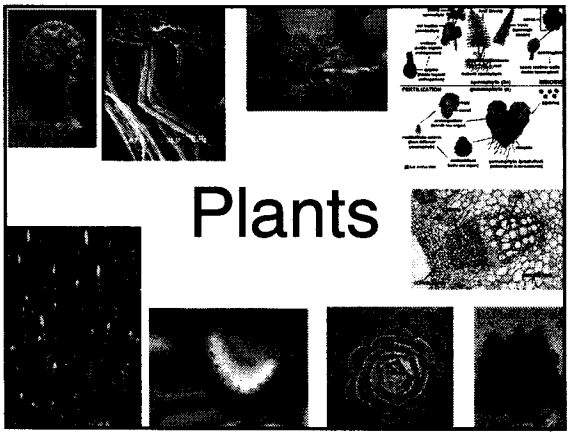
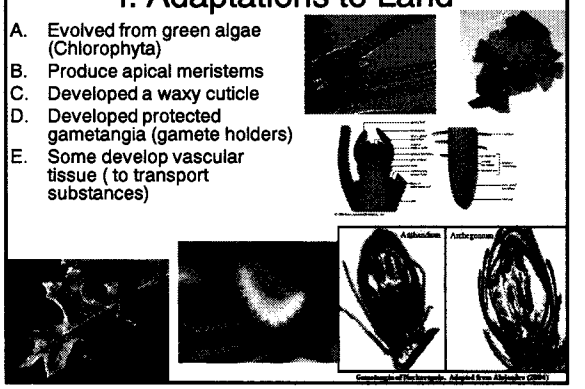


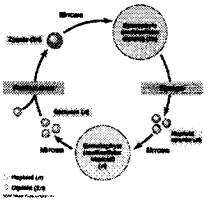
I. Adaptations to Land

A. Evolved from green algae (Chlorophyta)
B. Produce apical meristems
C. Developed a waxy cuticle
D. Developed protected gametangia (gamete holders)
E. Some develop vascular tissue (to transport substances)



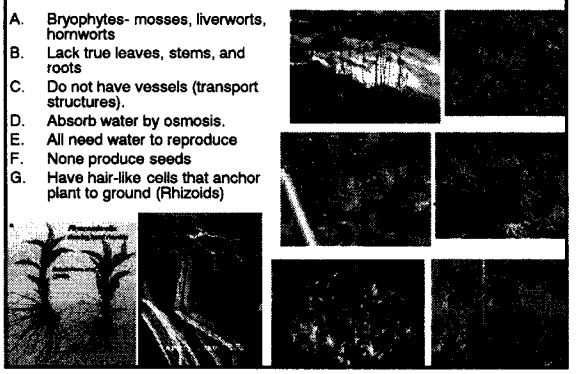
I. Adaptations to Land

E. All reproduce by Alteration of Generations
1. Haploid (1N) gametophyte produces gametes.
2. Gametes fuse to form diploid (2N) zygote.
3. Zygote divides many times to form diploid sporophyte.
4. Sporophyte forms a sporangium that produces haploid (1N) spores.
5. Cycle starts again



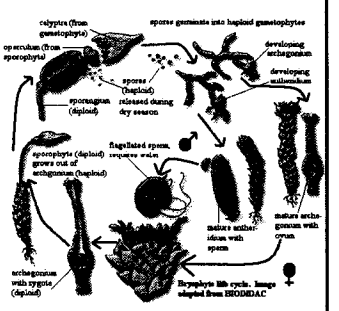
II. Nonvascular Plants

A. Bryophytes- mosses, liverworts, hornworts
B. Lack true leaves, stems, and roots
C. Do not have vessels (transport structures).
D. Absorb water by osmosis.
E. All need water to reproduce
F. None produce seeds
G. Have hair-like cells that anchor plant to ground (Rhizoids)



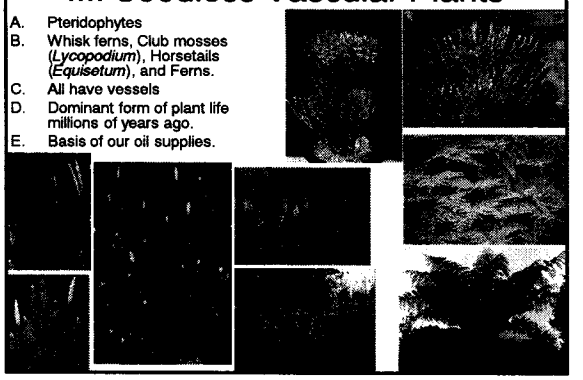
II. Nonvascular Plants

I. Life Cycle
1. Gametophyte
a) Dominant stage.
b) Structures include spores, protonema, antheridium, and archegonium, sperm.
2. Sporophyte- Structures include the zygote, capsule, and stalk.



