TRANSPORT SYSTEM

- **Unicellular organisms and some colonies can take material from their environment by diffusion, osmosis and active trnasport.**
- **But in multicellular organisms all cells can not take needed material from their environment.**
- **Therefore there is a special transport system in complex multicellular organisms.**

TRANSPORT IN PLANTS

- **In Plants, transport of materials is provided by;**
  - **–Leaves,**
  - **–Stem and**
  - **–Root**

The Leaf

A typical leaf consist of ;

- **Leaf blade**
- **Petiole (Stalk)**

The petiole attaches the leaf to the stem.

Plants are divided into two major groups:

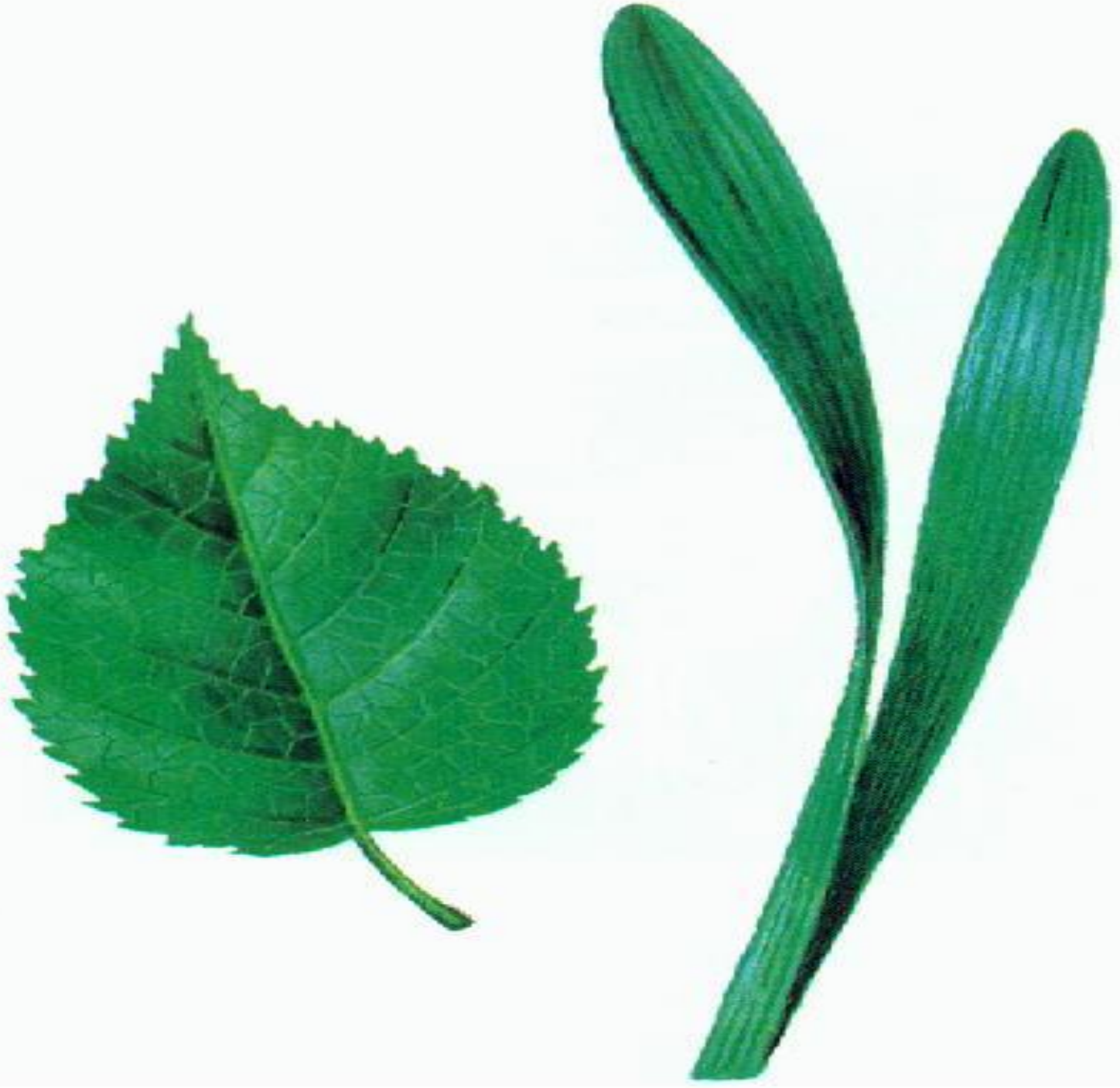
- **Flowering Plants**
- **Non-Flowering Plants**

FLOWERING PLANTS

- Flowering Plants are divided into two major group according to their seed leaves (Cotyledons).These are;
  - –Monocotyledons
  - –Dicotyledons

Differences Between Monocots and Dicots

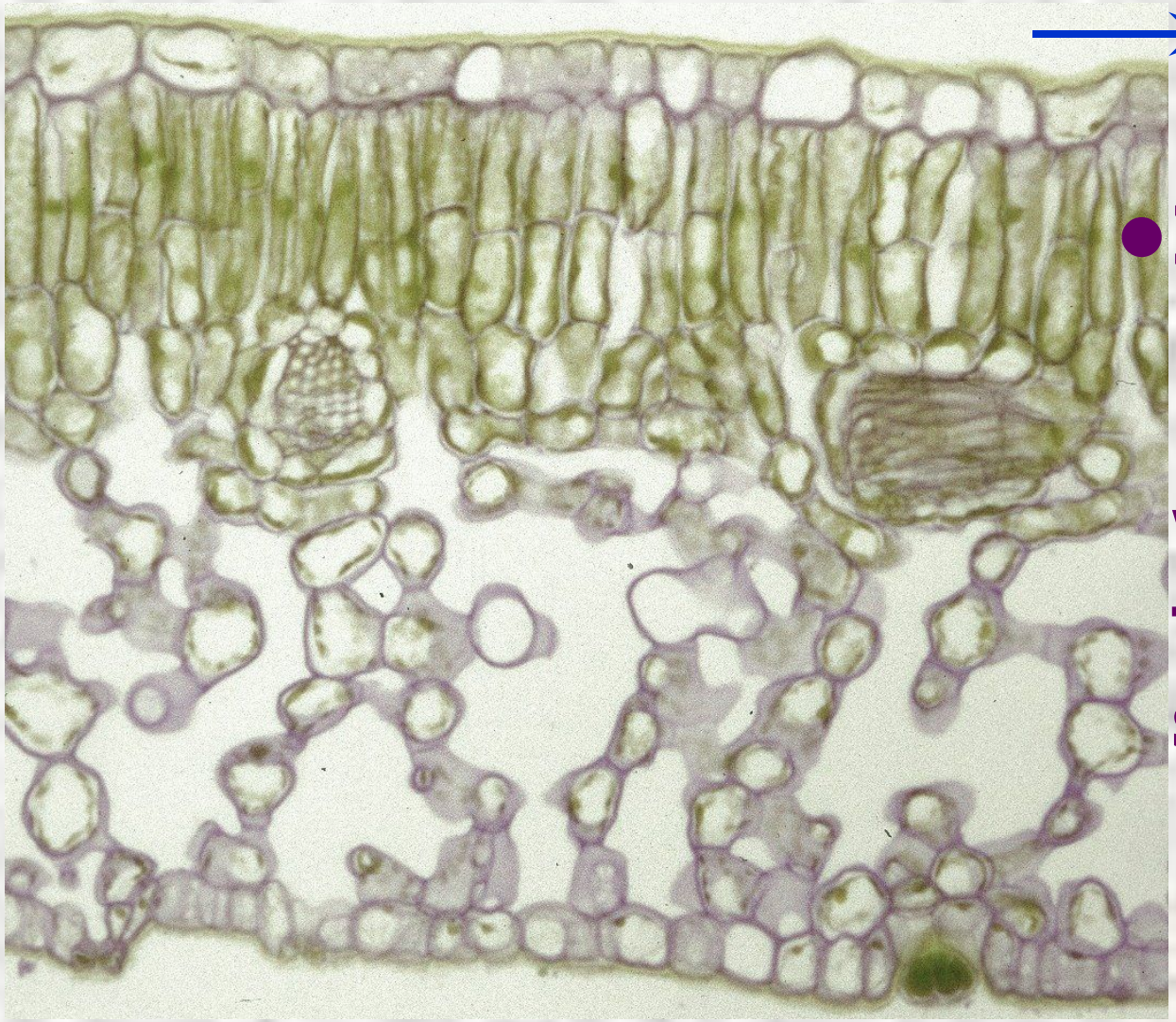
DICOTS	MONOCOTS
The leaf blade is not single structure	The leaf blade is single structure
The leaves of dicots are network veined	The leaves of monocots have parallel veins.



