Biology Grade 11 summarized note

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April,2020

Cell Biology

4.1 Cell theory

By the end of this section you should be able to:

- **Tell the history of cell biology.**
- **Describe cell theory and investigate the size, structure and** shape of cells
- **State the basic functions of cells.**

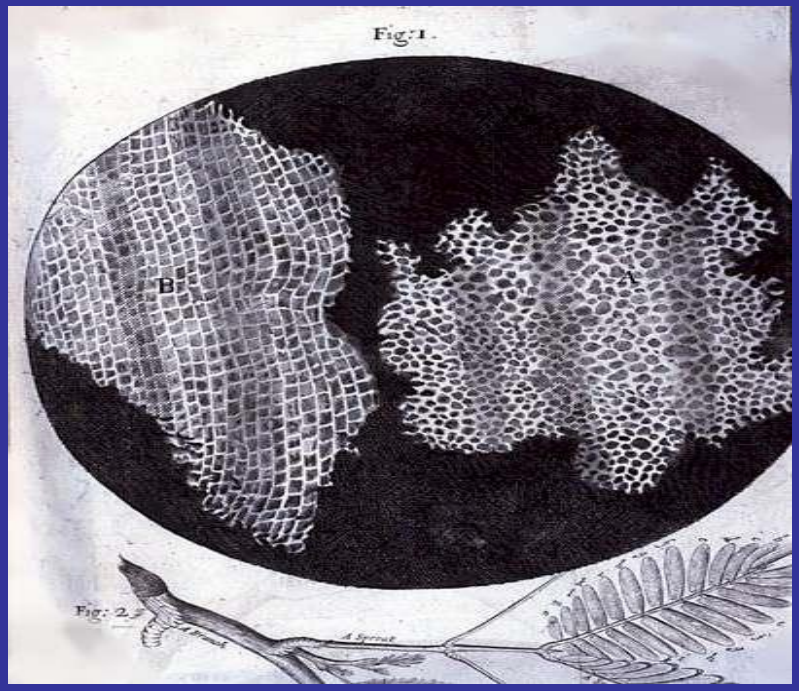
A timeline for the development of the cell theory

- **A) In 1665 Robert Hooke:-**
- **Saw tiny structures that he called ‘cells’ With one of the earliest compound microscopes, made drawings of cork.**
- **His microscope magnifies more than 30×, are very blurred and do not show much detail.**
- **Hooke saw only dead cells.**

1665 – Robert Hooke

Observed cells in cork.

Coined the term "cells”.



Cork Cells

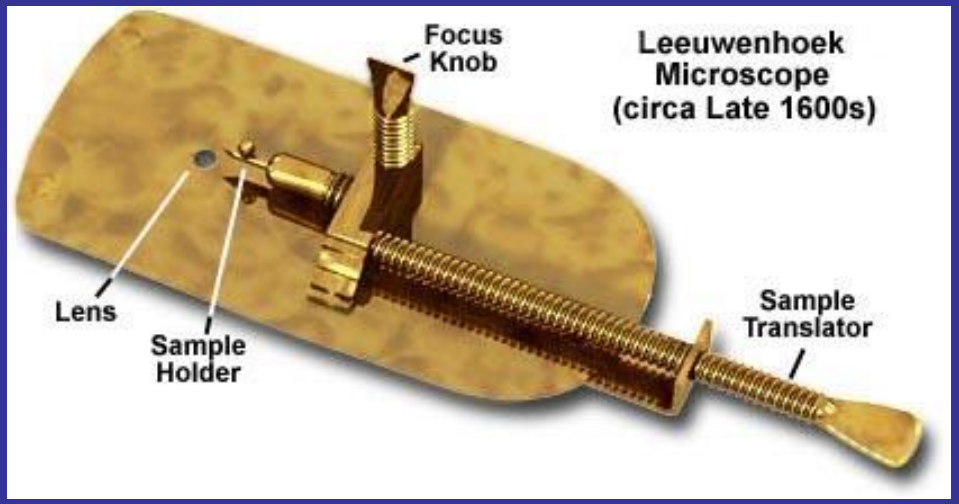


- **B) In 1674 Anton van Leeuwenhoek:-**
- **Observed living, moving unicellular organisms in a drop of water.**
- **He is used a simple microscope with only one lens.**
- **His microscope magnifies 300×.**
- **He called the moving organisms ‘animalcules’.**
- **He also observed bacteria (from his teeth), which he also called ‘tiny animalcules’.**