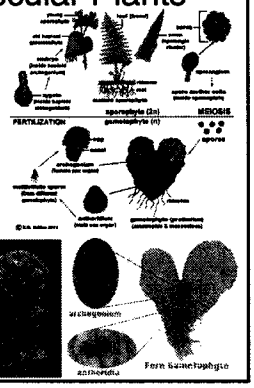
III. Seedless Vascular Plants

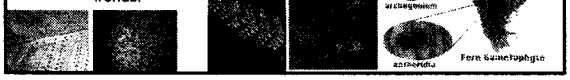
A. Pteridophytes
B. Whisk ferns, Club mosses (*Lycopodium*), Horsetails (*Equisetum*), and Ferns.
C. All have vessels
D. Dominant form of plant life millions of years ago.
E. Basis of our oil supplies.



III. Seedless Vascular Plants

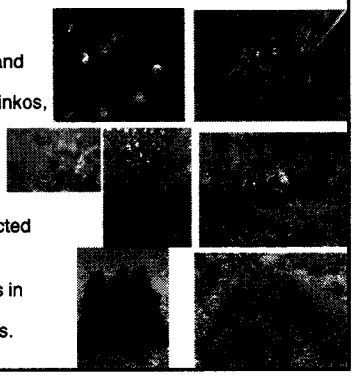
E. Life cycle of a Fern
   1. Gametophyte
      a) Small and heart-shaped.
      b) Structures include spores, rootlike rhizoids, antheridium, archegonium, and sperm.
   2. Sporophyte
      a) Dominant generation.
      b) Structures include the zygote, rhizome (underground stem), fiddlehead, sori, and fronds.





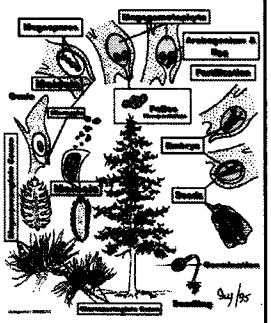
IV. Vascular Seed Plants

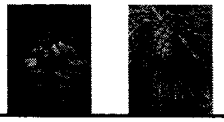
A. Gymnosperms
   1. From the greek *gymnos* (naked) and *sperma* (seed).
   2. Include cycads, ginkos, gnetophytes, and conifers.
   3. All have vascular tissue.
   4. All have seeds
   5. Seed is not protected by a fruit.
   6. No Flowers
   7. Some have seeds in cones.
   8. About 700 species.



IV. Vascular Seed Plants

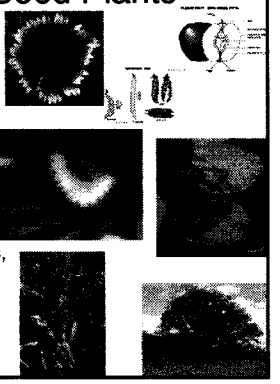
9. Life Cycle of a Conifer
   a) Sporophyte
      1) Dominant generation (the tree).
      2) Structures include male cone, female cone, microsporangium, megasporangium, seed, and zygote.
   b) Gametophyte- Structures include megaspores, spores, pollen, and eggs.





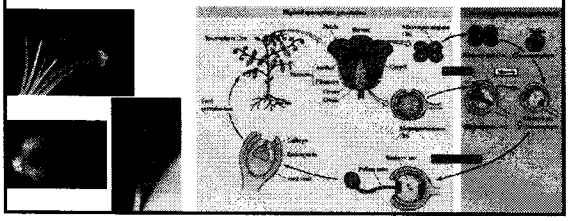
IV. Vascular Seed Plants

B. Angiosperms
   1. From the greek angion (closed container) and sperma (seed).
   2. All produce seeds within a fruit.
   3. About 275,000 species.
   4. All are flowering plants.
   5. Have highly efficient vascular systems.
   6. Evolved with insects.
   7. Includes corn, wheat, grass, oaks, cacti, and most food crops.



