

# Journey To "Cosmos" of the Cell

**Course is divided into three (3) parts:**

- 1) Cell and Molecular Biology
- 2) Cell Reproduction & Genetics
- 3) Homeostasis & Physiology

**three Unifying Concepts .i.e., Unity of Life**

**Cell Doctrine      Evolution      Bioenergetics**

## 1. Cell Theory...

1665 - 1st cells described by R. Hooke [cork]

1670 - Marcello Malphigi plant tissues may be cellulars

1805 - Lorenz Oken claims all organisms consist of cells

1839 - Cell Theory formally proposed...

Matthais Schleiden & Theodor Schwann

1858 - Rudolph Virchow: paradigm of the cell theory...

"All cell arise from pre-existing cells"

thus: **1) all individuals derived from a single cell** (egg cell)  
**2) all organisms are related genetically**

Some important facts about cells :

diverse :      many sizes, shapes, and types (165+ in humans)

similarities: have same basic structural plan

- surrounded by cell membrane
- contain nuclei      (bacteria = genophore)
- similar sub-cell parts (ORGANELLES)
- all contain same macromolecules

## 2. EVOLUTION... "Descent with modification"

1858 Charles Darwin & Alfred Russell Wallace...

2 new ideas about biological patterns in the natural world

...argue all species (past & present) descended from  
common ancestor

...hypothesize all species come from preexisting species &  
they change through time

...individuals in a population vary in heritable traits...

- result in vast biological diversity we see in

Living things change gradually over time and

change from one form .....> become new forms...  
to another form

### MECHANISM of EVOLUTION -

via **Natural Selection** (SURVIVAL of FITTEST)

- individuals in a population vary in heritable traits...
- some traits help individuals survive better & reproduce more
- Natural Selection picks individuals better fit to a specific environment...

only those with superior traits .. (physical, behavioral,  
biochemical) are more likely to survive and REPRODUCE.

**UNITY** comes from fact that all living things  
evolved by same rules, the Laws of Evolution

### 3. BIOENERGETICS - EQUILIBRIUM THERMODYNAMICS...

Science of energy flow and transformation

within, through, and between organisms...

"cells do not produce energy - they consume energy"

**UNITY** comes from fact that the **mechanisms & processes** of energy change & flow in cells are **NOT different**, but are the SAME, among different life forms,

Metabolic pathways used by cells are all the same in bacteria, plants and animals

glycolysis,

Krebs's cycle,

oxidative phosphorylation, &

photosynthesis.

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**CELL** is functional unit of life and all living systems

**CELL THEORY** is to Biology as Atomic Theory is to physics

**a Definition of a Cell :**

A particular organization of matter, bounded by a selectively permeable membrane, that is capable of self-reproduction, without the presence of other living organism (eliminates viruses).

"Living organisms are composed of inanimate molecules... and nothing is alive in a cell except the whole of it?"

Matrin Olomucki (1993) The chemistry of life. NY, McGraw Hill