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(Oleh: Eni Nuraeni, M. Pd)

- ❑ **PLANTS ARE MADE OF THREE TYPES OF CELLS AND FOUR TYPES OF TISSUES.**
- ❑ **THE THREE BASIC TYPES OF PLANT CELLS ARE**
PARENCHYMA,
COLLENCHYMA,
SCLERENCHYMA

[:http://www.sirinet.net/~jgjohnso/plants.html](http://www.sirinet.net/~jgjohnso/plants.html)

PARENCHYMA CELLS

- A. The most Abundant and Least Structurally Specialized Cells.
- B. Parenchyma Cells are usually loosely packed cubed-shaped or elongated cells that contain a large central vacuole and have thin, flexible cell walls.
- C. Cells occur throughout the plant and have MANY Functions, INCLUDING PHOTOSYNTHESIS, FOOD STORAGE, AND GENERAL METABOLISM (photosynthesis, storage of water and nutrients, and healing).
- D. AN IMPORTANT CHARACTERISTICS OF PARENCHYMA CELLS IS THAT THEY CAN DIVIDE AND BECOME SPECIALIZED FOR VARIOUS FUNCTION.
- E. These cells usually form the bulk of non-woody plants. For example, the fleshy part of an apple is made mostly of parenchyma cells.

GROWTH IN MERISTEMS

- Plants grow differently from Animals. Instead of Growing only for a limited time, Plants grow as long as the plant is alive.
- Instead of occurring throughout the organism, Plant Growth occurs only in Specific Growing Regions.
- THE GROWING REGIONS OF PLANTS ARE CALLED **MERISTEMS**, regions where cells continuously divide.
- **MERISTEMS** ARE LOCATED AT THE TIPS OF STEMS AND BRANCHES, AT THE TIPS OF ROOTS (APICAL), AND IN JOINTS WHERE LEAVES ATTACH TO STEMS (AXILLARY). (Table 31-2)
- IN WOODY PLANTS (TREES), THERE ARE MERISTEMS BETWEEN THE XYLEM AND PHLOEM.
- The type of Tissue found in Meristems is called **MERISTEMATIC TISSUE**.
- MERISTEMATIC TISSUE IS THE ONLY TYPE OF PLANT TISSUE THAT PRODUCES NEW CELLS BY MITOSIS.
- These New Cells are ALL ALIKE at First, but eventually they change (Differentiate) into VASCULAR TISSUE, DERMAL TISSUE, OR GROUND TISSUE.

- The Growing tissue at the tips of Roots and Stems are Called **APICAL MERISTEMS**.
- **APICAL MERISTEMS** LOCATED AT THE TIPS OF STEMS AND ROOTS, CAUSE ROOTS AND STEMS TO GROW LONGER AT THEIR TIPS. THEY CAUSE PLANTS TO GROW TALLER AND ROOTS TO GROW DEEPER INTO THE SOIL.
- Some Monocots have **INTERCALRY MERISTEMS** located above the bases of leaves and stems. Intercalary Meristems allow grass leaves to quickly regrow after being Grazed or Mowed.
- Gymnosperms and Most Dicots also have **LATERAL MERISTEMS**, which allow stems and roots to increase in Diameter. Lateral Meristems are located near the Outside of Stems and roots.

TWO Types of Lateral Meristems,

- The **VASCULAR CAMBIUM**, located between the Xylem and Phloem, Produces Additional Vascular Tissues.
- The **CORK CAMBIUM**, located Outside the Phloem, Produces **CORK**. Cork Cells replace the Epidermis in Woody Stems and Roots, Protecting the Plant. Cork cells are DEAD CELLS that provide Protection and Prevent Water Loss.

COLLENCHYMA CELLS

- A. Plant Cells that SUPPORT the Growing Parts of Plants.
- B. The cell walls of Collenchyma Cells are thicker than those of Parenchyma Cells. Collenchyma cell walls are also irregular in shape. The thicker cell walls provide more support for the plant.
- C. They have THICK Walls, STRETCHABLE Cell Walls that provide FLEXIBILITY SUPPORT.
- D. Collenchyma cells are usually grouped in Strands. They are specialized for supporting regions of the Plant that are Still Lengthening. The Tough String of a Celery Stalk (Stems) are made of Collenchyma Cells.

