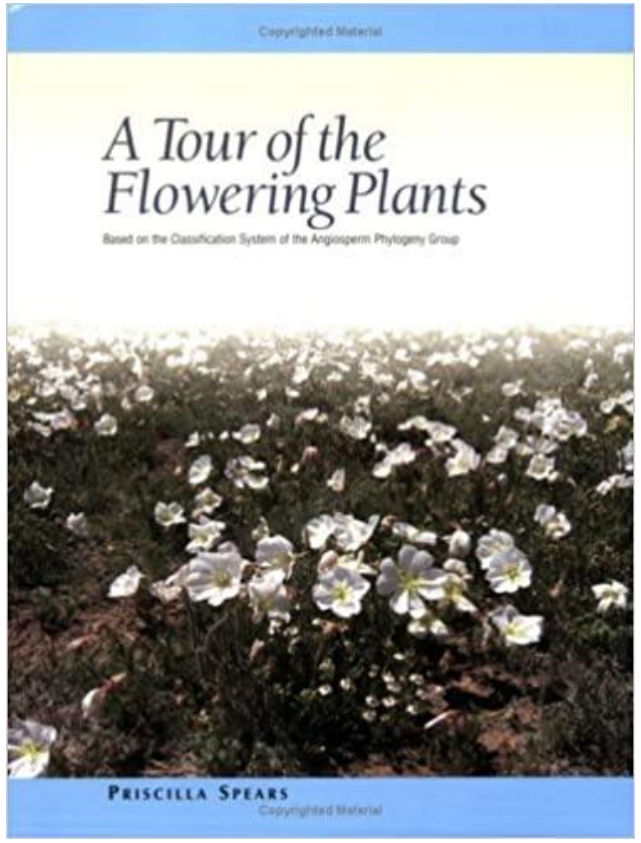
Learning Major Plant Families



Botany in a Day

HOPS Press

http://www.hopspress.com/Books/Botany_in_a_Day.htm



A Tour of the Flowering Plants

MBG Press

https://www.mbgpress.org/product-p/tour-of-flowering-plants.htm


Field identification of the 50 most common plant families in temperate regions

(including agricultural, horticultural, and wild species)

by Lena Struwe

struwe@aesop.rutgers.edu

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Note: Listed characteristics are the most common characteristics, there might be exceptions in rare species. This compendium is available for download without cost at http://www.sci.rutgers.edu/~struwe/ . Please send corrections and additions to the author.

Field ID of 50 Most Common…

Rutgers Univ. Extension - Free Online

http://www.sci.sdsu.edu/plants/plantsystematics/studentresources/Struwe_50MajorTempPlantFamilies2016.pdf

What's next?

Plant ID Techniques and Resources 9/25ish (pre-recorded)

- Understanding classification schemes
- Morphological features used for identification
- How to use dichotomous keys
- Free online tools and keys
- ID tips for different groups of plants
- Demonstration using a free, online key