The Anatomical Structure of the Leaf

1. The Cuticle Layer
2. Epidermal Tissue
3. The Mesophyll Layer
   - The Palisade Paranchima
   - The Spongy Paranchima
4. The Vascular Bundles (Veins)

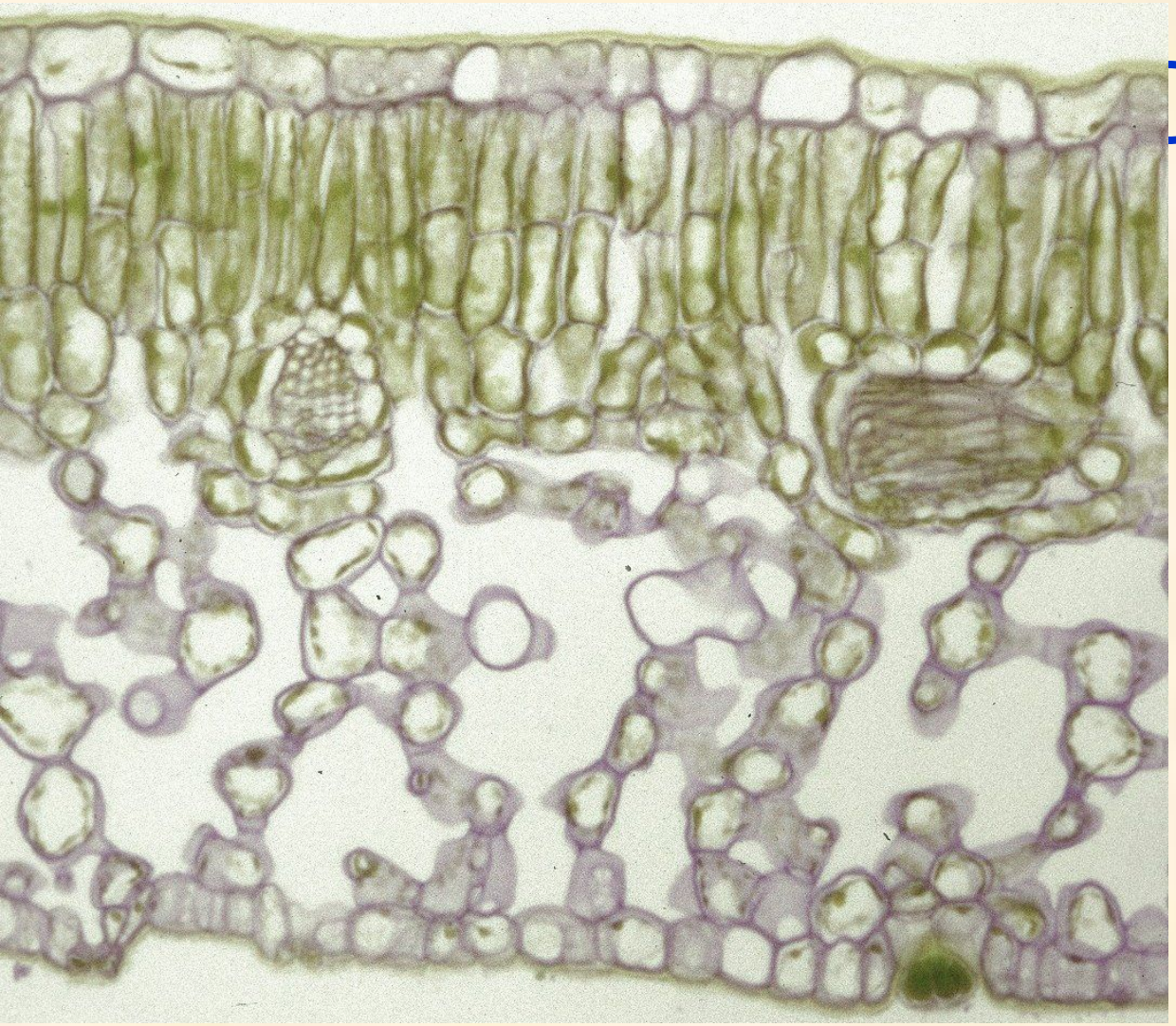
Parts of a leaf



→ Cuticle

- It is a waxy layer which prevent water loss from the leaf surface

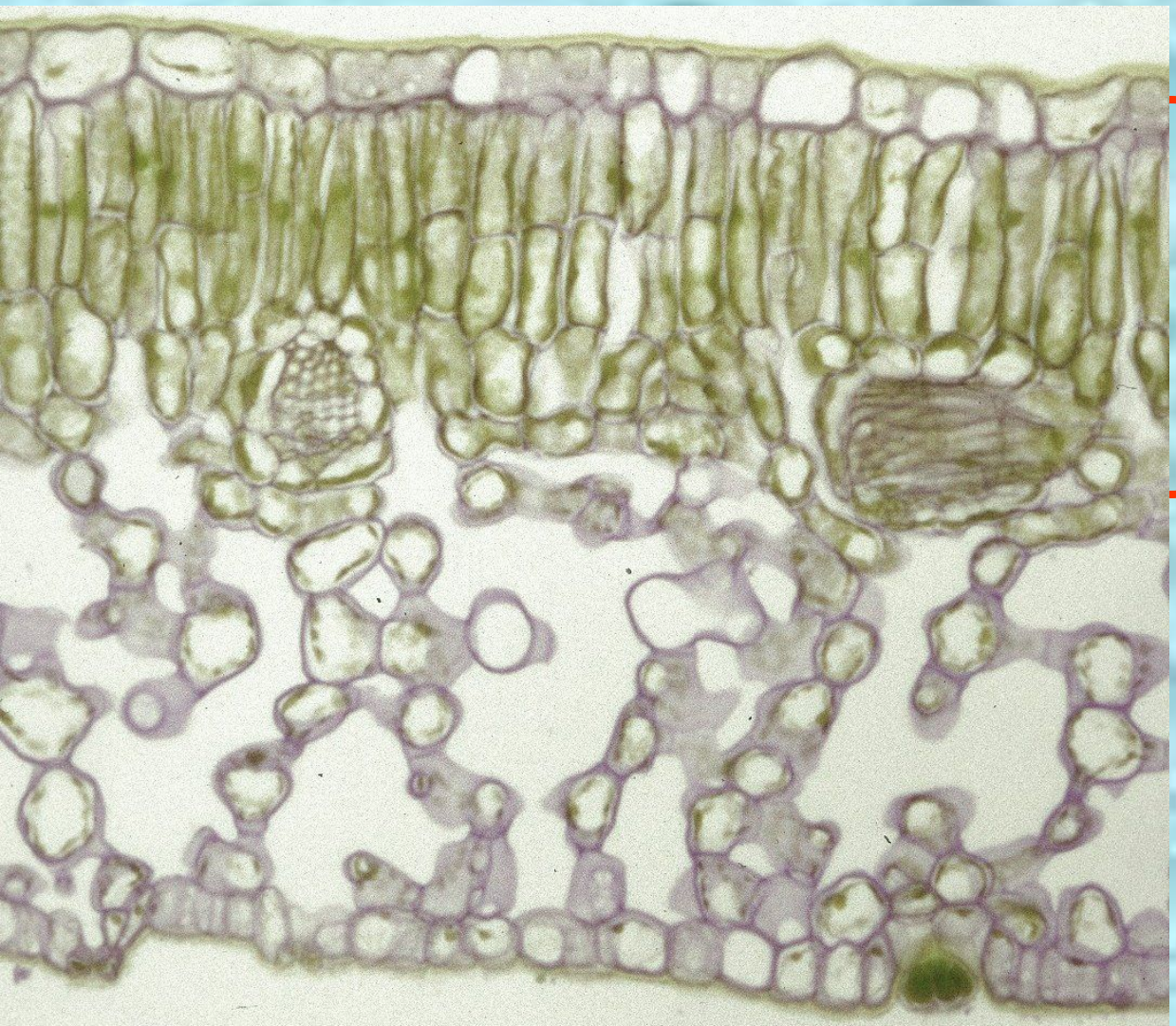
Parts of a leaf



upper epidermis

It protects internal tissues from mechanical damage and bacterial and fungal invasion

