Unit A: Basic Principles of Plant Science with a Focus on Field Crops

Lesson 3:
Understanding Stem Anatomy

Vocabulary

- Apical meristem
- Bud scales
- Bud scale scar
- Bulb
- Cambium
- Corm
- Internode
- Lateral bud
- Leaf scar
- Lenticels
- Node
- Phloem
- Rhizome
- Stolon
- Terminal bud
- Tuber
- Xylem

What Are the Functions of a Stem?

- Stems have many important jobs in a plant
- They are responsible for the size and shape of a plant
- Some are made of wood and some are herbaceous
- There are four functions of the stem

Functions of a Stem

- 1. Stems support the leaves
  - Able to stretch the leaves into the best positions for catching sunlight
- 2. Move water, minerals and food through the whole plant
- 3. Can also produced food through photosynthesis
  - Not its main job, but will occur in plants with small or no leaves
- 4. Store food that has been manufactured by the plant

Stems of bamboo plant

Courtesy of McGraw Hill Publishing

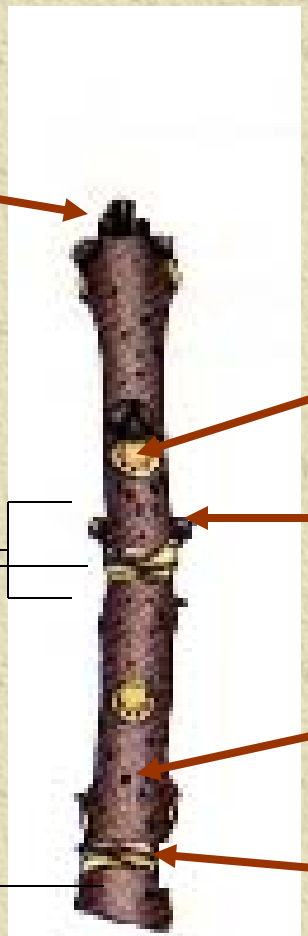
What Are Some of the Structures on the Outside of a Stem?

- There are many structures on the stem which are very useful to us in identifying plants
  - Sometimes it is easier to identify a plant by its stem rather than its leaves
- There are eight structures found on the outside of a stem:
  - 1. ***Terminal bud*** – contains apical meristem; found at the tip of a stem; it increases the length of a stem

- 2. ***Node*** – where the leaf and bud attaches to the stem
- 3. ***Internode*** – distance between two nodes; tells how much the tree grew in one season
- 4. ***Lateral bud*** – also called the axillary bud; develops into a leaf or flower
- 5. Lateral and terminal buds are protected by ***bud scales*** – helps the bud survive harsh climate changes; when the bud opens in the spring, the scales fall off leaving a ***bud scale scar***

- 6. ***Leaf scar*** – is the remains of the leaf after it has fallen off of the tree; it is just below the lateral bud
  - If you look closely at the scar, you can see the remains of the vascular tissue (xylem & phloem)
- 7. ***Lenticels*** – are small spots on the stem that allow a stem to exchange gases (oxygen & carbon dioxide) with the environment

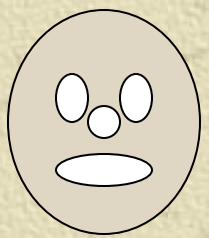
External Parts of a Stem



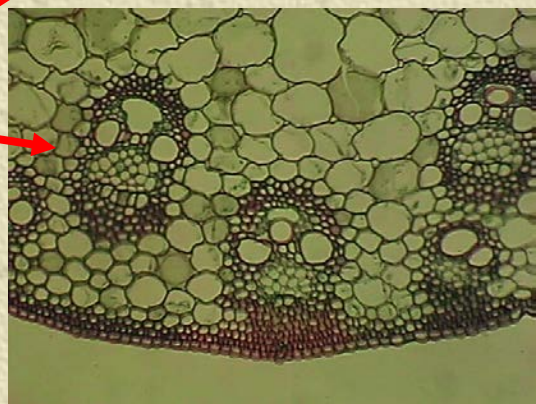
- Terminal bud
- Leaf scar with vascular bundle scars
- Lateral bud
- Node – where leaf & bud attach
- Lenticel
- Internode – distance between 2 nodes
- Bud scale scar

What Are Some of the Internal Structures of a Stem?