SCLERENCHYMA CELLS

- A. Support the NON-Growing Parts of plants.
- B. Sclerenchyma cells have thick, even rigid cell walls. They support and strengthen the plant in areas where growth is No Longer Occurring.
- C. They Have THICK, NONSTRECHABLE Cell Walls.
- D. The Cells Walls are so THICK that the Cell USUALLY DIES at maturity, providing a frame to support the plant.
- E. WHEN THEY MATURE, MOST SCLERENCHYMA CELLS ARE EMPTY CHAMBERS SURROUNDED BY THICK WALLS.

TWO TYPES OF SCLERENCHYMA CELLS:

- **FIBERS** - CELLS UP TO 50 cm LONG THAT USUALLY OCCUR IN STRANDS. FABRIC SUCH AS LINEN AND FLAX ARE MADE OF THESE FIBERS.
- **SCLEREIDS** - HAVE THICKER CELLS WALLS THAN FIBERS, HAVE MANY SHAPES, AND CAN OCCUR SINGLY OR IN SMALL GROUPS. The gritty texture of a pear is from Sclereids it contains. Sclereids also cause the Hardness of a peach pit and a walnut shell.

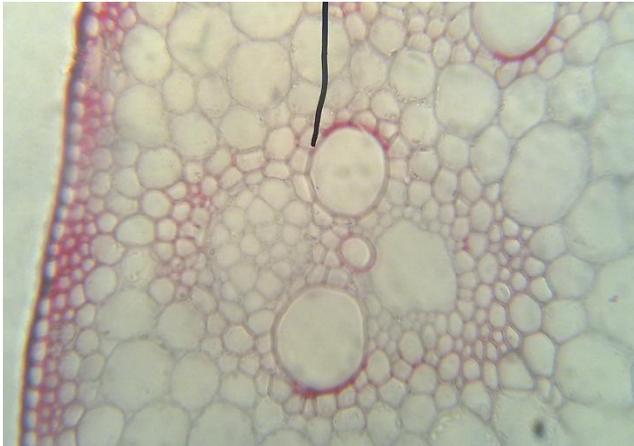
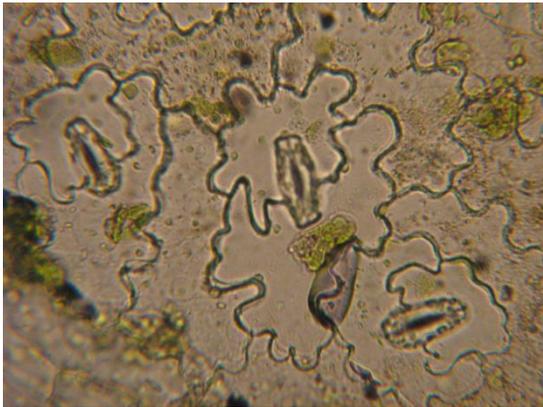
PLANT TISSUES AND SYSTEMS

1. Cells that work together to perform a specific function form a Tissue.
2. Tissues are arranged into Systems in Plants, including the Dermal System, Ground System, and Vascular System. (Table 31-1)
3. These Systems are further organized into the Three Major Plant Organs - THE ROOTS, STEMS AND LEAVES.
4. THE FOUR BASIC PLANT TISSUES ARE VASCULAR TISSUE, DERMAL TISSUE, GROUND TISSUE, AND MERISTEMATIC TISSUE.

