What is biology?
The study of living things

Origins of word “biology” Biology (Greek or Latin origin)

Bios = life

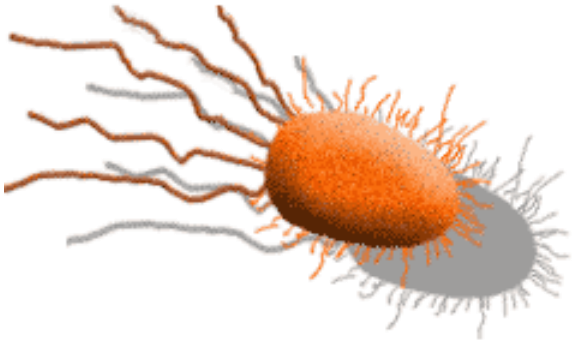
Logos = study of

All living things share certain characteristics

- تصنيف الكائنات الحية

Prokaryotes – The first Cells

- Cells that lack a nucleus or membrane-bound organelles
- Includes bacteria
- Simplest type of cell
- Single, circular chromosome



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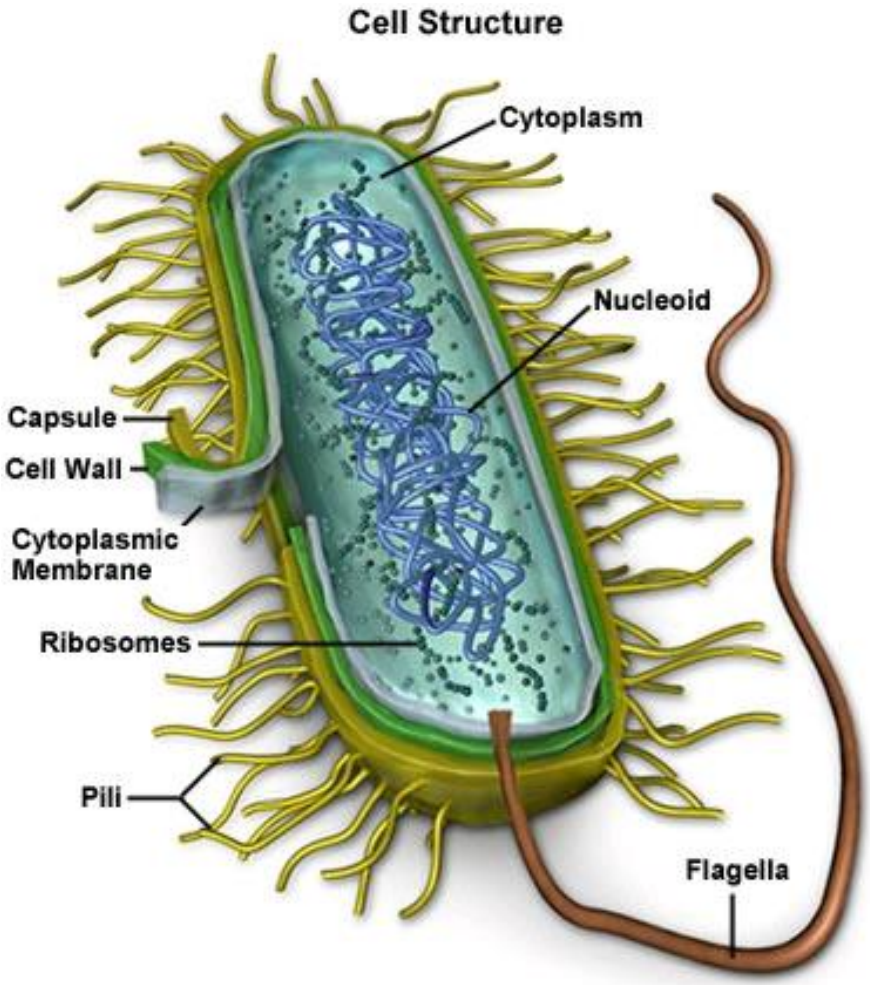
Prokaryotes

- **Nucleoid region** (center) contains the DNA
- Surrounded by **cell membrane & cell wall (peptidoglycan)**
- Contain **ribosomes** (no membrane) in their cytoplasm to **make proteins**