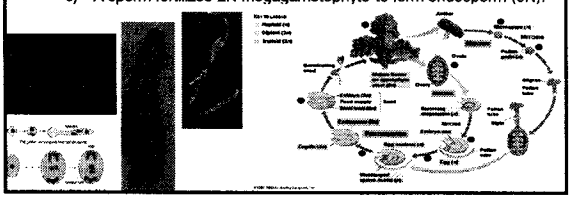
V. Life Cycle of Angiosperms

A. Sporophyte
   1. Dominant generation (tree, plant body)
   2. Flower
      a) Structures include sepals, and petals.
      b) Male structures include anther, filament, stamen, and microsporangium.
      c) Female structures include stigma, style, ovary, carpal (pistil), ovules, and megasporangium.



V. Life Cycle of Angiosperms

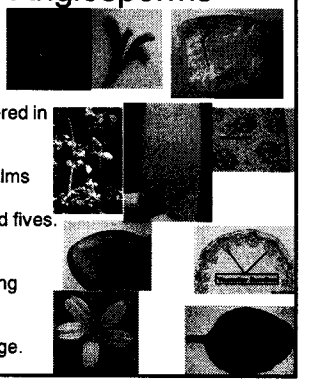
B. Gametophyte
   1. Male structures: microspores, pollen grain, tube cell, generative cell (divides into 2 sperm)
   2. Female structures: megaspore, megagametophyte (embryo sac), egg.
   3. Double fertilization
      a) Unique to angiosperms.
      b) A sperm fertilizes 1N megaspore to form a zygote.
      c) A sperm fertilizes 2N megagametophyte to form endosperm (3N).



VI. Types of Angiosperms

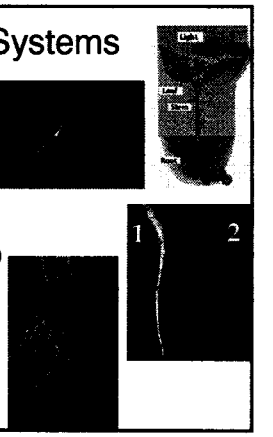
A. Monocots
   1. Flower parts in threes.
   2. One (Mono) seed leaf (cotyledon).
   3. Vascular bundles scattered in stem.
   4. Veins run parallel
   5. Grass, corn, orchids, palms

B. Dicots
   1. Flower parts in fours and fives.
   2. Two (Di) seed leaves (cotyledon)
   3. Vascular bundles in a ring inside stem.
   4. Veins are branched.
   5. Oak, rose, bean, cabbage.



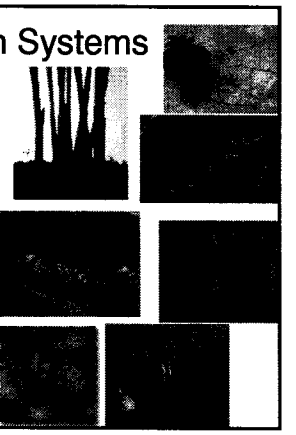
VII. Organ Systems

A. Root system
   1. Functions
      a) Anchor plants
      b) Absorbs and conducts water and nutrients
      c) Stores food
   2. Two types
      a) Taproot (some are modified for food storage)
      b) Fibrous roots



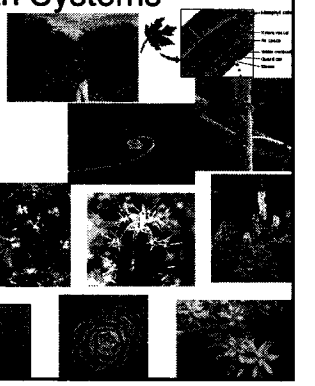
VII. Organ Systems

B. Shoot System
   1. Stems- some are specialized for food and water storage.
      a) Stolons- horizontal stems above ground (runners)
      b) Rhizomes- horizontal stems below ground (some end in tubers that store food)
      c) Bulbs- vertical underground shoots modified for food storage.