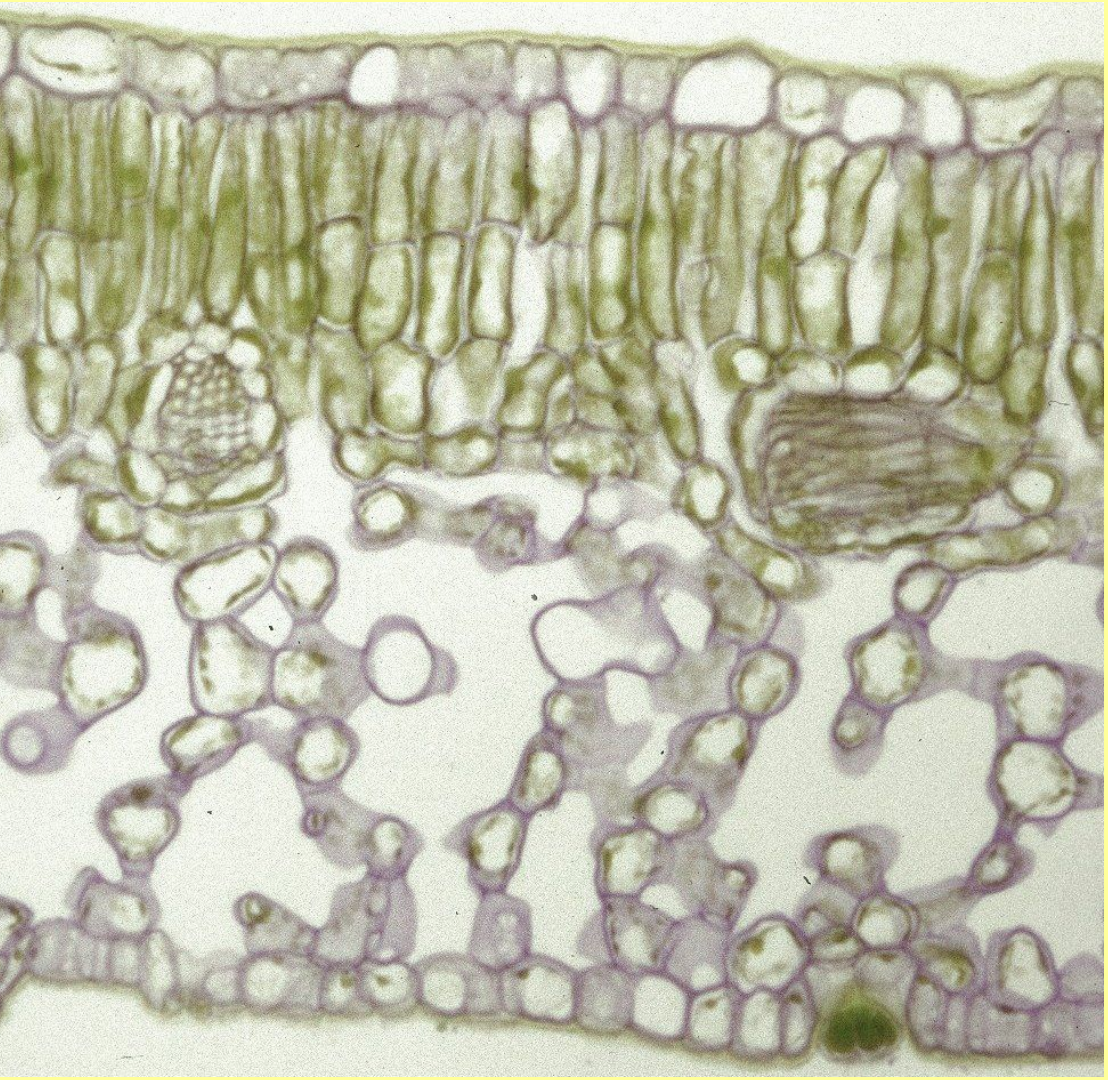
Parts of a leaf



palisade mesophyll

contains many chloroplasts

Parts of a leaf



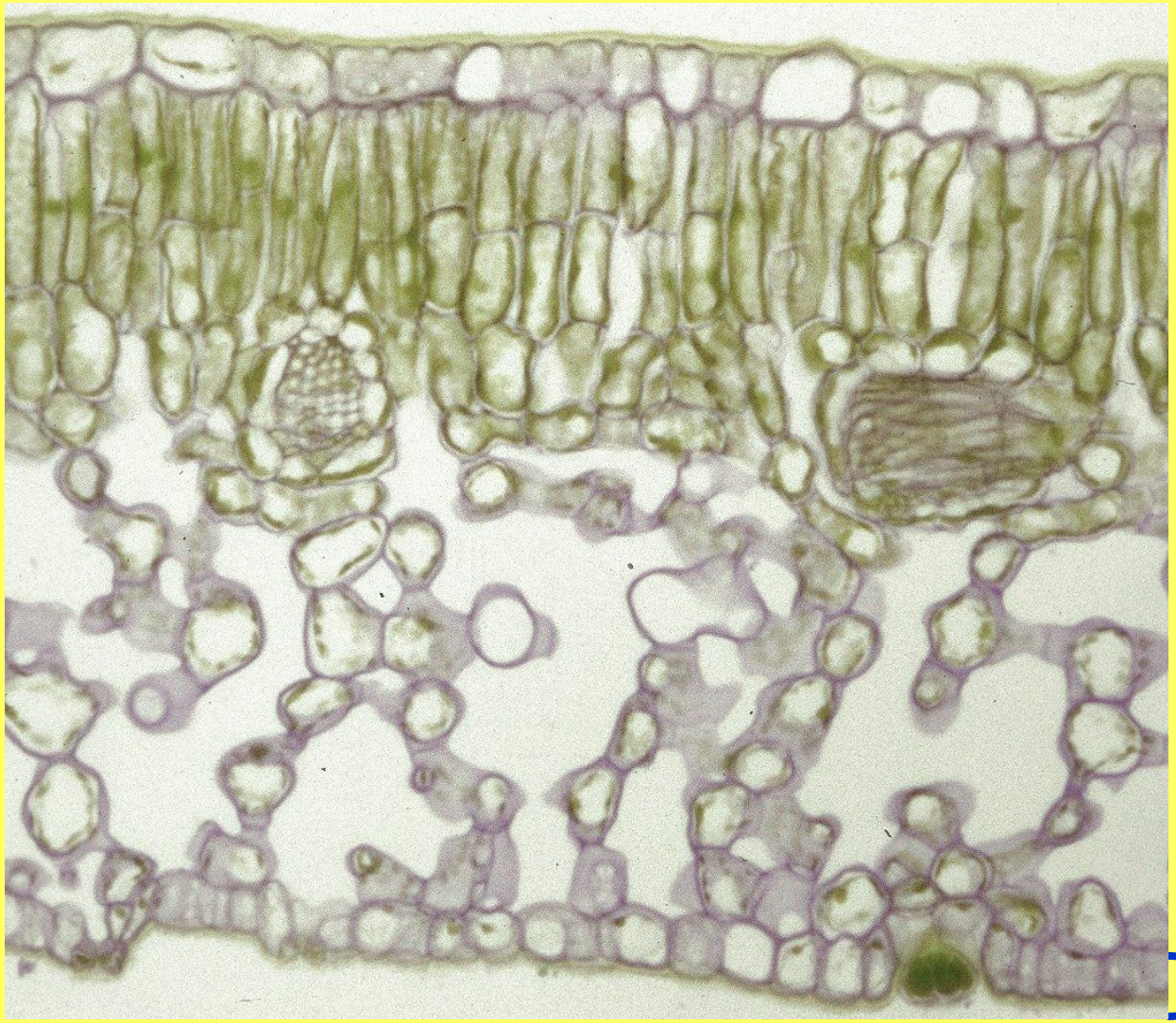
less chloroplasts for photosynthesis

spongy mesophyll

Parts of a leaf

vascular bundle (vein)