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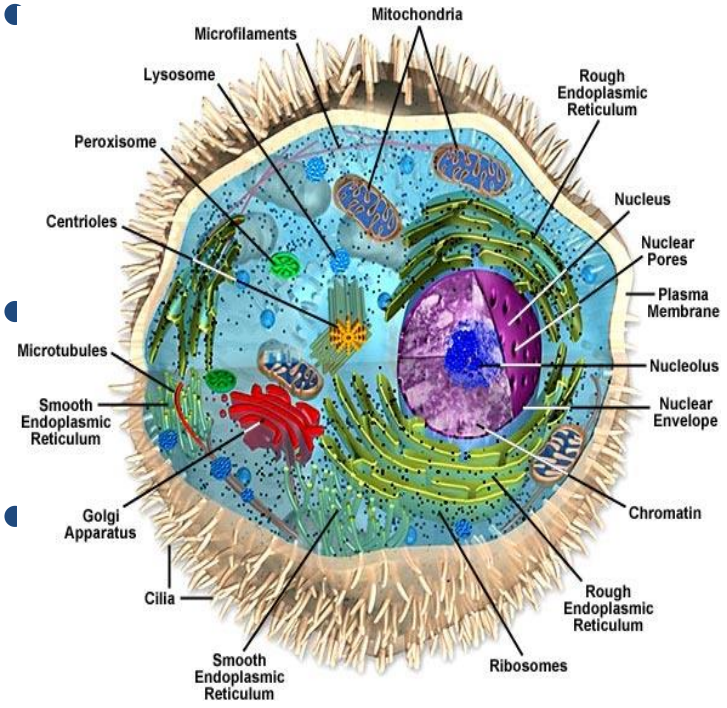
Eukaryotes

- Cells that HAVE a nucleus and membrane-bound organelles
- Includes protists, fungi, plants, and animals
- More complex type of cells



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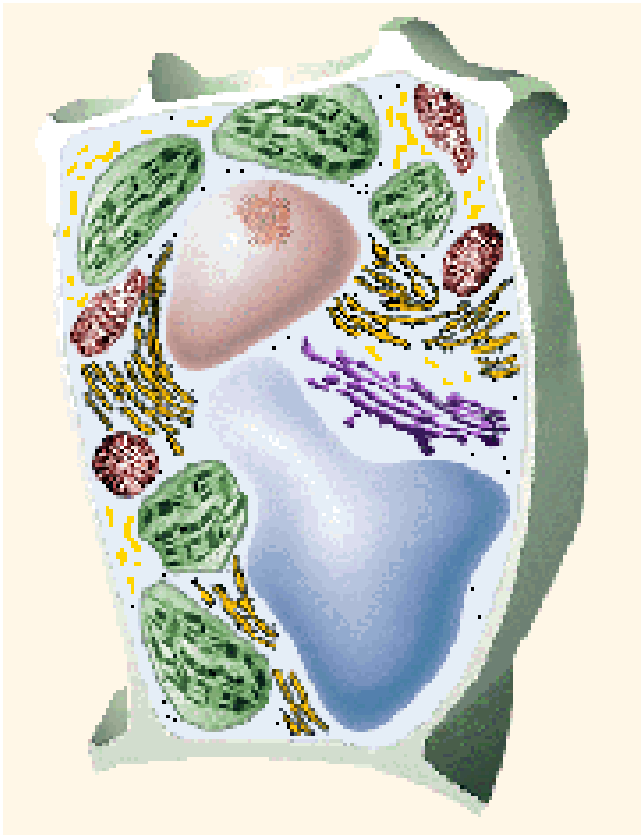
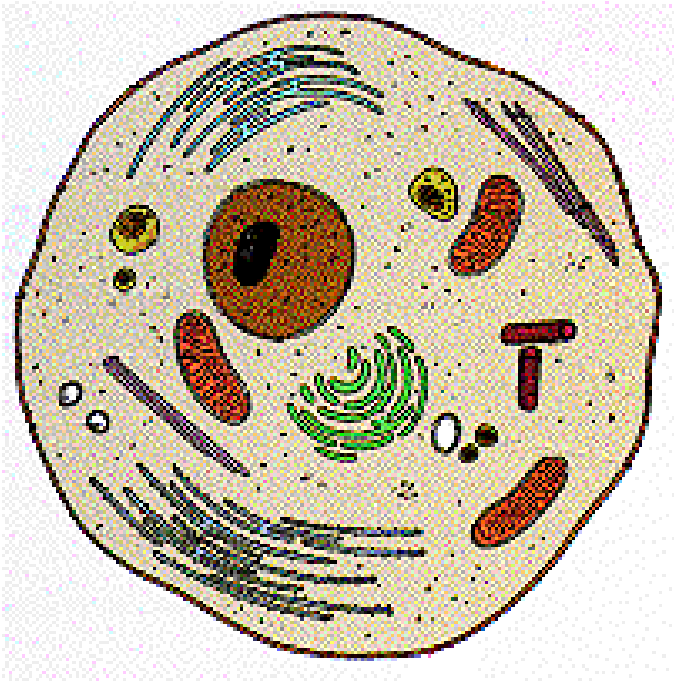
Two Main Types of Eukaryotic Cells