1673- Anton van Leeuwenhoek



Created a powerful microscope



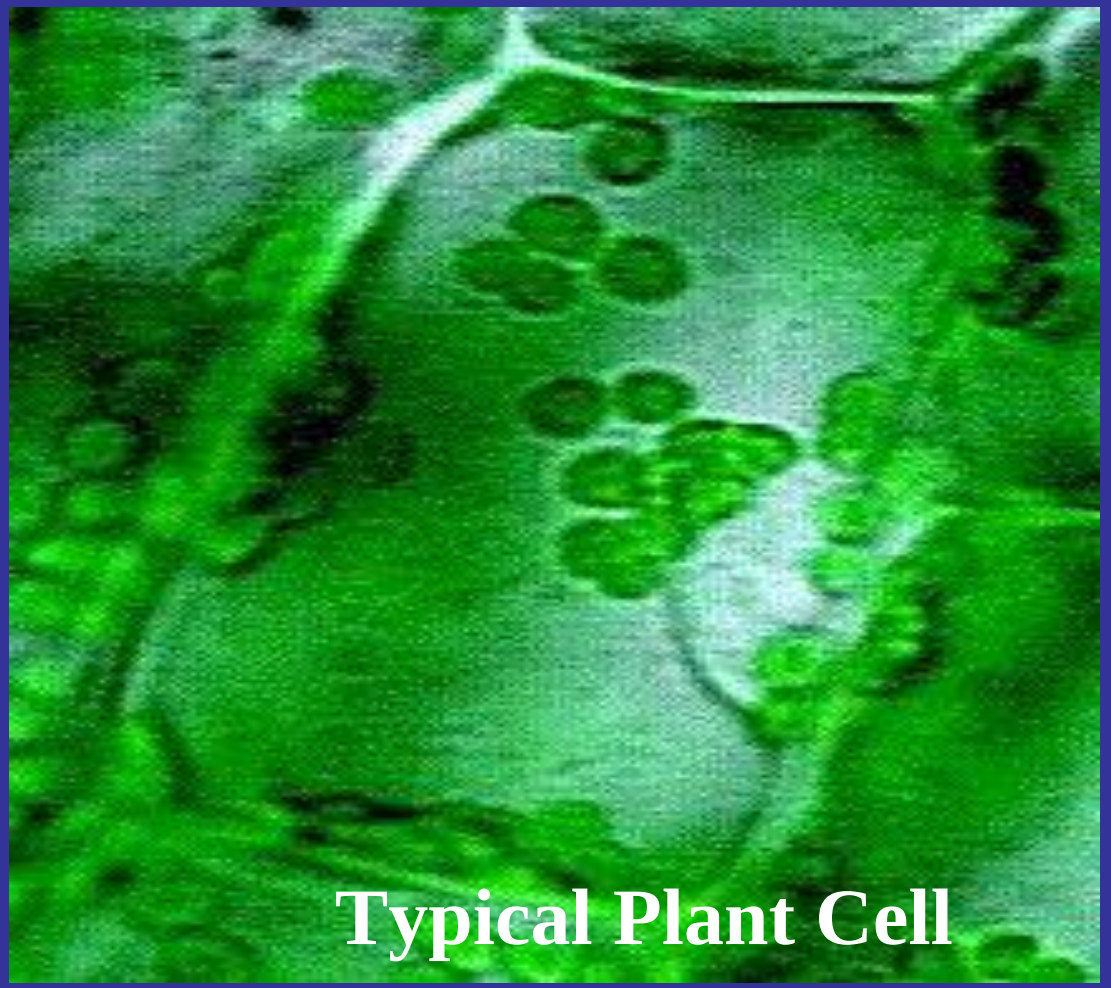
C) In 1824 Rene Dutrochet

- **The French biologist concluded that all organisms are composed of cells.**
- **He also discovered:**
  -The stomata in the epidermis of leaves.
  -The process of osmosis.
  -That chlorophyll is needed for photosynthesis to occur
  -Respiration occurs in both animals and plants. He also concluded that:
- **‘All growth occurs because of the increase in volume by the addition of more little cells’.**

E) In 1838 - Matthias Schleiden

-A botanist who concluded that all plants are made of cells.





