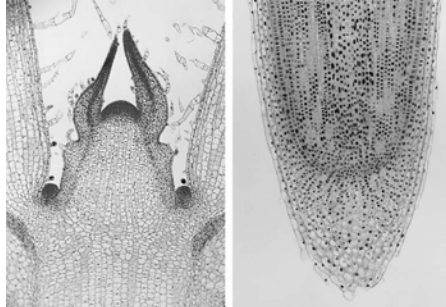


“Land” plants only

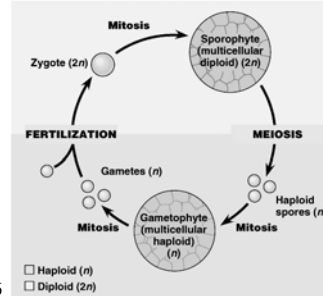
- Apical meristem



C&R 29.3

All “Land” plants (some but not all green algae)

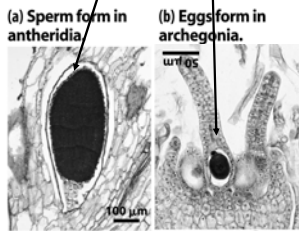
- Alternation of generations (sporic life cycle)



C&R 29.6

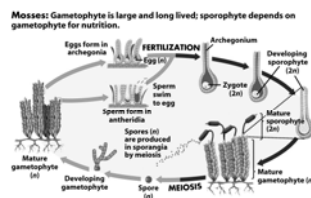
“Land” plants only

- Multicellular gametangia:
antheridia and archegonia



30.13

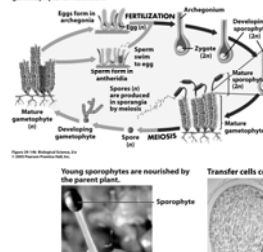
Moss life cycle



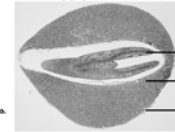
“Land” plants only

- Multicellular, dependent embryos → “Embryophytes”

Mosses: Gametophyte is large and long-lived; sporophyte depends on gametophyte for nutrition.

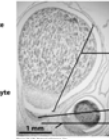


Seeds package an embryo with a food supply.



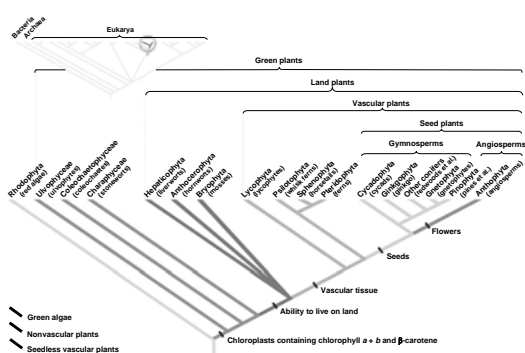
30.20

29.17a



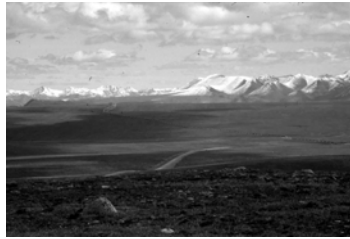
30.14

The Phylogeny of Green Plants



D. Problems of land life: Adaptations for living in air

Bryophyte ecology: a. Groundcover and epiphytes



Groundcover



Epiphytes

Bryophyte ecology: b. Global carbon cycle

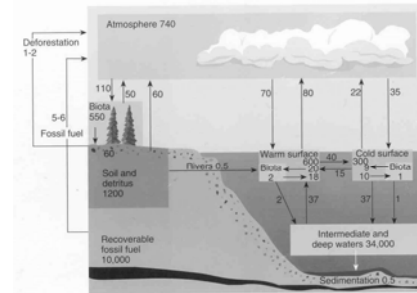
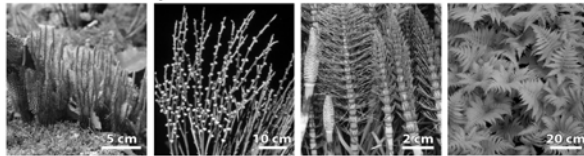


Figure 12.7 Global compartments of CO₂. (Edmonds 1992:14.)

B. Seedless vascular plants (Pteridophytes)

Seedless vascular plants have vascular tissue but do not make seeds.



