Objectives (lecture and lab):
1) Understand the evolutionary novelties of the most successful land plants
2) Learn the basic characteristic of Pine leaves
3) Be able to distinguish the major groups of conifers
4) Link the life cycle of a pine to moss life cycles

Seed Plants
- Over 275,000 species
- Have vascular bundles and leaves with branched veins
- Seeds—An embryo surrounded by nutritive tissue and enveloped by a seed coat.
  The nutritive tissue is the female gametophyte!

Q: How might seeds evolved from a species resembling a fern?

Nabors Fig. 22.3

Q: What are the advantages of having a seed?

Stem Structure
- Vascular bundles in the stem occur in a ring (at least ancestrally)
- Vascular cambium

Q: In what ways does a vascular cambium help to make this group of organisms so successful?

Pine Leaves
  Pine leaves (needle) last 3-30 years.
  They are long and tubular
  Typical Anatomical Features
  1) They have sunken stomata
  2) There are no intercellular spaces
  3) The vascular bundle is centralized
  4) There is thick cuticle
  5) Large resin ducts are found in the mesophyll
  6) There is a large fiber layer below the epidermis

Fig. 22.6

Q: How do these characteristics help to make conifers successful in habitats where there are periods when soil water is scarce?

Homework: Learn the life cycle of a typical pine (see p. 417). Compare and contrast with other life cycles we have discussed. Where does the seed fit in?