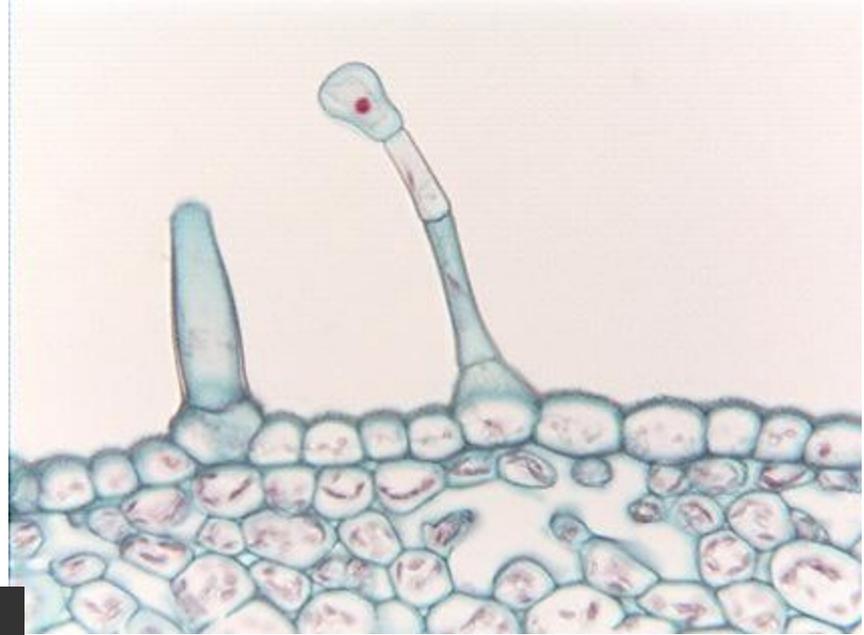
DERMAL TISSUE SYSTEM

1. **DERMAL TISSUE** forms the SKIN (the outside covering) of a Plant, Covering all parts of the ROOTS, STEMS, AND LEAVES.
2. One kind of Dermal tissue is the **EPIDERMIS**, made of Parenchyma Cells, which is usually only one cell thick, and is the outer protective tissue of young plants and mature Non-woody Plants.
3. Dermal Tissue has different functions, depending on its LOCATION on the plant.
4. **ABOVE the Ground**, Dermal Tissue prevents the plant from drying out by reducing water loss from evaporation (Transpiration). This Dermis Tissue also Secretes a Waxy Layer called **CUTICLE**.
5. **BELOW the Ground**, Dermal Tissue ABSORBS Water. On the underground parts of a plant, the Epidermis FORMS **ROOT HAIRS** that ABSORB Water and Nutrients.
6. On leaves and stems openings in the epidermis are called Stomata. Stomata regulate the passage of gases and moisture into and out of the plant.
7. In woody stems and roots, the Epidermis is replaced by Dead Cork Cells.

Sayatan daun tembakau Tipe stomata?