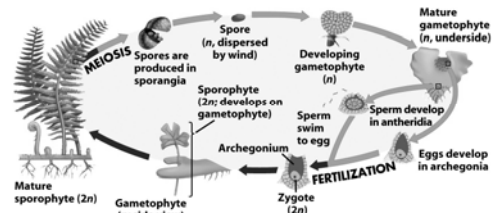
Lycophytes Whisk ferns Horsetails Ferns
Figure 29-7c. Biological Science, 2/e
© 2005 Pearson Prentice Hall, Inc.

Lycophyta - "club mosses"
Psilotophyta
Sphenophyta
Pterophyta

What's new?

1. Vascular tissue, true leaves, true roots
2. Sporophyte dominant

Ferns: Sporophyte is large and long lived but, when young, depends on gametophyte for nutrition.

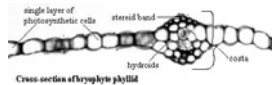


30.17b

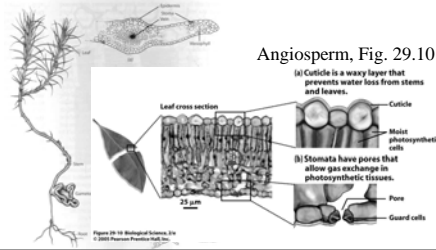
Figure 29-14c. Biological Science, 2/e
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Other SVP developments: true leaves

Moss phyllids



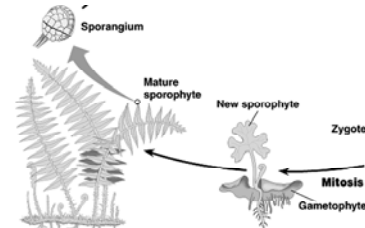
http://www.palaeos.com/Plants/Bryophyta/Bryophyta.html



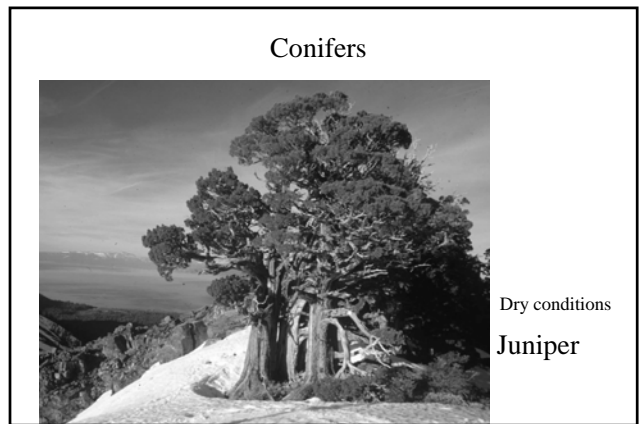
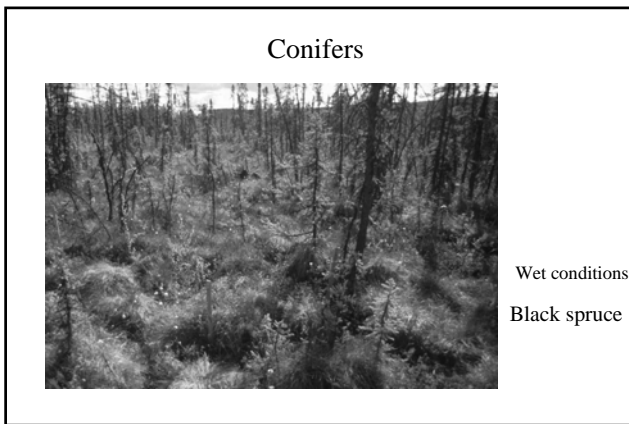
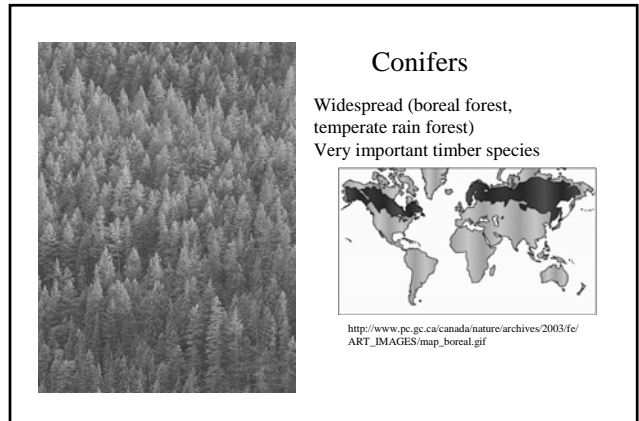
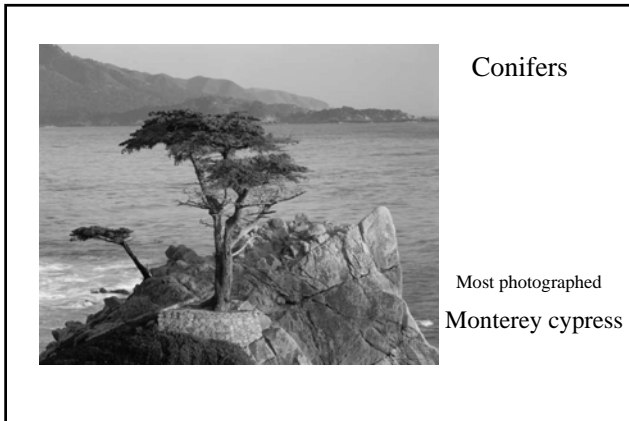
Club moss, REE Fig. 19-3