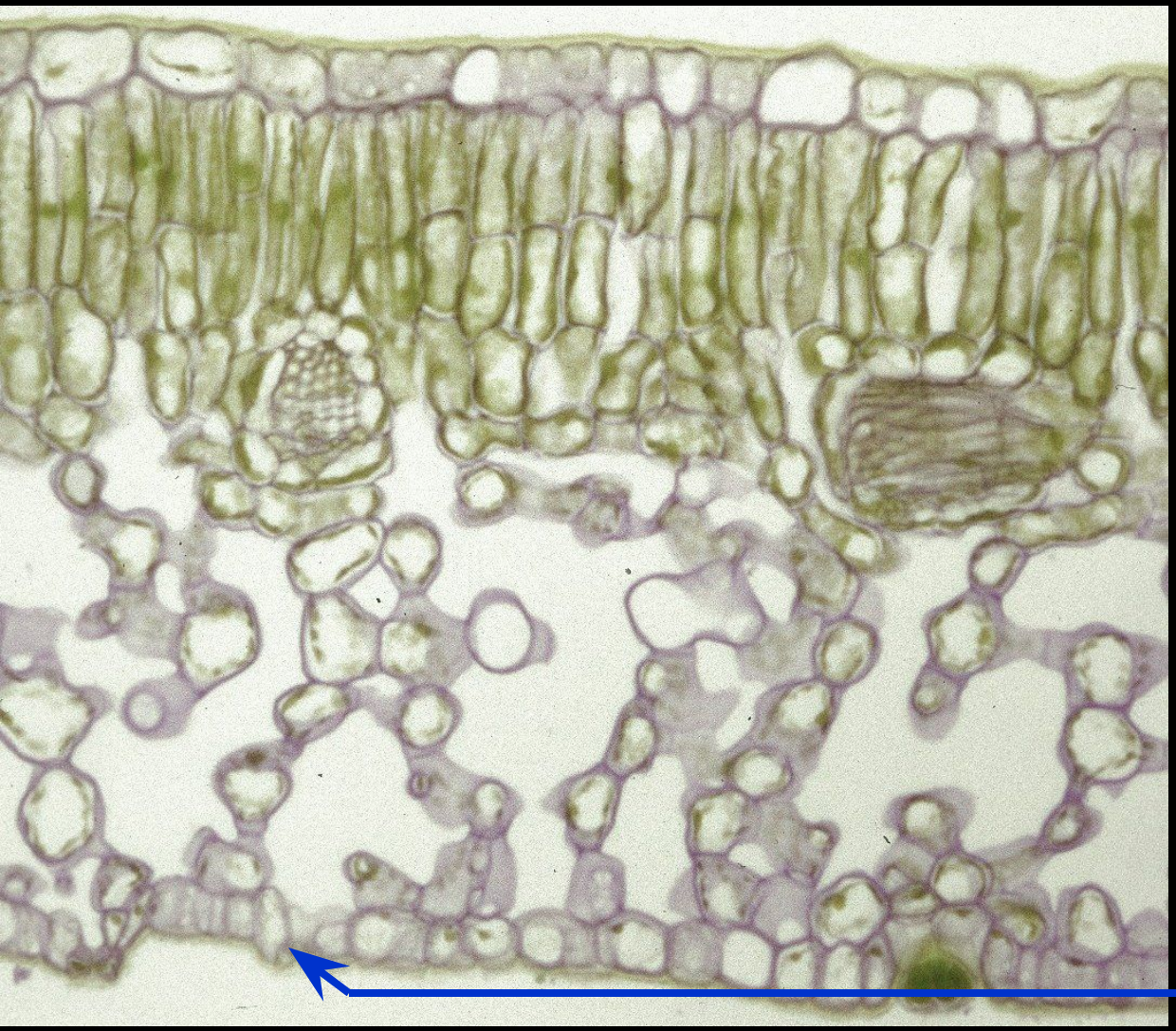
Parts of a leaf



same as upper epidermis except the cuticle is thinner

lower epidermis

Parts of a leaf

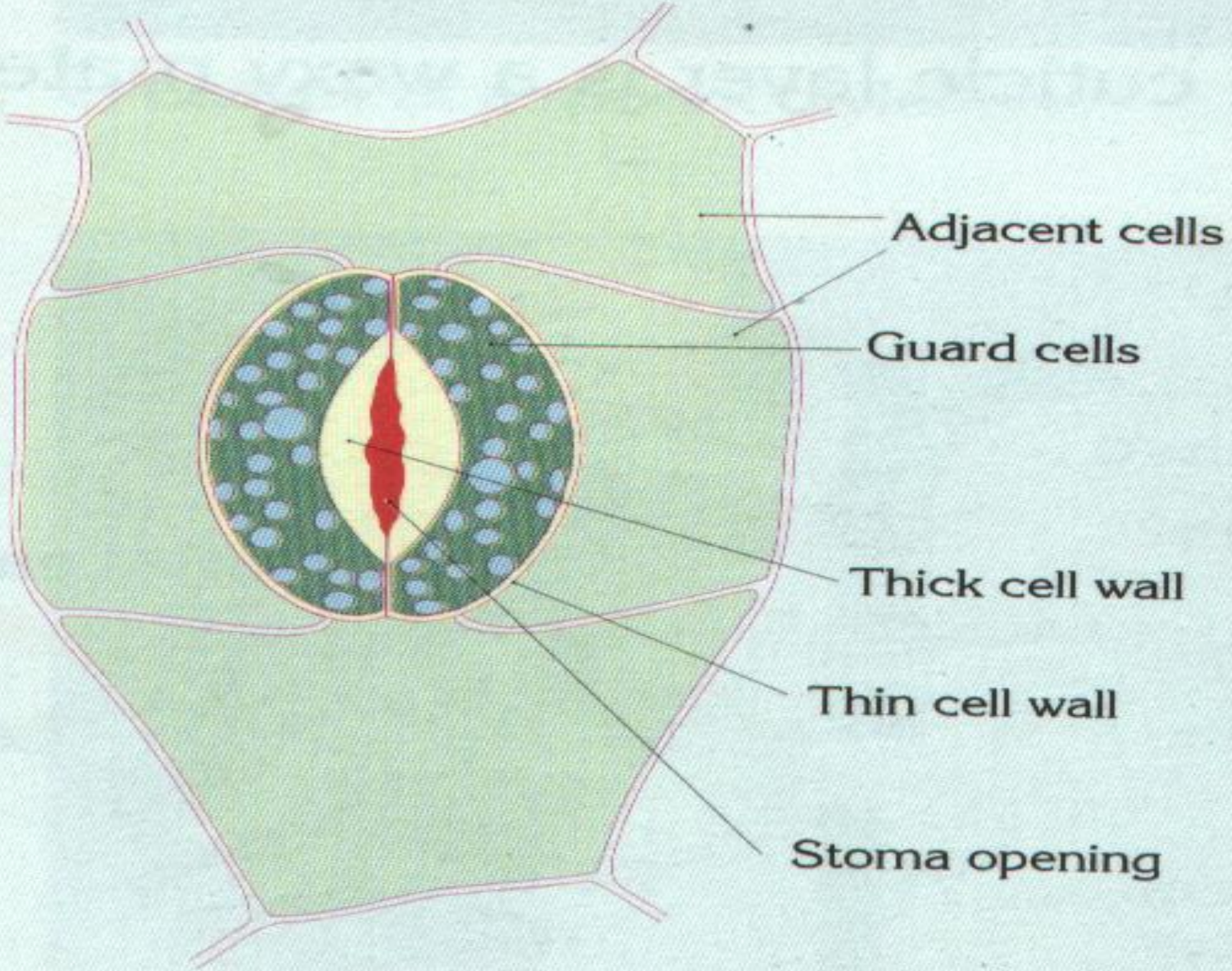


opening which allows gases to pass through it to go into or out of the leaf

stoma

STOMATA

- There are many stomata in epidermal tissue.
- The stomata allow the exchange of carbon dioxide and oxygen.
- Water vapour also passes out of the leaf through the stomata.
- Stomata open during the day and close at night.