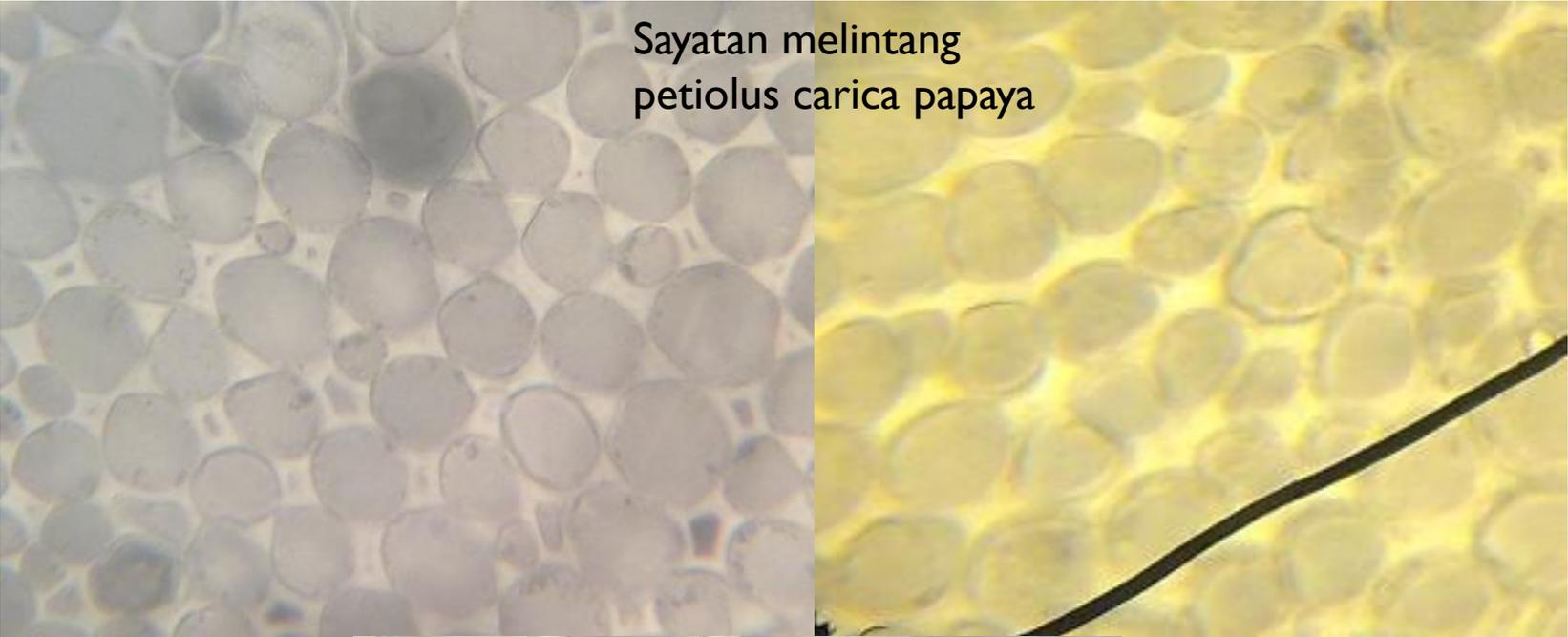






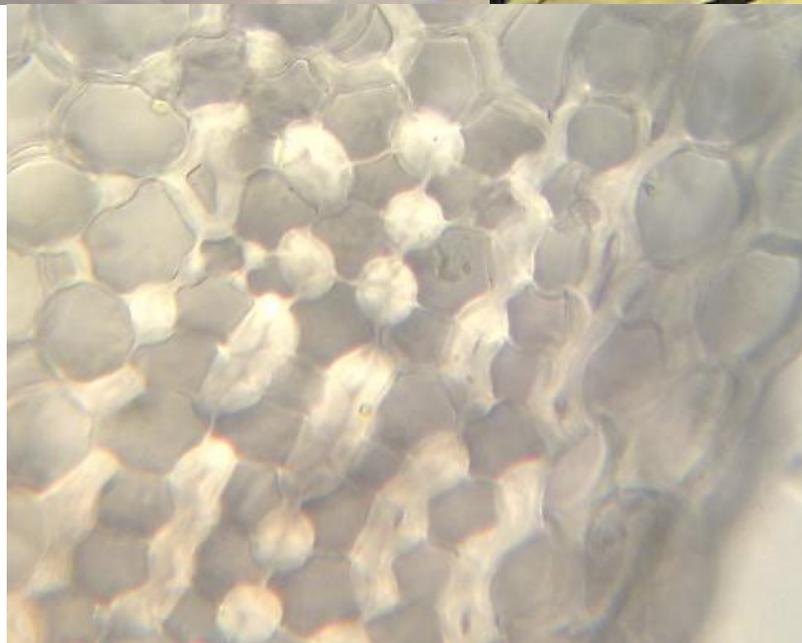
GROUND TISSUE SYSTEM

1. Dermal Tissue surrounds the Ground Tissue System, which consists of all three types of Plant Cells.
2. Ground Tissue consists of everything that is not Dermal Tissue or Vascular Tissue. Parenchyma, a simple tissue, makes up most Ground Tissue.
3. Ground Tissue has many metabolic functions, including PHOTOSYNTHESIS, FOOD STORAGE AND SUPPORT.
4. Non-woody roots, stems, and leaves are made up primarily of Ground Tissue.