Figure 29-10 Biological Science, 2/e
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Other SVP developments: true roots

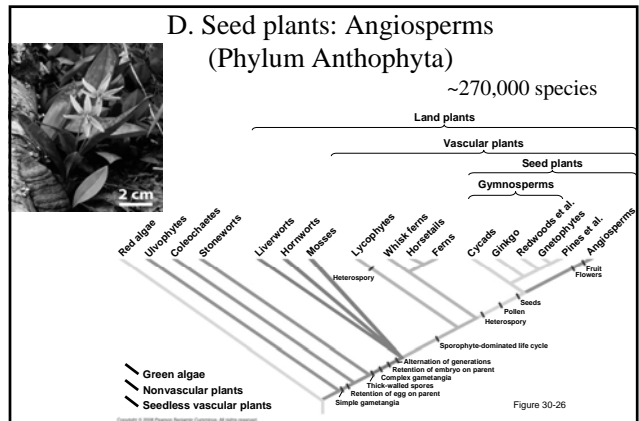


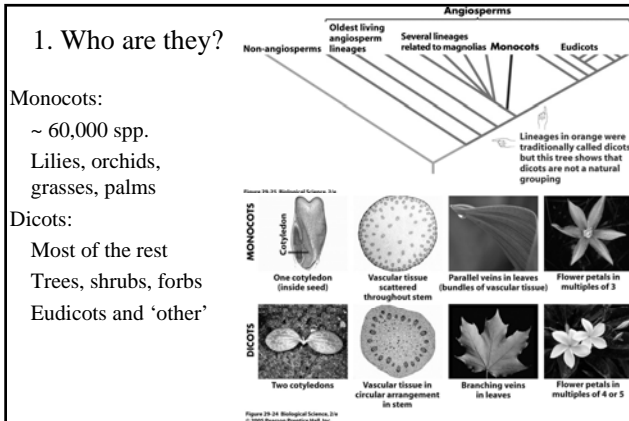
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3. What's new?

- a. Secondary growth
- b. Continued g'phyte reduction
- c. Pollen and heterospory
- d. Seeds





Monocots:
~ 60,000 spp.
Lilies, orchids,
grasses, palms

Dicots:
Most of the rest
Trees, shrubs, forbs
Eudicots and 'other'

2. Why are they important?

- Most diverse phylum, huge radiation
- Base of many terrestrial food webs
- Basis of agriculture
Fruits
Vegetables
Grains
- Secondary compounds – drugs, medicines