Adjacent cells
Guard cells
Thick cell wall
Thin cell wall
Stoma opening

Stomatal opening regulates by two factors:

1. TURGOR PRESSURE

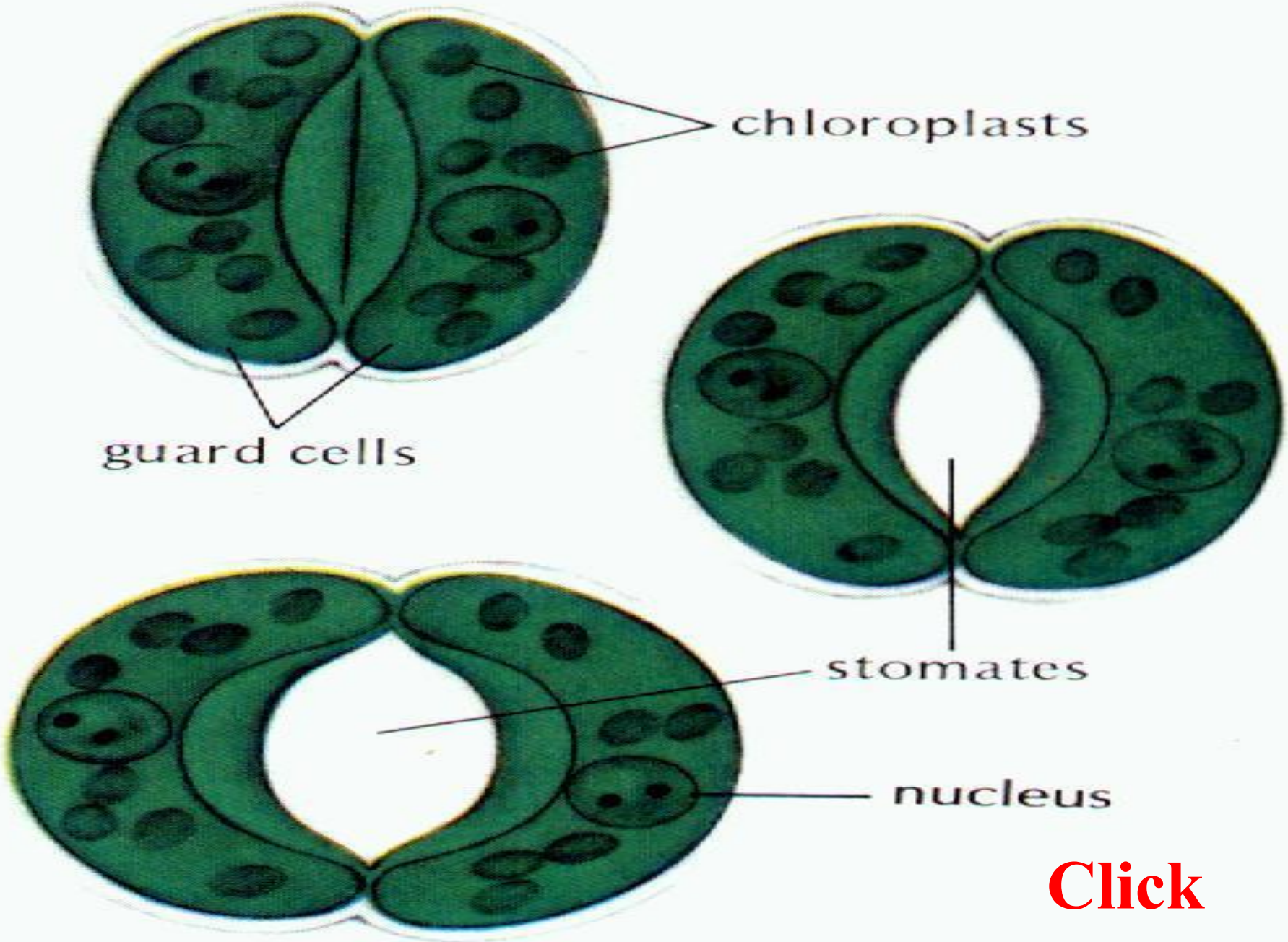
2. CO_2 CONCENTRATION

TURGOR PRESSURE

1. Glucose molecules are produced by photosynthesis in guard cells.
2. These glucose molecules increase the osmotic pressure in this cell.
3. And guard cells take water and swollen by turgor pressure.
4. Stomata cells are opened by the effect of turgor pressure

At night;

1. Glucose concentration decreases in guard cells.
2. Therefore osmotic pressure decreases
3. Water passes from guard cells to the adjacent cells.
4. And stomata are closed.



Click

TYPES OF STOMATA

- In arid climates the stomata are found deep of the epidermal layer. These stomata are called lower case stomata.
- At the normal humidity and temperature, stomata are found at the same level as the epidermis.These stomata are called normal case stomata
- At the high humidity, stomata are found at the upper position than epidermal layer.These stomata are called upper case stomata.

Functions of the leaf

- Photosynthesis
- Gas exchange
- Transpiration
- Excretion
- Regulation of temperature

TRANSPIRATION

- **Excess water is excreted from the stomata as water vapour. This process is called transpiration.**
- **WIND, HUMIDITY and TEMPERATURE effect the rate of transpiration.**

STEM

- Stem holds leaves and flowers in the air.
- Some underground stems are specialized for food storage

Types of stem

- **Woody Stem**

Woody stems contain thick wood. Plants with woody stems live more than 2 years

- **Herbaceous Stem**

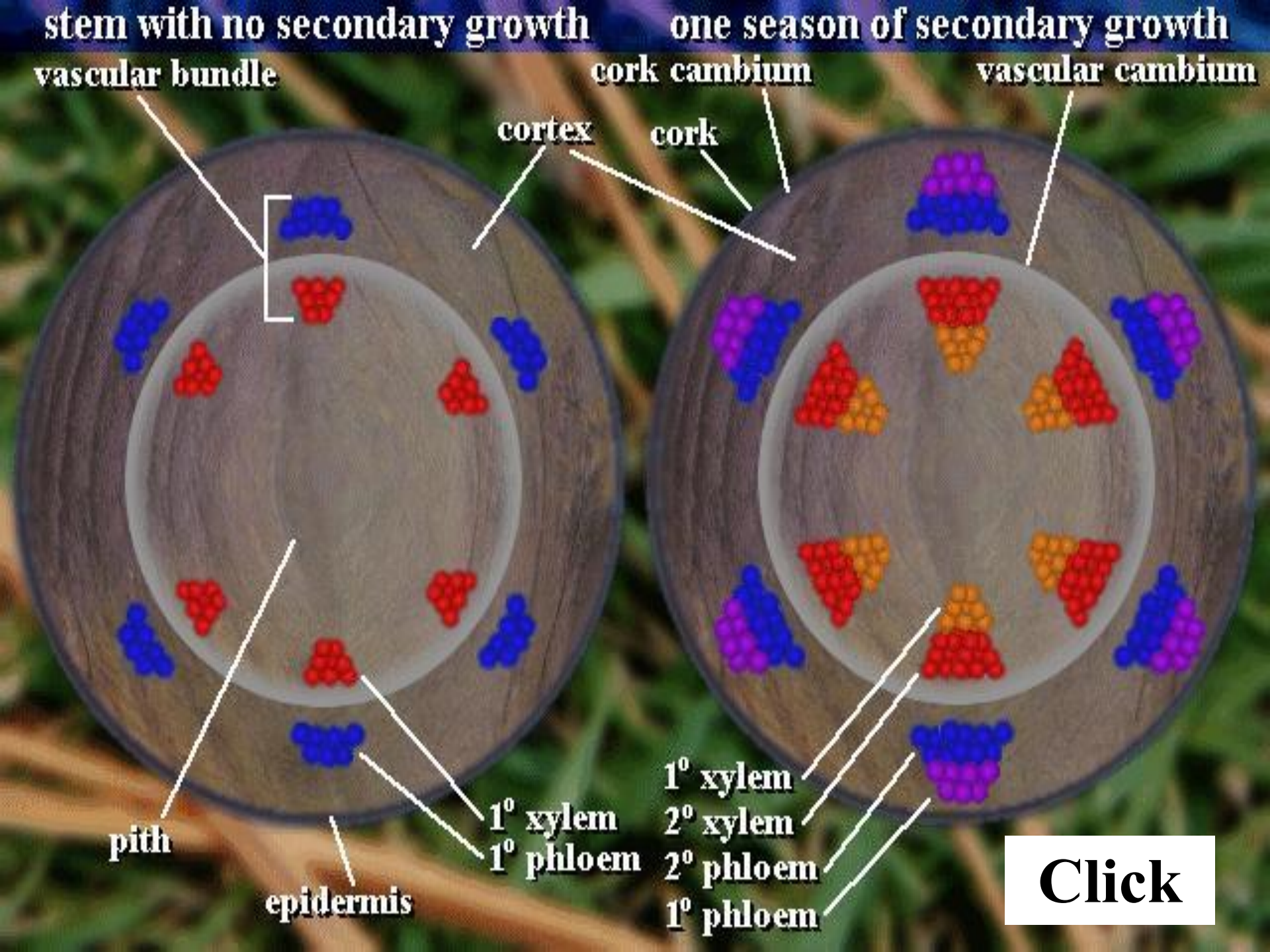
Herbaceous stems are soft and green. Plants with herbaceous stem live either 1 or 2 years.

