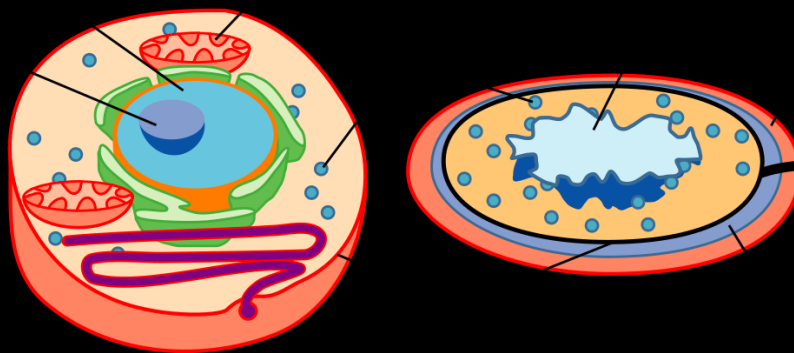


These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Cell: An Introduction



- Dr. Manishika Jain, NTSE Scholar, UGC NET JRF, CSIR NET JRF
Gold Medalist, Jawaharlal Nehru University, Delhi

Introduction

- Lamarck: no body can have life, if no cells
- Cytology: Study of form, structure & composition of cell
- Cell Biology: Deals with structure, chemistry & functioning of cell
- Unicellular: Amoeba, bacteria, yeast, acetabularia – independent existence & perform all essential functions
- Multicellular: made of many cells (new born infant - 2×10^{12} cells to 100 trillion in 60 kg man)
- Large organism – not have large-sized cells but more cells

These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Cell

- Structural unit
- Functional Unit
- Building blocks
- Smallest unit capable of independent existence
- Totipotent: Single cell can form whole organism
- Cell → Tissue → Organ → Organ System (division of labour)
- Pasteur – life originates from life
- Haeckel – nucleus stores and transmits hereditary

Microscope

- 1st by Zacharias Janssen – 1590
- Modified by Galileo
- Then by Robert Hooke – new microscope – study of cork cells
- Hooke – book – Micrographia- honey comb structure called it cellulae
- Malpighi – called it saccules & utricles
- Leeuwenhoek – 1st to observe, describe & sketch free living cell
- Robert Brown – disc. nucleus in cell
- Dujardin – living semifluid substance as sarcode
- Purkinje & von Mohl – called sarcode as protoplasm
- Schwann – disc. cell membrane
- Nageli & Cramer – named it as cell membrane

These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Cell Theory

- By Schleiden & Schwann
- Schwann – animal cells don't have cell wall
- Organism made of cells
- Cells are units of structure and function of living organisms
- New cells from pre-existing cells
- Each cell has protoplasm
- All cells are alike in chemistry & physiology
- Activity of organism are sum total of activities of cell

Modern Cell Theory or Cell Doctrine

- All living beings have cells
- Cells are units of structure & function
- Cell can survive independently, organelle cannot
- Cells have fundamental similarity
- Life exists in cells
- Cells can be modified (elongated in muscle & nerve cell)
- Cell grows & multiplies
- Life passes to next generation as cell
- New cells from pre-existing cells
- All cells have common ancestry
- Cells are totipotent
- No organism can have activity that is absent in its cell

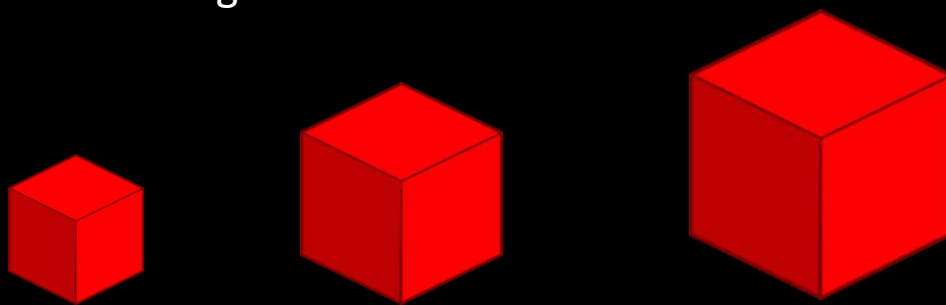
These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Objections to Modern Cell Theory

- Virus are acellular
- Some organisms – body is not differentiated in cells (e.g. rhizopus)
- Protozoa have uninucleate differentiated body
- Bacteria & cyanobacteria don't have nucleus
- RBCs & sieve tube cells are without nucleus
- In skin & cork – protoplasm is replaced by nonliving material

Surface Volume Ratio

- Small cells – higher surface volume ratio



These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Types of Cells

- Undifferentiated / Stem Cells: Unspecialized and have power of division – stem apical meristem
- Differentiated / Post-mitotic Cells: Specialized for better organization and avoid duplication
- Dedifferentiated Cells: Differentiated cell which revert to undifferentiated state and loose specialization - cork cambium of plant, healing of wound, regeneration in animals and vegetative propagation in plants

Compartmentalization of Cellular Life

- Separation from extracellular medium
- Selective permeability
- Accumulation
- Interconnections
- Recognition
- Communication & exchange
- Intracellular compartmentalization

These Slides Accompany the YouTube Video Tutorial:
<https://www.youtube.com/watch?v=nL6KKmG7wLQ&index=1>

Cell Sizes

- Smallest cell – Mycoplasma
- RBC is $7\ \mu\text{m}$ in diameter
- Lymphocytes are $6\ \mu\text{m}$
- Kidney, liver and intestine are $20\text{-}30\ \mu\text{m}$
- Longest human cell – nerve cell of $90\ \text{cm}$
- Egg cells are large sized cells – store food for embryo
- Avian eggs are largest

Cell Shapes

- Surface cells – flat
- Cortex – polygonal
- RBC – biconcave
- Nerve cells – long
- Sperms – tail for mobility

Prokaryotic & eukaryotic cells (to be discussed in next lesson)