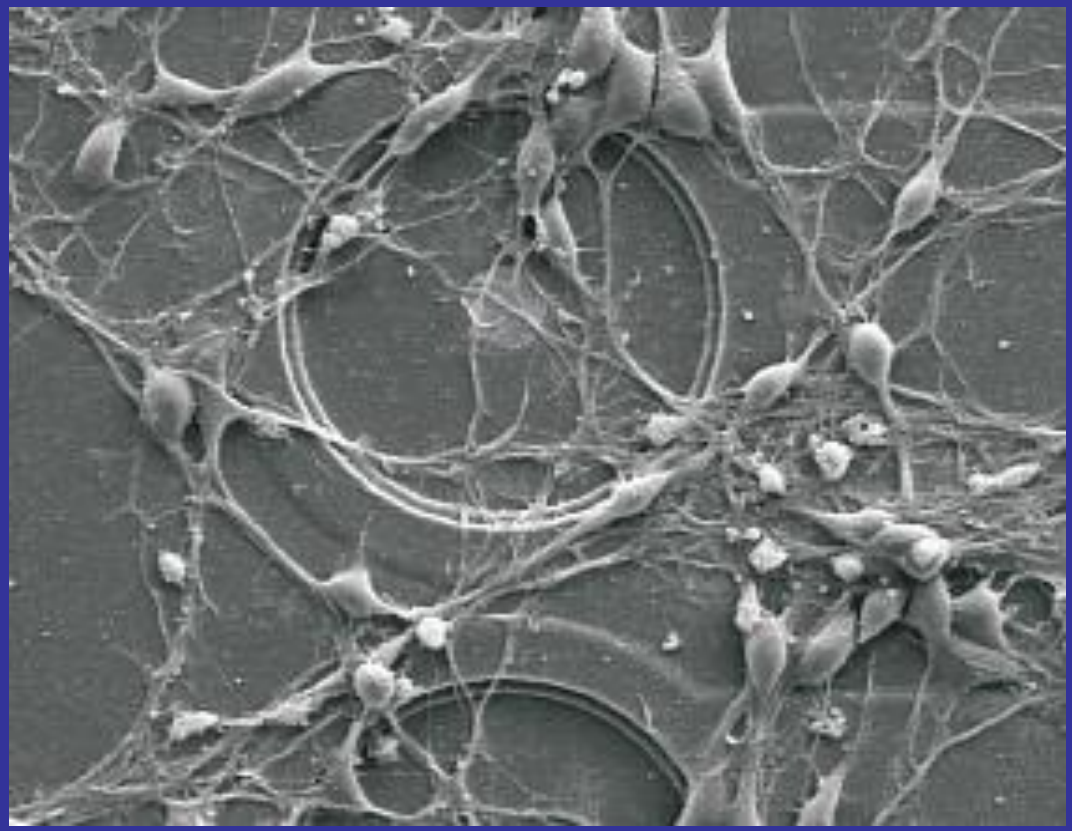
Typical Plant Cell

F) In 1839 - Theodor Schwann

-A zoologist who concluded that all animals are made of cells.



Theodor Schwann



Nerve Cells

- **Matthias Schleiden and Theodor Schwann put forward the first clearly stated cell theory(1839).**
- **It states that:-**
  -The cell is the unit of structure, physiology and organization in living things.
- **The cell retains a dual existence as:**
  – a distinct entity, and
  – a ‘building block’ in the formation of organisms
- **Cells form by free cell formation**

G) In 1855 - Rudolf Virchow

A physician who did research on cancer cells and concluded "Omnis cellula e cellula".

"All cells come from other pre-existing cells."



- **Rudolf Virchow...**
- **He completes the first accepted version of the cell theory:**
  -All organisms are made up of one or more cells.
  -All cells come from pre-existing cells.
  -The cell is the unit of structure, physiology and organisation in living things.