VII. Organ Systems

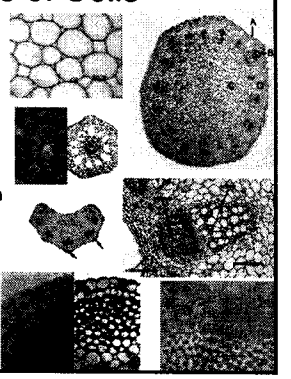
2. Leaves- main photosynthetic organ, some have specialized functions.
   a) Tendrils- modified leaflets that cling to supports.
   b) Spines- protection
   c) Modified for storing water in succulents.
   d) Attract pollinators.



VIII. Types of Cells

A. Parenchyma
   1. least specialized
   2. primary walls are thin and flexible
   3. synthesize and store organic products

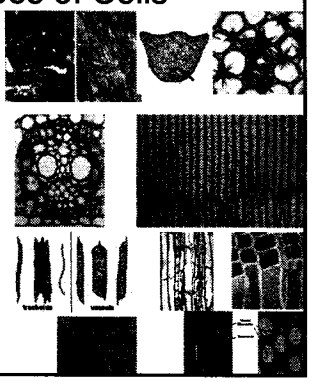
B. Collenchyma
   1. lack secondary walls
   2. primary wall is thicker than parenchyma but uneven.
   3. grouped in strands or cylinders for support.
   4. elongate as stem and leaf grows.



VIII. Types of Cells

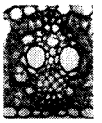
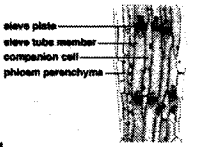
C. Sclerenchyma
   1. Function in support
   2. rigid, thick secondary walls containing lignin.

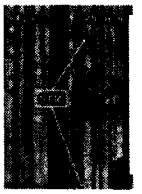
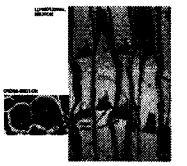
D. Xylem
   1. Water conducting cells
   2. Dead at maturity
   3. Tracheids
      a) Long, thin tapered cells with pits.
      b) Lignin in walls provide support
   4. Vessel Elements- wider, shorter, thinner, with perforated ends



VIII. Types of Cells

E. Phloem
1. Conduct food
2. Alive at maturity
3. Sieve-tube members have sieve plates at ends
4. Companion cells


IX. Tissue Systems

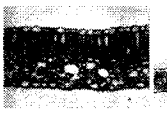
A. Dermal
1. Single-layer of tightly packed cells.
2. Functions in protection
3. Root hairs are extensions
4. Waxy cuticle is secreted from leaves and stems.

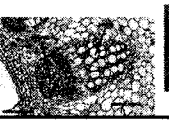
B. Vascular- Xylem and Phloem

C. Ground
1. Mainly parenchyma
2. Fills in space between dermal and vascular tissue.
3. Functions in photosynthesis, storage, and growth.





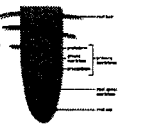



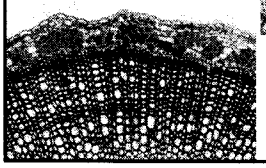
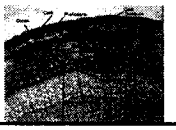




X. Meristems

A. Apical Meristems
1. Elongate plants
2. Provide primary growth

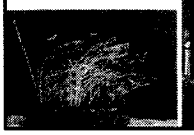
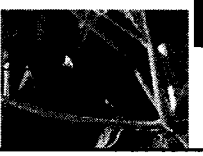
B. Lateral Meristems
1. Produce girth
2. Provide secondary growth

XI. Plant Hormones

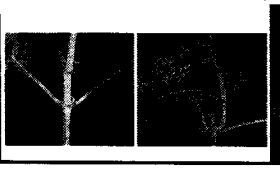
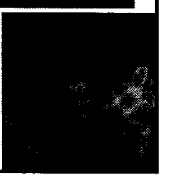
A. Chemical signals that coordinate parts of an organism
B. Produced low concentrations
C. Create Tropisms
1. Phototropism
2. Gravitropism
3. Thigmotrophism (touch)

XII. Types of Hormones

A. Auxin
1. IAA (indoleacetic acid)
2. Location: seed embryo; meristems of apical buds, young leaves
3. Function: **Stem elongation**; **Root growth**, cell differentiation, branching; fruit development; apical dominance; tropisms