- Inside of the stem, there are tissues that are used for transport of materials through the plants
- Stem tissues are organized in one of the following ways:
  - They are found in small bundles scattered throughout the stem
    - They look like smiley faces
    - Characteristic of monocots

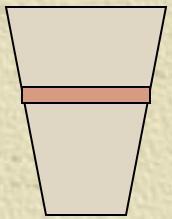


Monocot bundle

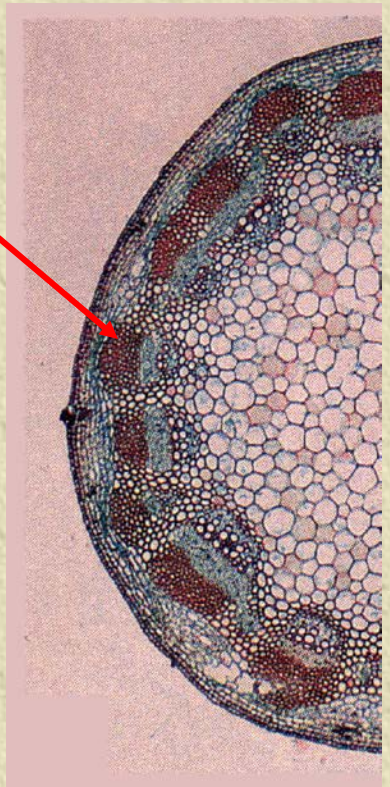


Courtesy of Corinne Banowski

- They are also found in rings around the stem
  - They look like candy-corns
  - Characteristic of dicots
  - This is what gives the plant annual rings
    - Determines the age of a plant



Dicot bundle

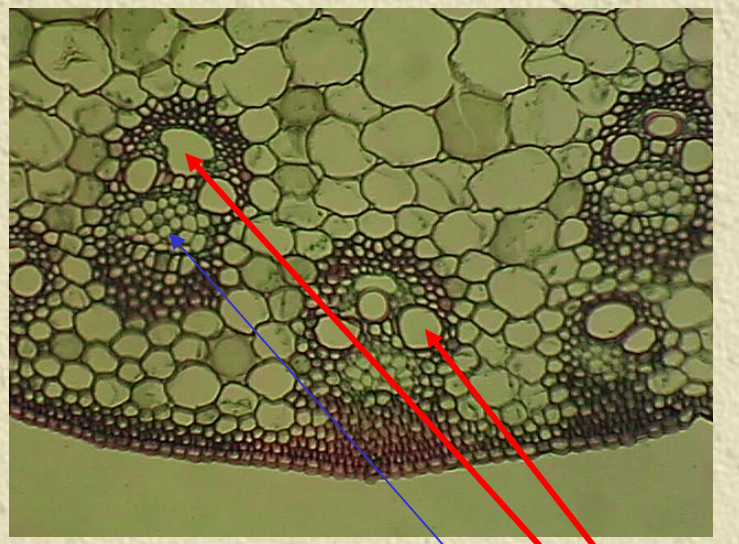


Courtesy of McGraw Hill Publishers

- There are three important tissues found inside the stem:
  - A) ***xylem*** – conducts the water and minerals upward throughout the plant
    - Made of tube-like cells which grow together to conduct liquids
    - Tends to be found closer to the center of the stem
  - B) ***phloem*** – conducts the food that is produced in the leaf downward to the rest of the plant
    - These cells also form tubes
    - Tends to be found towards the outside of the stem

- C) ***Cambium*** **–** the tissue responsible for the production of new xylem & phloem
  - Also increases the girth (width) of a stem
  - Generally found between the xylem and phloem