-The cell retains a dual existence as a distinct entity and a building block in the construction of organisms

The modified and extended cell theory:

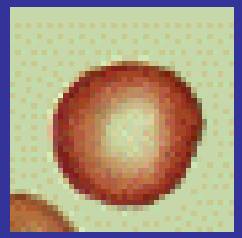
- All known living things are made up of cells
- The cell is a basic structural and functional unit of all living things.
- All cells come from pre-existing cells by division.
- Cells contain hereditary information which is passed from cell to cell during cell division.
- All cells have basically the same chemical composition

Questions

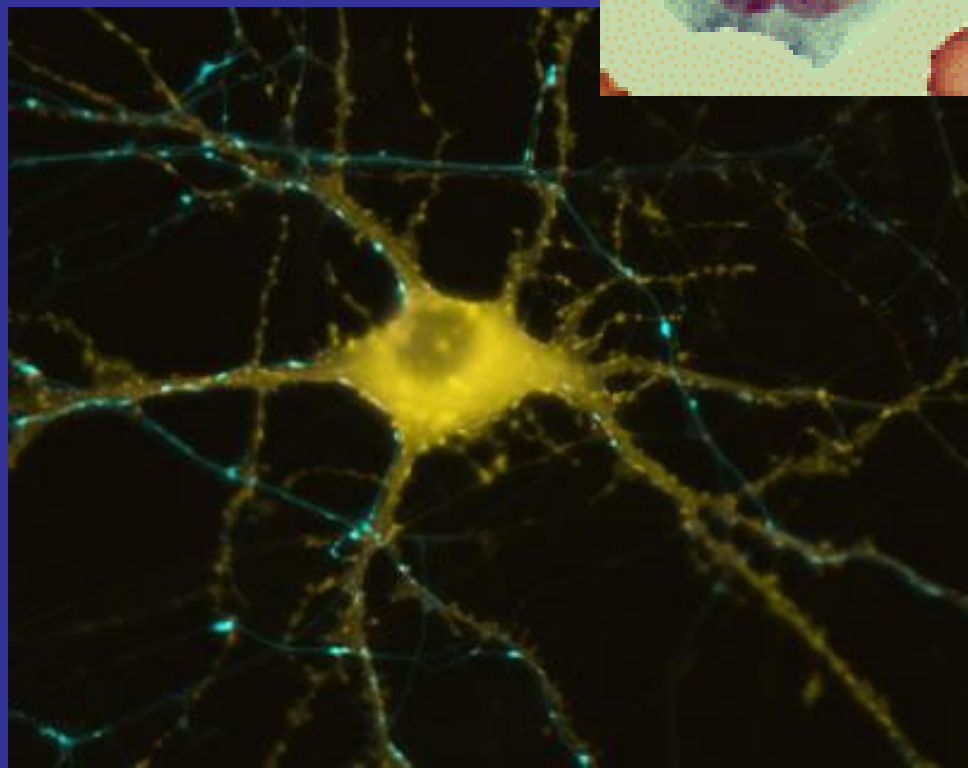
- Name the scientist who saw living cells for the first time.
- Can you mention two statements from modern cell theory?

Cells are Diverse…

In size, shape, and internal organization.









How big are cells?

- A chicken's egg is just one huge cell up to 5 cm (0.05 m) in length.
- The smallest bacterial cells are only just over 100 nm in length.
- This is approximately one hundred-thousandth of the size of the chicken's egg.
  -That's quite a range of sizes!
- It all depends on which cells can you measure

- **There are 3 smaller units commonly used:**
- **a) Millimetres (mm) – 1/1000 of a metre**
- **b) Micrometres (µm) – 1/1000 of a millimetre, and 1/1 000 000 of a metre**
- **c) Nanometres (nm) – 1/1000 of a micrometre, 1/1 000 000 of a millimetre, and 1/1000 000 000 of a metre**
- **Our red blood cell that is 0.000007 m in diameter is 0.007 mm** or **7 µm in diameter.**
- **This is a much more comprehensible number**

- **We can convert the units from one to another as shown below:**

- **To convert a larger unit to the next smaller unit, multiply by 1000: E.g: convert 3.5 mm to μm. 3.5 mm = 3.5 × 1000 = 3500 μm**
- **To convert a smaller unit to the next larger unit, divide by 1000: E.g:-Convert 87 nm to μm. 87 ÷ 1000 = 0.087 μm**