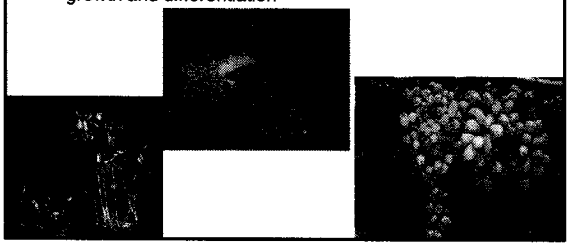



XII. Types of Hormones

B. Cytokinins (CK)
1. Location: roots (and actively growing tissues)
2. Function: root growth and **differentiation**; cell division and growth; germination; **delay senescence** (aging); **apical dominance** (w/ auxin)

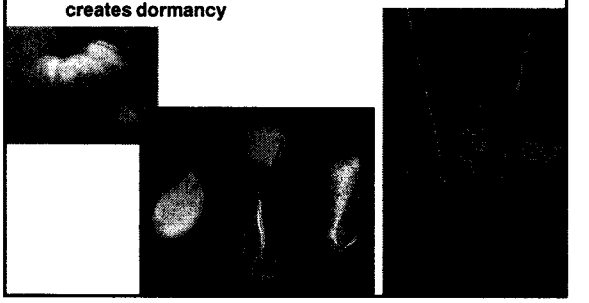

XII. Types of Hormones

C. Gibberellins
1. Location: meristems of apical buds and roots, young leaves, embryo
2. Function: **germination** of seed and bud; **stem elongation**; leaf growth; flowering (bolting); **fruit development**; root growth and differentiation



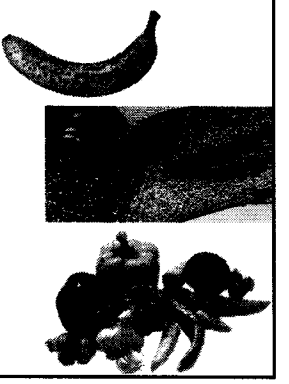
XII. Types of Hormones

D. Abscisic Acid (ABA)
1. Location: leaves, stems, roots, green fruit
2. Function: inhibits growth; **closes stomata** during stress; **creates dormancy**



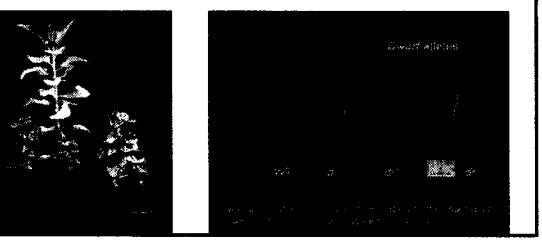
XII. Types of Hormones

E. Ethylene
1. Gaseous hormone
2. Location: ripening fruit tissue; stem nodes; aging leaves and flowers
3. Function: **fruit ripening**; oppositional to auxin, promotes leaf abscission; promotes/inhibits growth/development of roots, leaves, and flowers; **promotes senescence** (aging)



XII. Types of Hormones

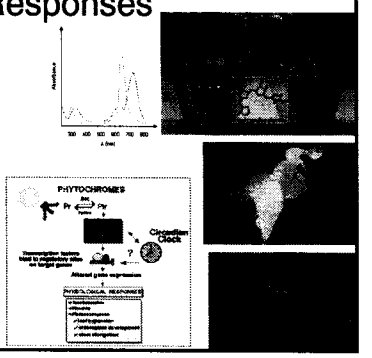
F. Brassinosteroids
1. Location: Seeds fruits, shoots, leaves, and floral buds
2. Function: Inhibits root growth, retards leaf abscission, promotes xylem differentiation



XIII. Daily and Seasonal Responses

A. Phytochromes
1. Plant pigments that absorb red light
2. Detects length of darkness in a photoperiod
3. Produce photoperiodisms

B. Circadian rhythm (24 hour patterns)



XIII. Daily and Seasonal Responses

C. Critical night length controls flowering
1. Short-day plant: light period shorter than a critical length to flower (flower in late summer, fall, or winter; poinsettias, chrysanthemums)
2. Long-day plant: light period longer than a critical length to flower (flower in late spring or early summer; spinach, radish, lettuce, iris)
3. Day-neutral plant: unaffected by photoperiod (tomatoes, rice, dandelions)