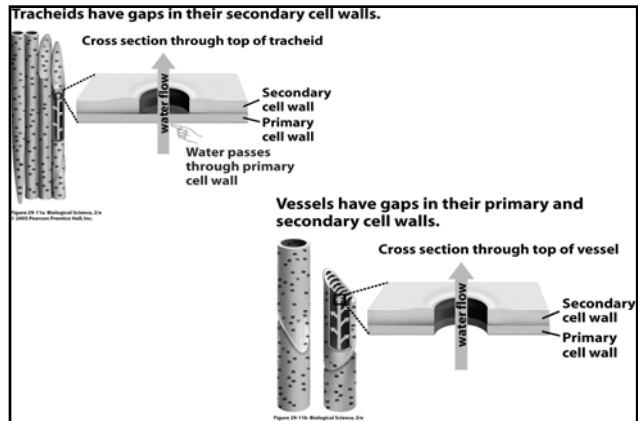
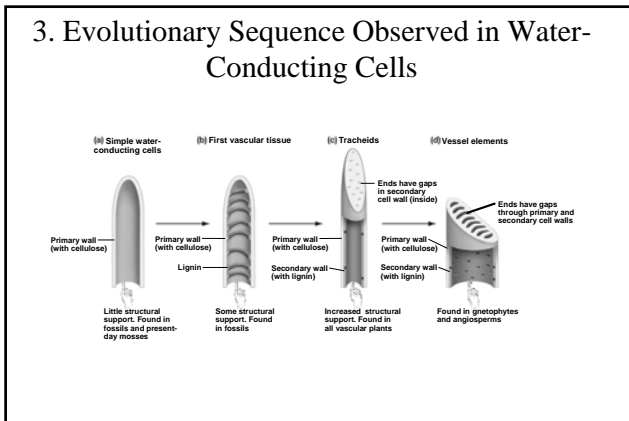
III. Major Evolutionary Trends

- Structure: Vascular tissue, leaves, & roots
- Reproduction: Fertilization without water: pollen
- Reproduction: Dispersal of progeny: from spores to bare seeds to seeds in fruits
- Life cycles → reduction of gametophyte, dominance of sporophyte

A. What is “vascular tissue” and what does it do?

- Xylem**
 - water and nutrients up from roots to stem, leaves: one way
 - hollow
 - dead at maturity
 - secondary cell walls, lignin
- Phloem**
 - photosynthate from leaves to roots, shoots, meristems
 - living at maturity
 - no secondary cell walls

Figure 29.11 Biological Sciences, 3/e © 2007 Pearson Education, Inc. and W. H. Freeman & Co.



4. Secondary growth

- In Gymnosperms
- (lateral meristem - draw)

B. Fertilization without water 1. pollen and heterospory

Conifers: Sporophyte is dominant; gametophyte depends on sporophyte for nutrition.

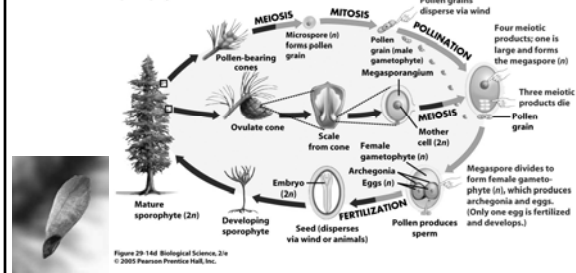


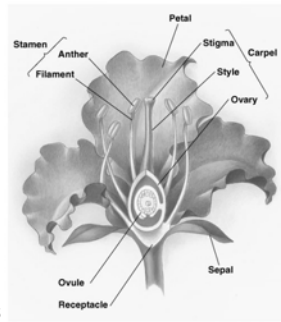
Figure 29-14d Biological Science, 2/e
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Conifer life cycle

29.14d

2. Flowers - more efficient fertilization (pollination)

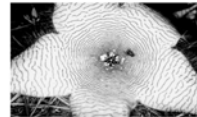
Stamen = microsporangia
Ovule = megasporangium plus integuments
Carpel = stigma + style + ovary
Petals and sepals = modified leaves, attract pollinators



C&R, 30.13

Co-evolution with animals

(a) Carrion flowers smell like rotting flesh and attract carrion flies.



(b) Hummingbird-pollinated flowers are red and have long tubes with nectar at the base.



(c) Bumble-bee-pollinated flowers are often bright purple.

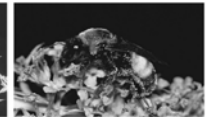


Figure 29-20 Biological Science, 2/e
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Many crops depend on natural pollinators



US Postal Service

http://www.berkeley.edu/news/media/releases/2006/10/25_pollinator.shtml

(a) Horseflies have a short proboscis and pollinate short-spurred orchids.



(b) Tanglewing flies have a long proboscis and pollinate long-spurred orchids.

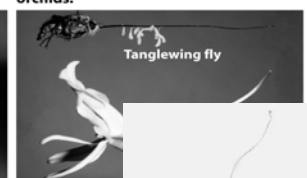


Figure 29-21 Biological Science, 2/e
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Darwin's Hawk Moth

<http://www.pbs.org/wnet/nature/bestofnature/video.html>

http://encarta.msn.com/media_461530192_761578331_1_1/Darwin's_Hawk_Moth.html



C. New mode of dispersing progeny

1. Seeds

Conifers: Sporophyte is dominant; gametophyte depends on sporophyte for nutrition.