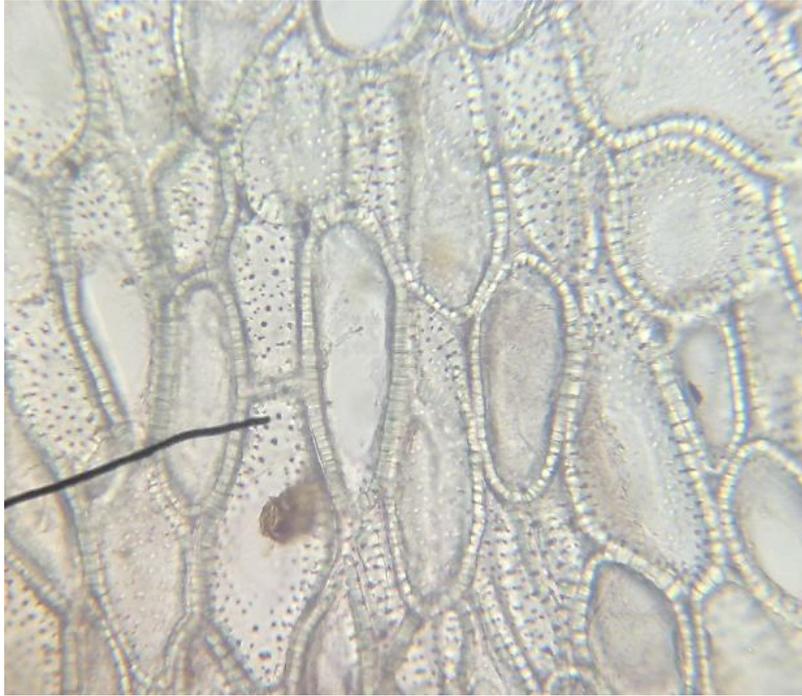


Sayatan melintang
petiolus carica papaya

This image shows a microscopic cross-section of a papaya petiole. The tissue is composed of large, rounded, parenchymatous cells with thin cell walls. The overall appearance is somewhat granular and light-colored.