Location of Vascular Tissues

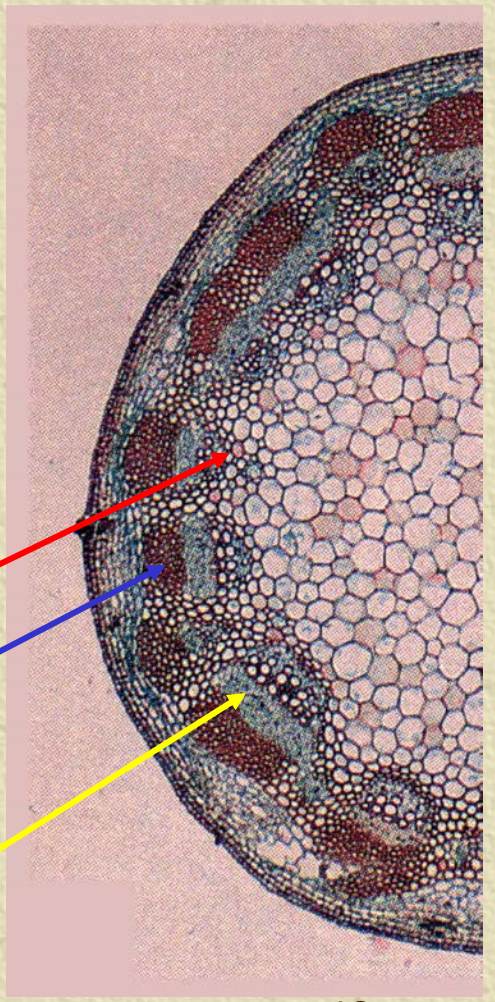


Notice that monocots do not have cambium

Xylem

Phloem

Vascular Cambium

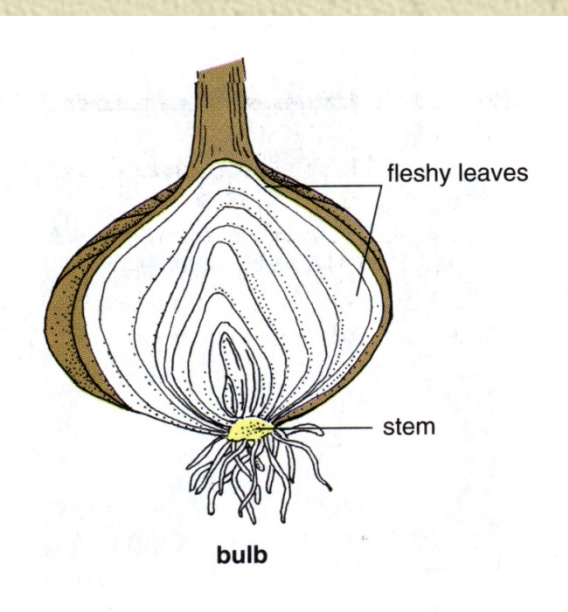


What Are Some Different Kinds of Specialized Stems?

- We generally expect stems to be upright and above ground; however there are many stems that do not fit this mold
- Some stems are modified to store food or help the plant reproduce
- Some stems grow beneath the soil instead of above it
- There are five types of specialized stems

Five Types of Specialized Stems

1. ***Bulb***
   - A very short, flattened stem
   - Has several fleshy leaves
   - Tend to be found beneath the soil
     - Ex. Onion, garlic



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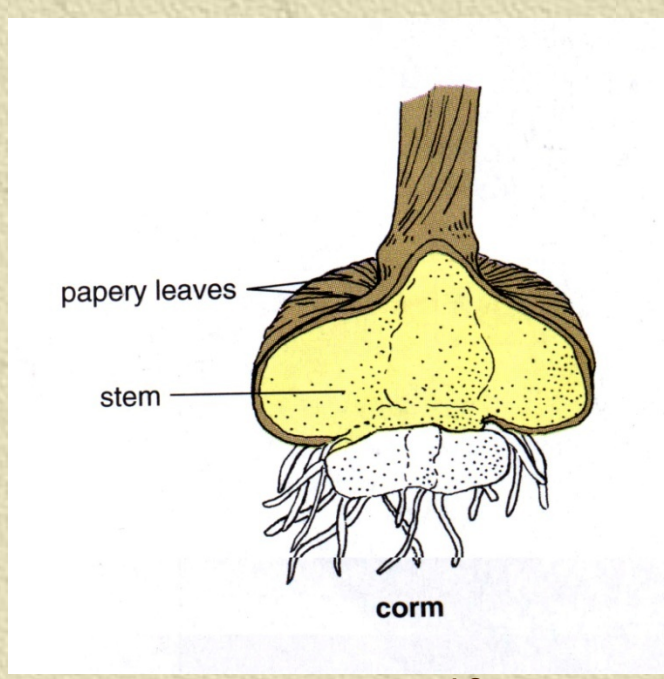
2. ***Corm***

- A spherical structure similar to a bulb
- Most of the corm is stem (unlike the bulb which is mostly leaves)
  - Ex. Gladiolus (flower)



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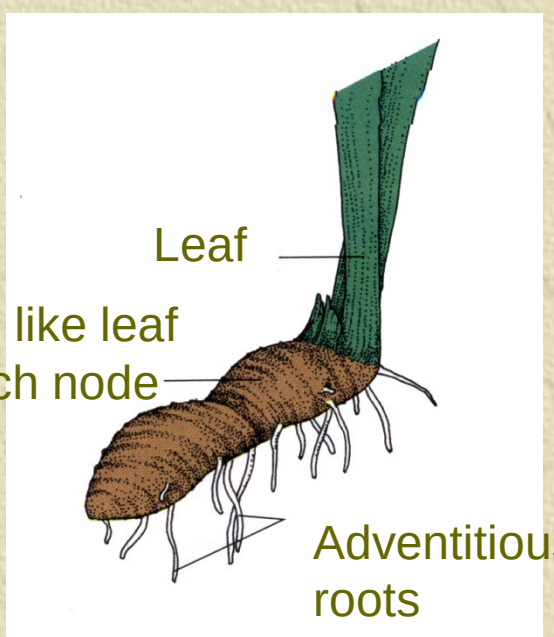
3. ***Rhizome***