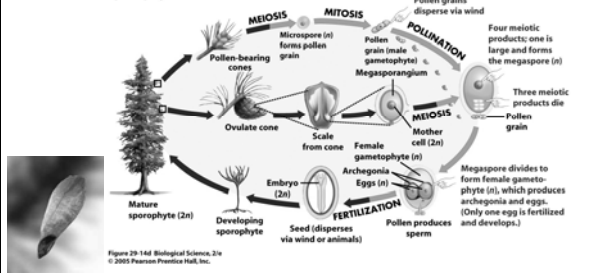
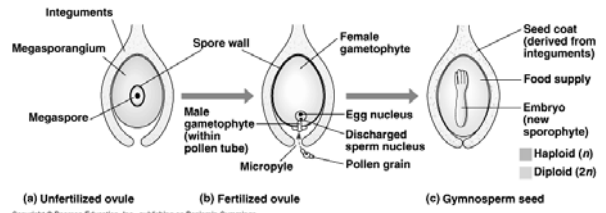


Figure 29-14d Biological Science, 2/e © 2005 Pearson Education, Inc.

Conifer life cycle

29.14d

Seed formation

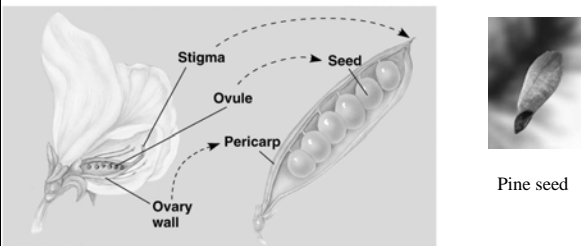


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C&R, Fig. 30.2

Incorrect color in "c" - should be blue for food supply, which is haploid (megagametophyte).

2. Fruits - more efficient dispersal

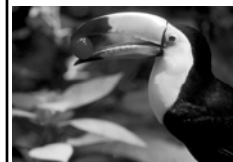


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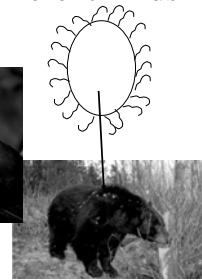
C&R, 30.15

Pine seed

Fruits - different kinds



Animal dispersed - eaten



Animal dispersed - riding



Wind-dispersed



Water-dispersed

Coevolution with animals
30.20, 30.25

3. Angiosperm life cycle

Angiosperms: Similar to gymnosperms, but ovules and seeds form in enclosures called ovaries.

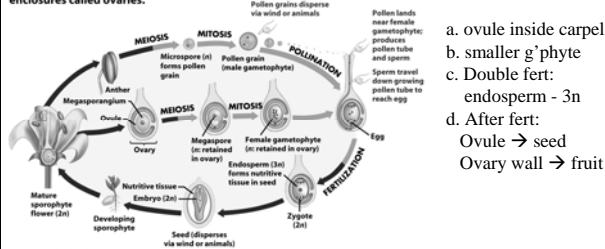


Figure 29-14e Biological Science, 2/e © 2005 Pearson Education, Inc.

- a. ovule inside carpel
- b. smaller g'phyte
- c. Double fert: endosperm - 3n
- d. After fert: Ovule → seed
Ovary wall → fruit

2. Bryophyte life cycle and structure

Mosses: Gametophyte is large and long lived; sporophyte depends on gametophyte for nutrition.

- 1. G'phyte vs. s'phyte
- 2. Archegonia and antheridia
- 3. Water for fert.
- 4. Embryo on g'phyte
- 5. Spores for dispersal
- 6. Roots and leaves?

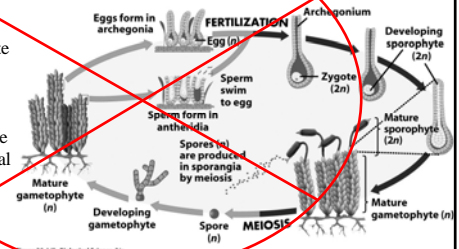


Figure 29-14b Biological Science, 2/e © 2005 Pearson Education, Inc.

Fig. 30.17a