In dicots,

- Vascular bundles are located at the core of the stem.
- The xylem and phloem vessels are separated by circular cambium layer.
- Xylem vessels are found near the core of the stem
- Phloem vessels are located in the outer portion of the stem.

In Monocots,

- They generally have herbaceous stem
- Vascular bundles are scottered.
- Each bundle contains xylem and phloem.
- There is no cambium between xylem and phloem vessels.
- Generally stem has chloroplast


stem with no secondary growth
one season of secondary growth
vascular bundle
cork cambium
vascular cambium
cortex
cork
pith
epidermis
1° xylem
1° phloem
1° xylem
2° xylem
2° phloem
1° phloem
Click

ROOT

- **The roots of plants are found underground.**
- **They anchor the plant in the soil and absorb water and minerals**
- **They transport water and minerals to the stem and other parts of plant.**
- **Roots have no leaves and chloroplast.**

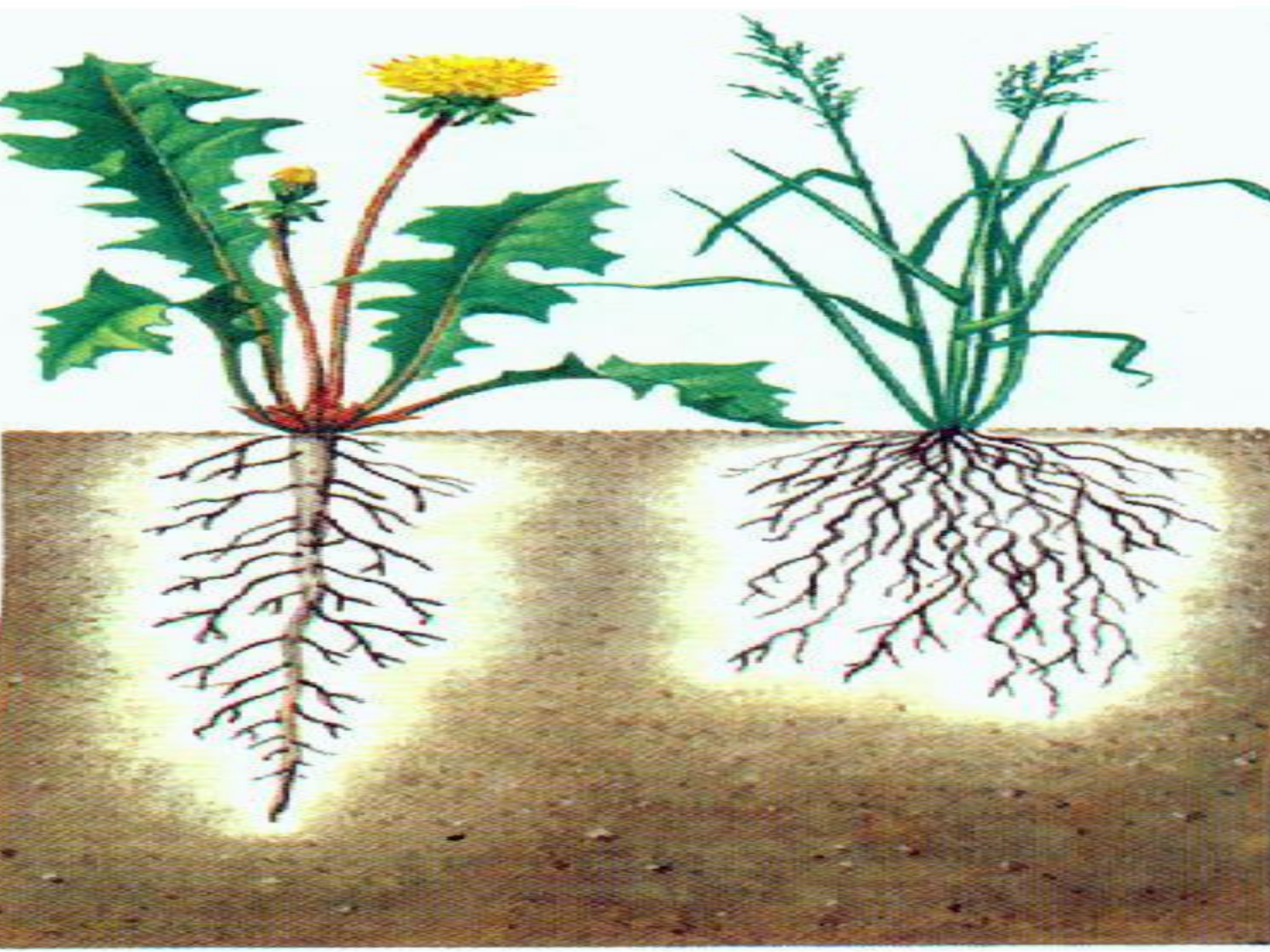
There are two types of roots:

TAP ROOT

It is found in dicots.

FIBROUS ROOT

It is found in monocots.



PARTS OF ROOT

1. Root Cap: It protects the tip of root.
2. Meristematic Zone:Root grows by this part.
3. Alongation Zone
4. Maturation Zone:It has root hairs.Root hairs increase surface area of root.

TRANSPORT OF ORGANIC AND INORGANIC MATERIALS IN PLANTS

TRANSPORTATION PARTS IN PLANTS

In plants, transportation of materials are provided by;