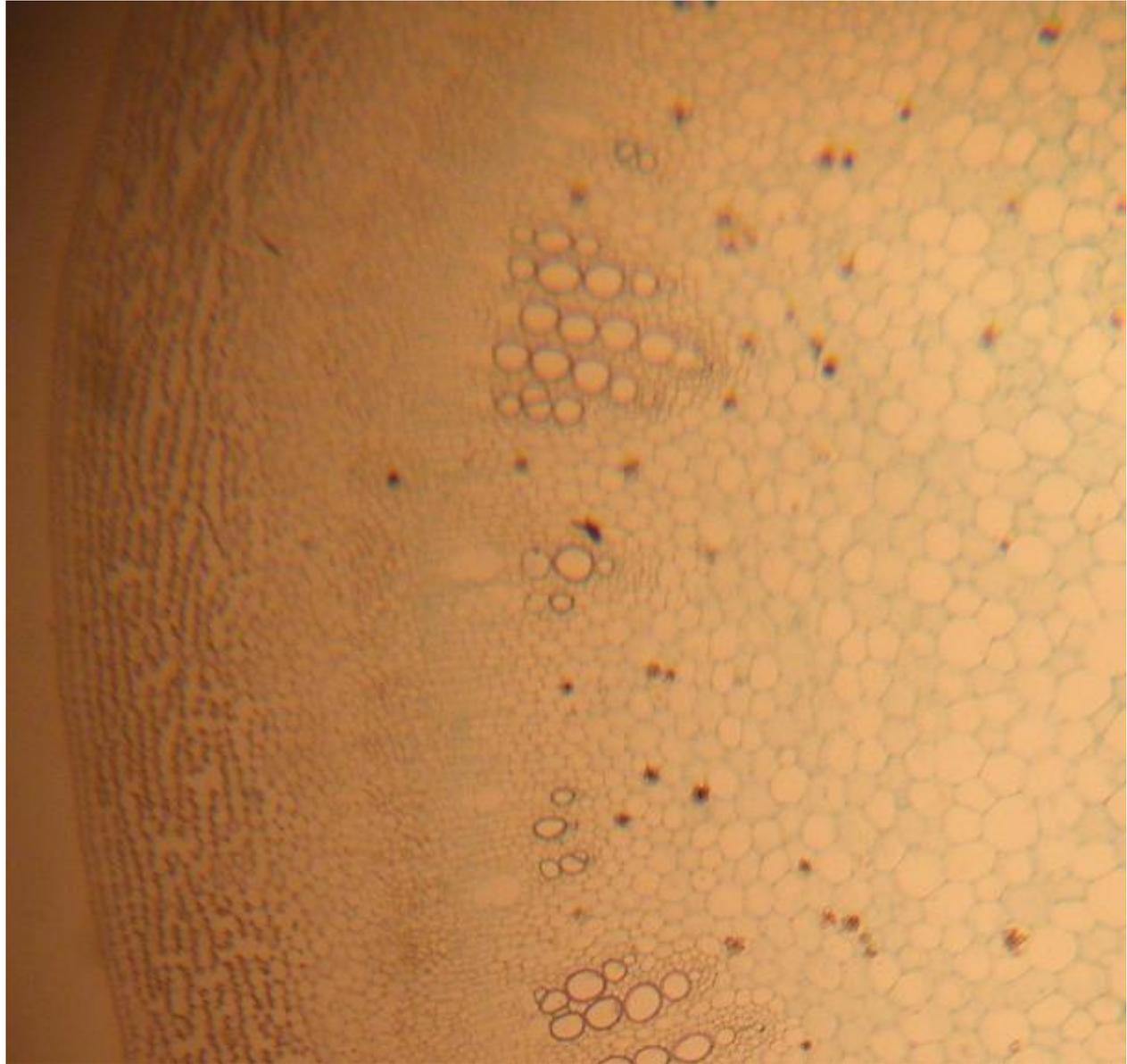
Sayatan melintang
petiolus sambucus



VASCULAR TISSUE SYSTEM

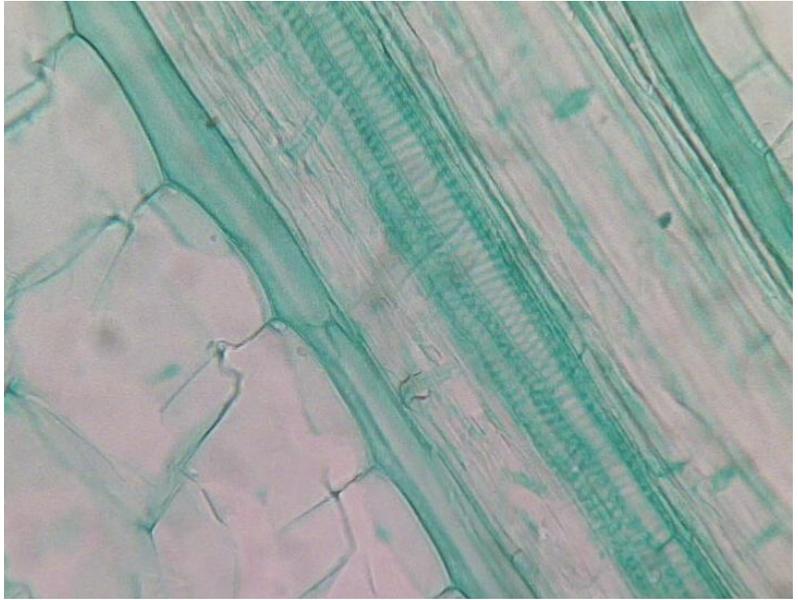
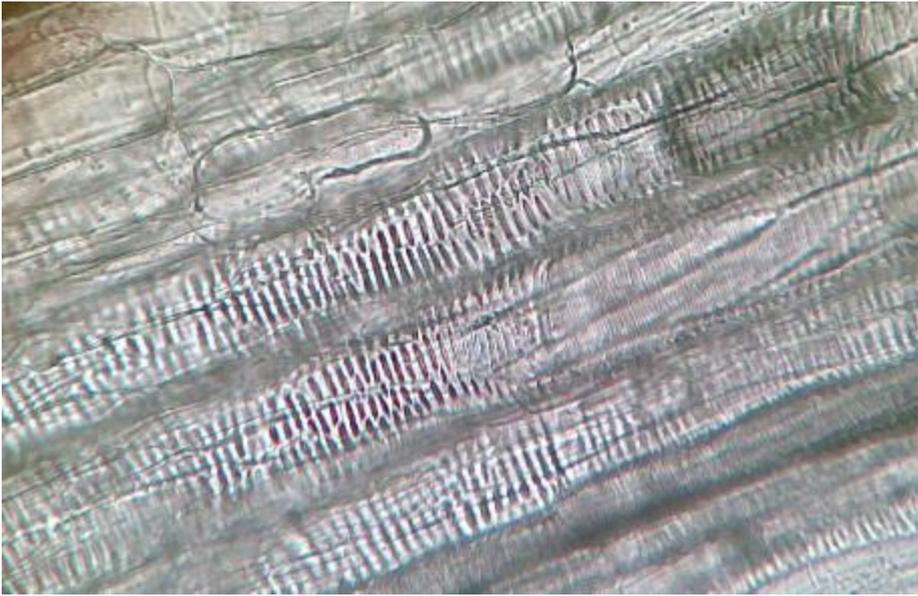
1. Vascular plants have specialized Tissue called Vascular Tissue. Vascular Tissue carries WATER and Nutrients THROUGHOUT THE PLANT AND HELPS SUPPORT THE PLANT.
2. There are TWO Kinds of Vascular Tissue; both Kinds of Vascular Tissue contain SPECIALIZED CONDUCTING CELLS:





I. XYLEM

- MOVES WATER AND MINERALS UPWARD FROM ROOTS TO LEAVES.
 - 1) When Water and Minerals are absorbed by the Roots of a Plant, These substances must be transported up to the Plant's Stems and Leaves.
 - 2) XYLEM is the Tissue THAT CARRIES WATER AND DISSOLVED SUBSTANCES UPWARD IN THE PLANT.
 - 3) Two Kinds of Conducting Cells are present in Xylem of ANGIOSPERMS: TRACHEIDS and VESSEL ELEMENTS. Both types of cells DO NOT conduct Water until they are DEAD and EMPTY. (Figure 31-2)
 - 4) **TRACHEIDS** ARE LONG, THICK WALLED SCLERENCHYMA, NARROW CELLS OF XYLEM WITH THIN SEPARATIONS BETWEEN THEM. WATER MOVES FROM ONE TRACHEID TO ANOTHER THROUGH **PITS**, WHICH ARE THIN, POROUS AREAS OF THE CELL WALL.
 - 5) **VESSEL ELEMENTS** ARE SHORT, SCLERENCHYMA, WIDE CELLS OF XYLEM WITH NO END WALLS. Vessel Elements DO NOT have separations between them; they are arranged end to end like stacked barrels stack on top of each other. These Vessels are wider than Tracheids, and more water moves through them.
 - 6) Angiosperms, or Flowering Plants, contain Tracheids and Vessel Elements.
 - 7) Gymnosperms, or cone bearing seed plants, contain Only Tracheids.



2. PHLOEM

- MOVES SUGARS OR SAPS IN BOTH DIRECTIONS THROUGHOUT THE PLANT ORIGINATING IN THE LEAVES.
 - 1) Sugars made in the leaves of a plant by photosynthesis must be transported throughout the plant.
 - 2) Phloem Tissue CONDUCTS SUGARS UPWARD AND DOWNWARD IN A PLANT.
 - 3) The sugars move as Sugary Sap.
 - 4) TWO Kinds of Cells are present in Phloem: SIEVE TUBE MEMBER AND COMPANION CELLS.

- 1) **SIEVE TUBES MEMBERS** ARE CELLS OF PHLOEM THAT CONDUCT SAP. Sieve Tube members are stacked to form long **SIEVE TUBES**. Compounds move from Cell to Cell through End Walls called **SIEVE PLATES**.
- 2) **COMPANION CELLS** ARE PARENCHYMA CELLS OF PHLOEM THAT ENABLE (ASSIST) THE SIEVE TUBE ELEMENTS TO FUNCTION.
- 3) Each Sieve Tube Element has a Companion Cell. Companion Cells CONTROL the movement of substances through the sieve tubes.
- 4) The partnership between these two cells is vital; Neither Cell can Live without the other.