- A thick underground stem
- Lies horizontally
  - Ex. Iris (flower)



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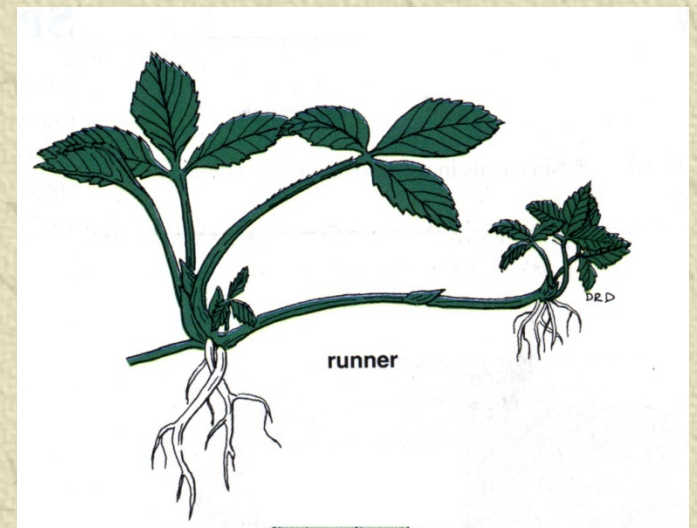
4. ***Stolon***

- A horizontal stem
- Lies above ground
- Sometimes called runners
- Tend to be involved in spreading the plant
  - Ex. Strawberries



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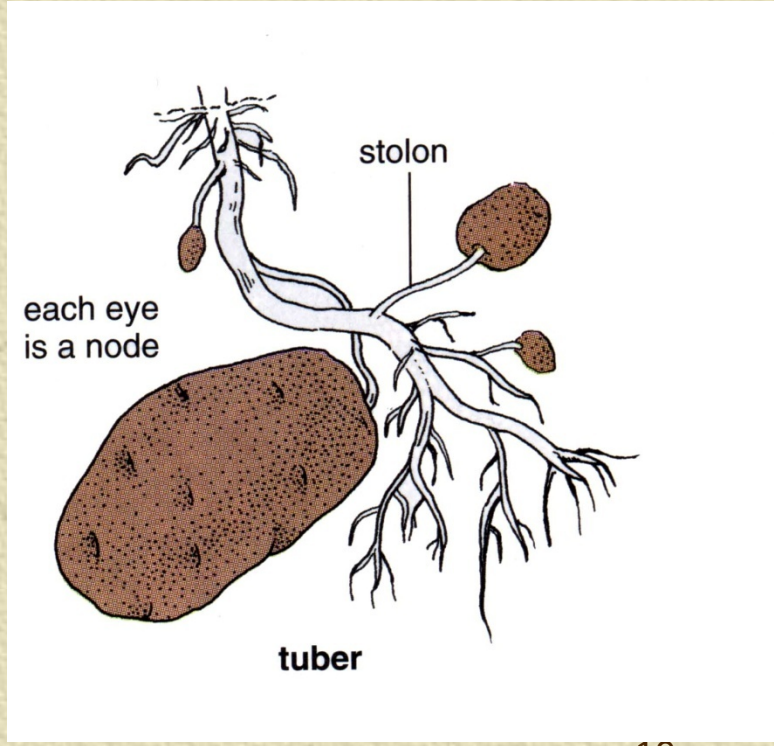
5. ***Tuber***

- A rhizome with a tip that is swollen with stored food
  - Ex. Potatoes



Courtesy of McGraw Hill Publishers

Summary

- Name the four functions of the stem.
- What is the tip of the external stem called? What kind of tissue does it have inside that allows it to grow?
- Where does a leaf and bud attach to the stem?
- When a leaf or bud falls off, what is left behind?
- Name the three types of internal tissues and their functions.

Summary continued

- In what directions do the xylem and phloem conduct materials?
- What increases the girth of a plant?
- Where does gas exchange occur on a stem?
- Name the five types of modified stems and give an example of each.