- **Xylem**
- **Phloem**

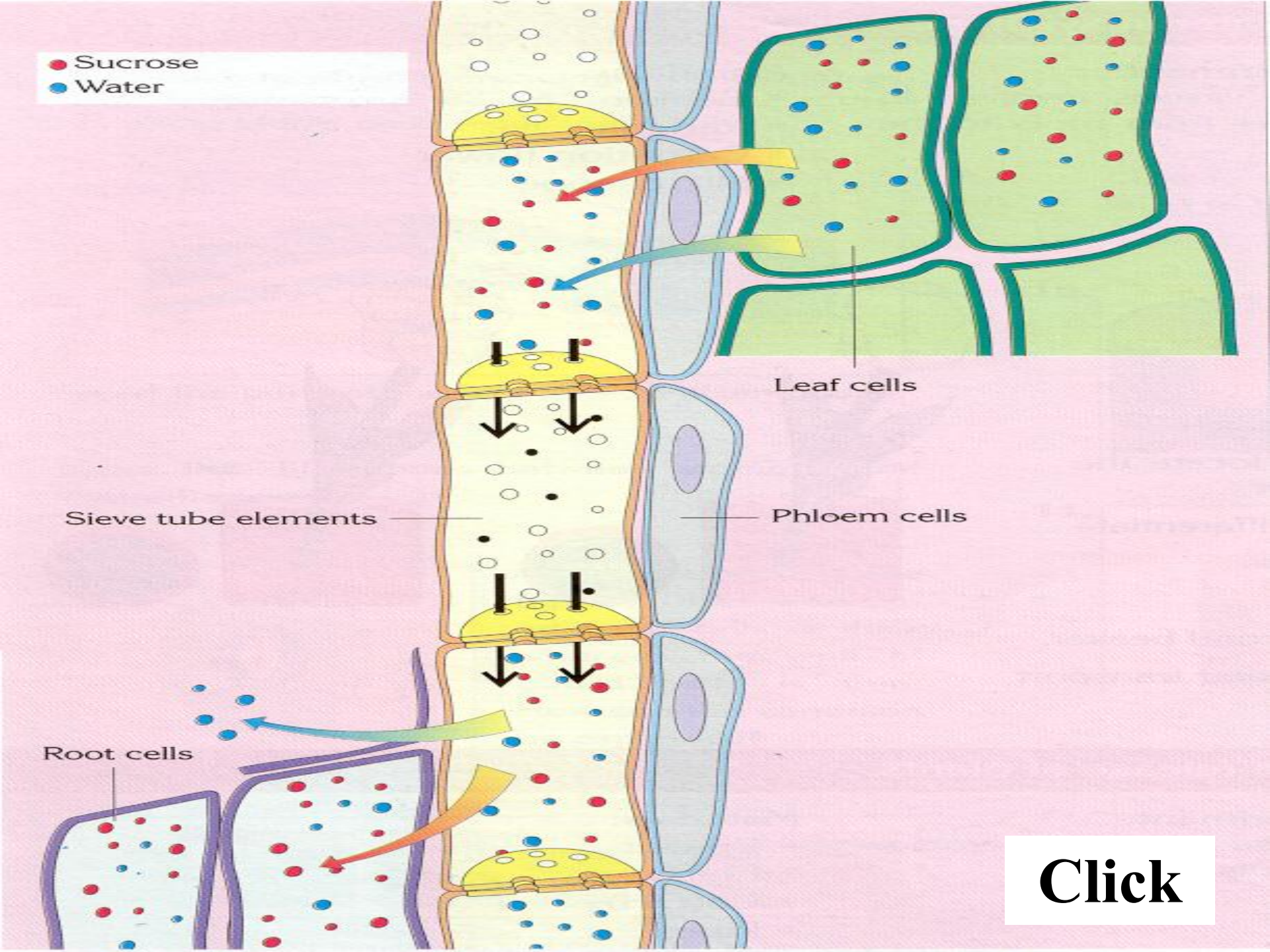
PROPERTIES OF XYLEM

1. Transport of water and minerals from roots to the stem and leaves
2. They are located at the core of the plant
3. They are composed of trachea, tracheids, schlerenchyma and parenchyma.
4. Their cells are non-living cells
5. There is no cell wall among of tracheids.
6. The rate of transportation is rapid in xylem.

PROPERTIES OF PHLOEM

1. Transport of glucose and other organic compounds from leaves to the stem and root
2. Transport of nitrogenous compound from root to the stem and leaves.
3. The rate of transportation is slower than the xylem.
4. Their cells are living.
5. Phloes is composed of two types of cells: Sieve and Companion cells.

6. Sieve cells contain cytoplasm but don't have nucleus at maturity.
7. The walls of sieve cells have many small openings.
8. Companion cells which contain both a nucleus and cytoplasm.
9. In sieve tube materials are carried by diffusion.


Sucrose
Water
Leaf cells
Sieve tube elements
Phloem cells
Root cells

Click

CAMBIUM

- **Phloem and xylem cells are produced by cambium layer.**
- **It increases diameter of stem.**
- **Cambium layer is found in dicot plants**

WATER AND MINERAL TRANSPORT

- Terrestial plants absorb water and minerals from the soil by means of their roots.
- In the root hair, inogranic and organic molecules are present at higher concentration.
- Water moves from the soil to the root by osmosis than it is transported by the xylem vessels.

Factors Effecting The Water Transport

1. Capillarity
2. Root Pressure
3. Transpiration-Cohesion Theory

CAPILLARITY

- Capillarity is the upward movement of liquid in a tube of narrow diameter.
- Xylem cells in plants form a system of tubes of very small diameters.
- Xylem capillarity can rise water only one meter above the ground.

ROOT PRESSURE

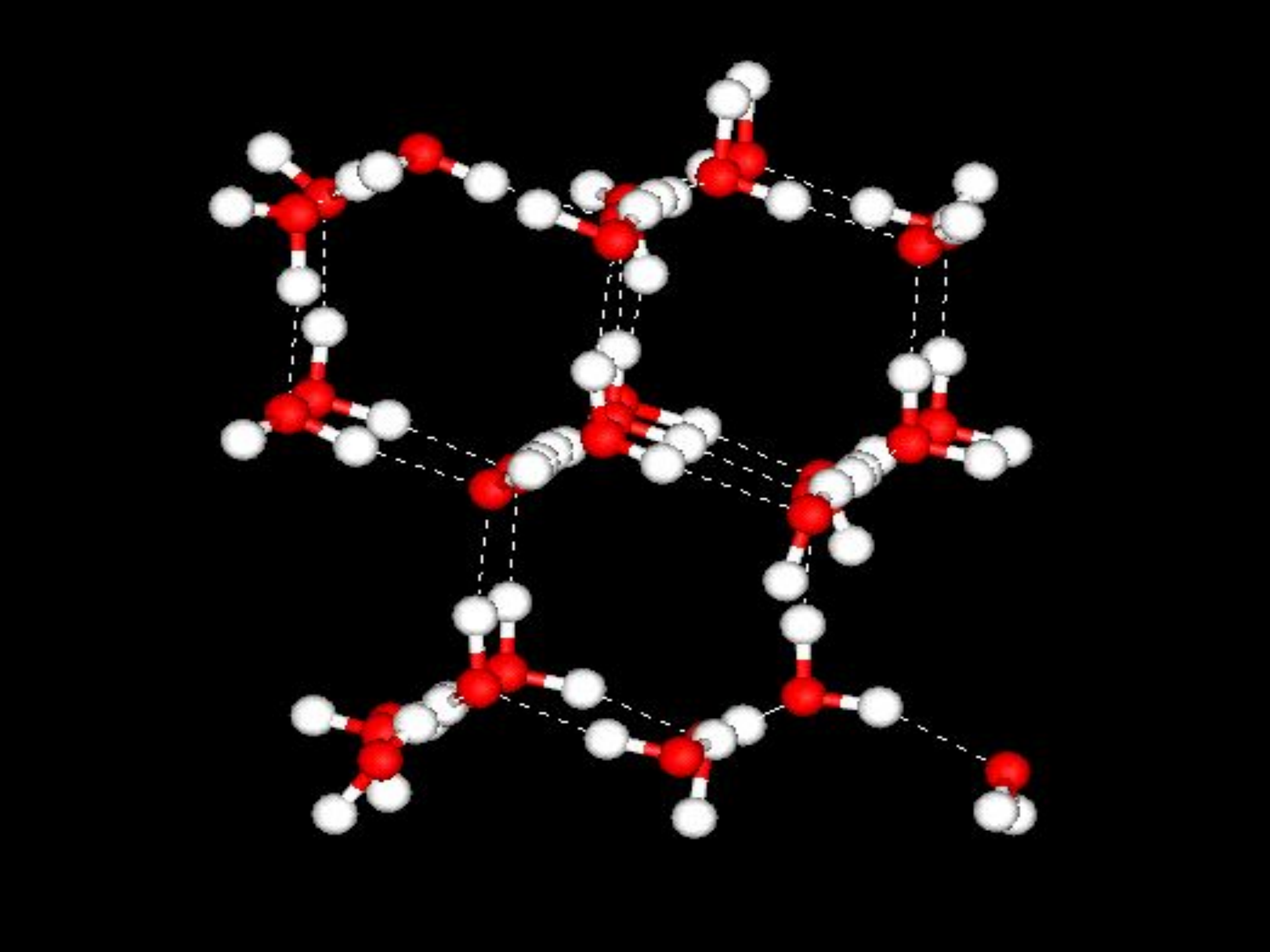
- Cytoplasm of the root cells has a higher concentration than the water in soil.
- This cause a high osmotic pressure in the root.
- This pressure drives the water into and up the xylem.

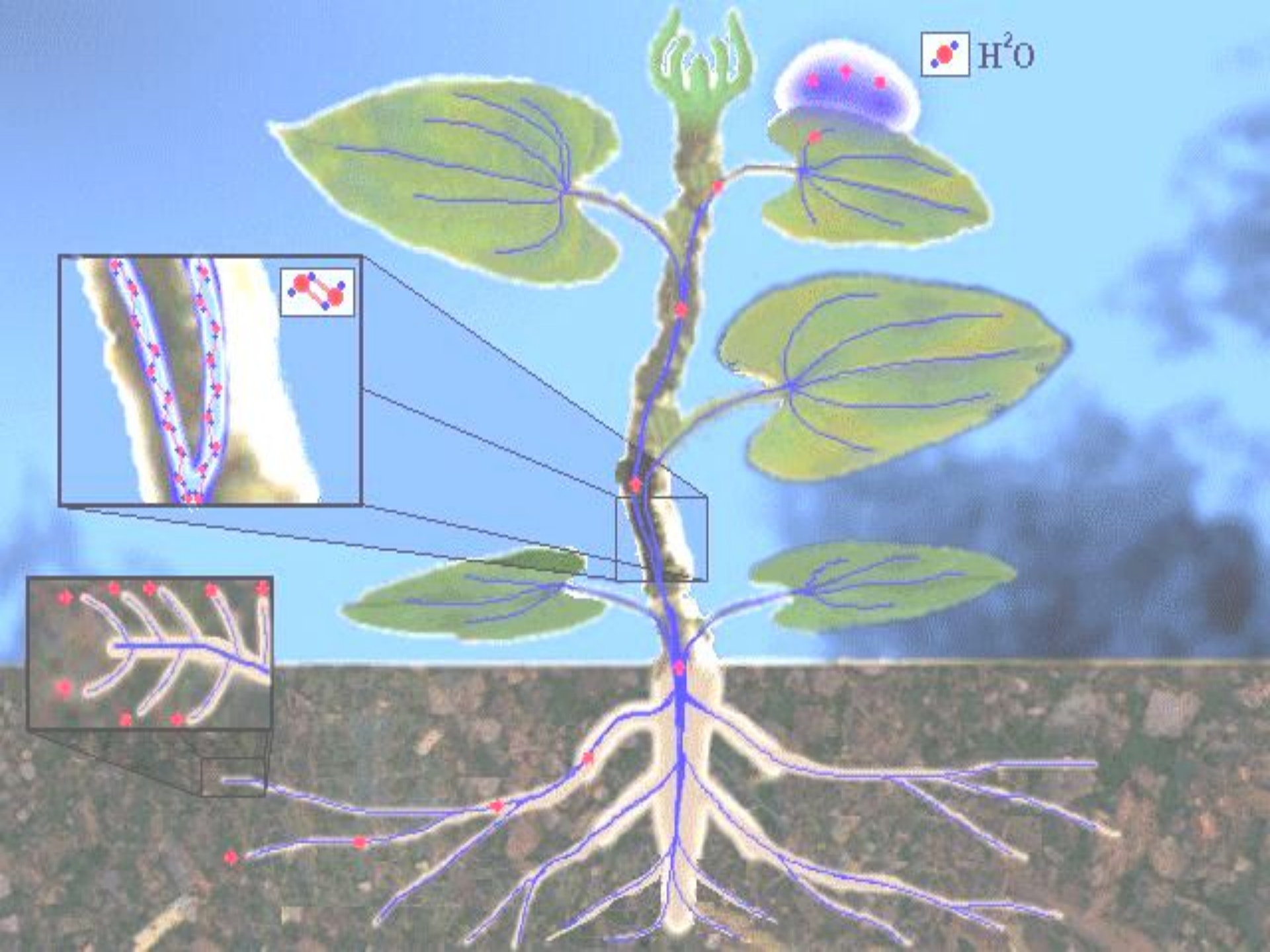
TRANSPIRATION-COHESION THEORY

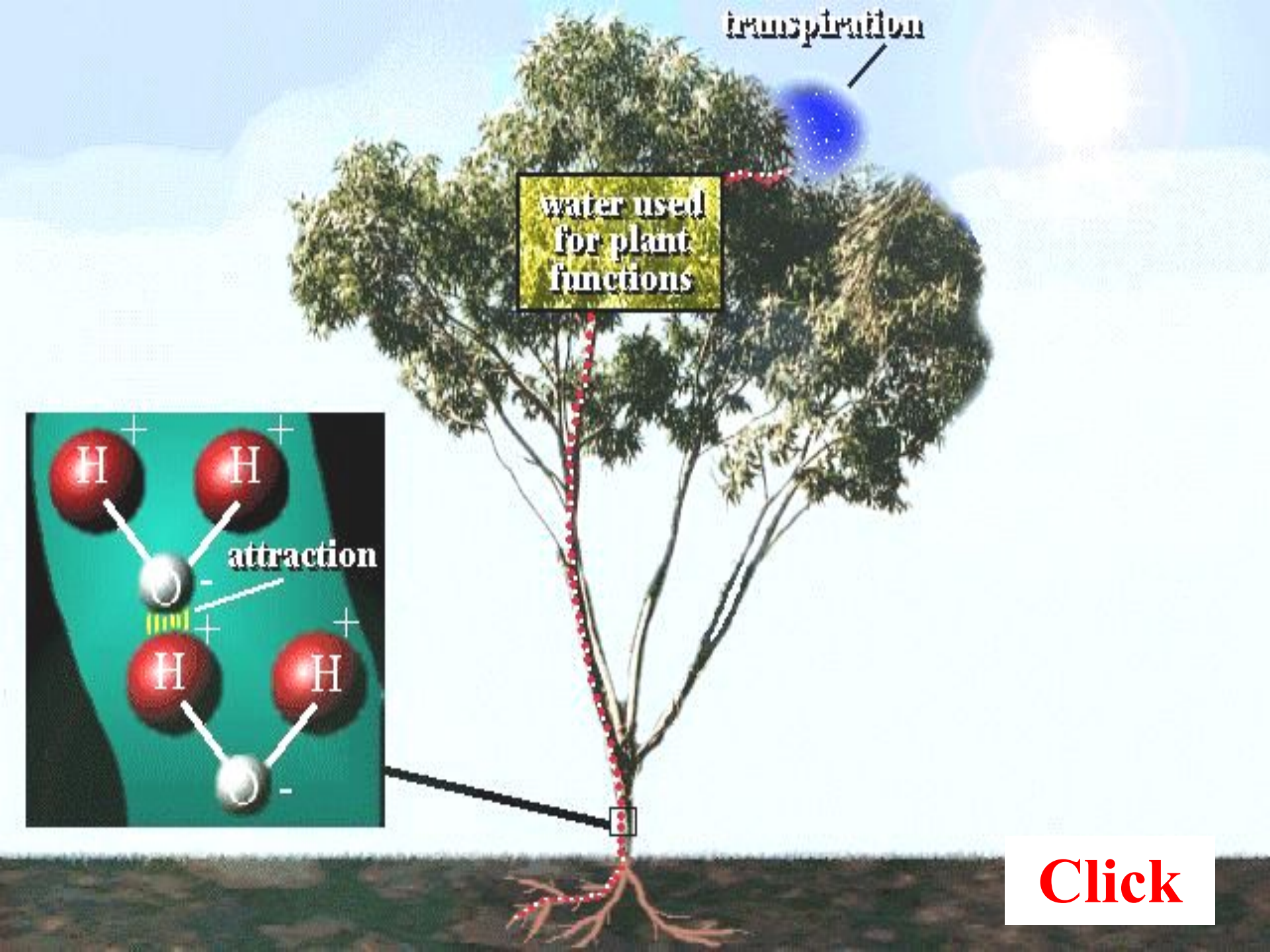
- According to the theory, the column of water is not broken because of the cohesion of the water molecules.
- There is a dendency for water to flow in to the leaves to replace the transpired water.
- Water will flow from the leaf veins into the leaf mesophyll.
- Water flows up the stem from the root.

COHESION

- Cohesion is an attactive force between identical or similar molecules.
- Water is carried to the tops of the tallest trees by means of transpiration-cohesion force.




H^2O


transpiration
water used for plant functions
H
H
O
attraction
H
H
O
Click

Click 1

Click 2