Plant Cell



Animal Cell

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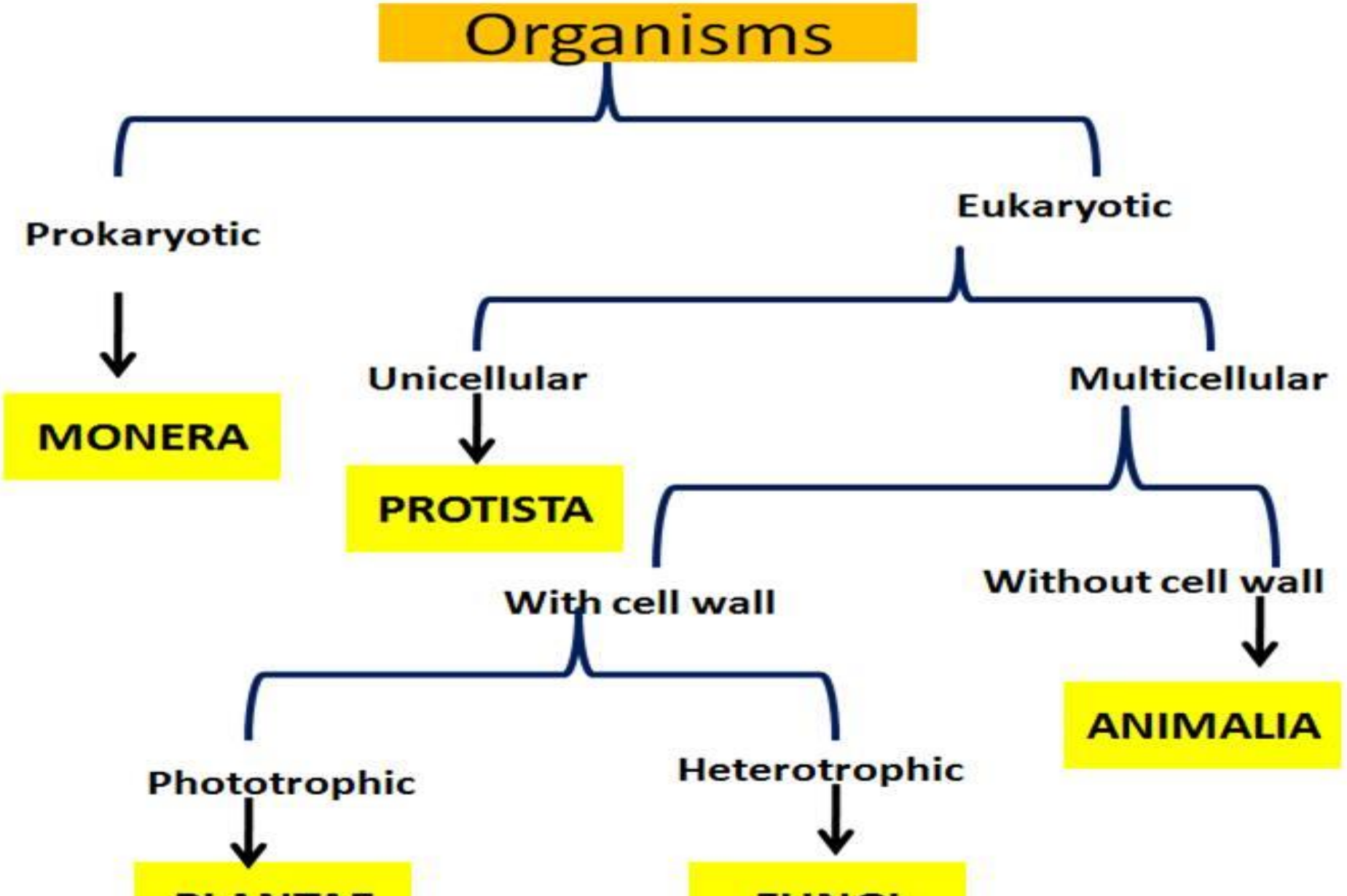
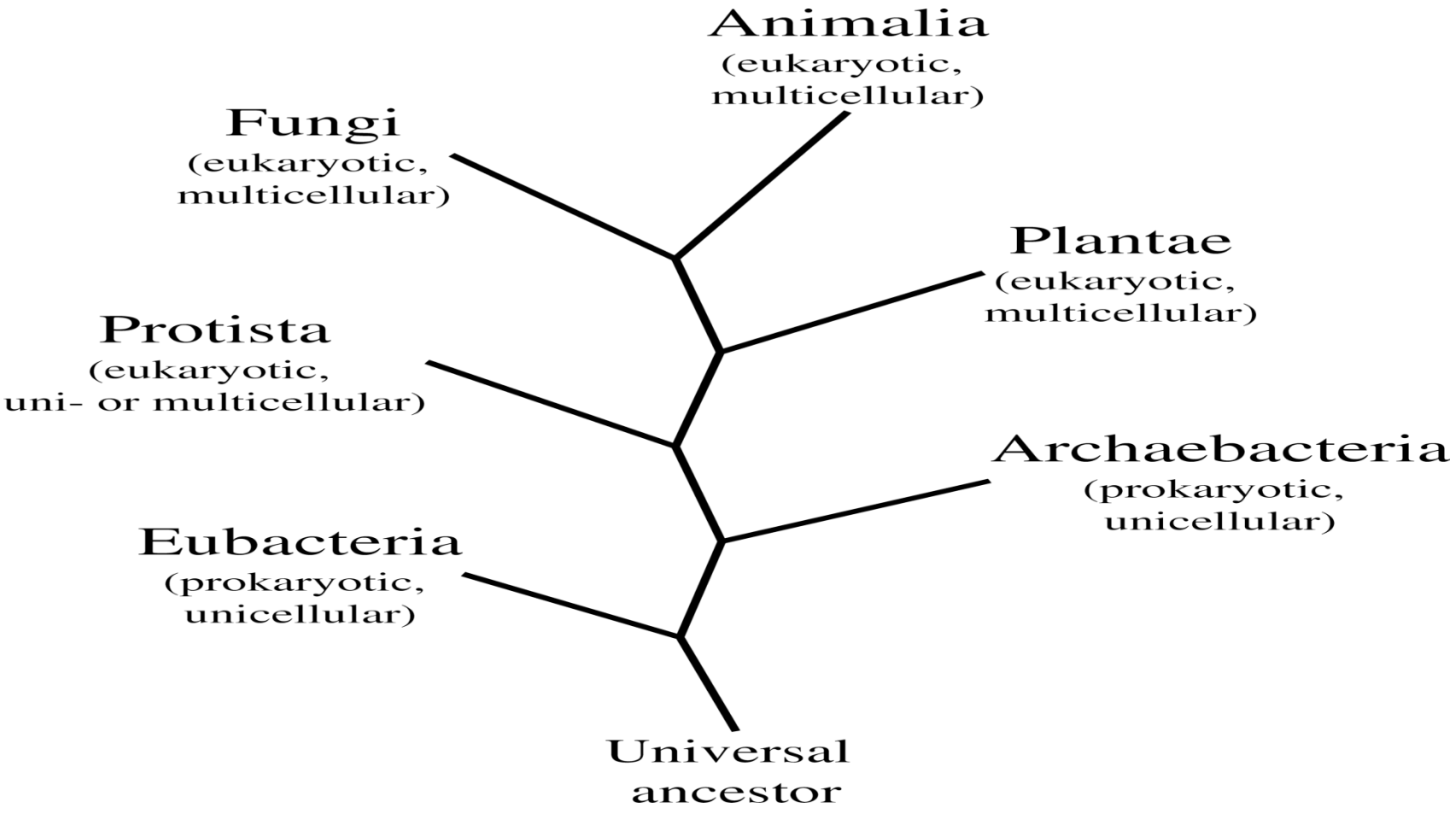
Robert H. Whittaker (1969)



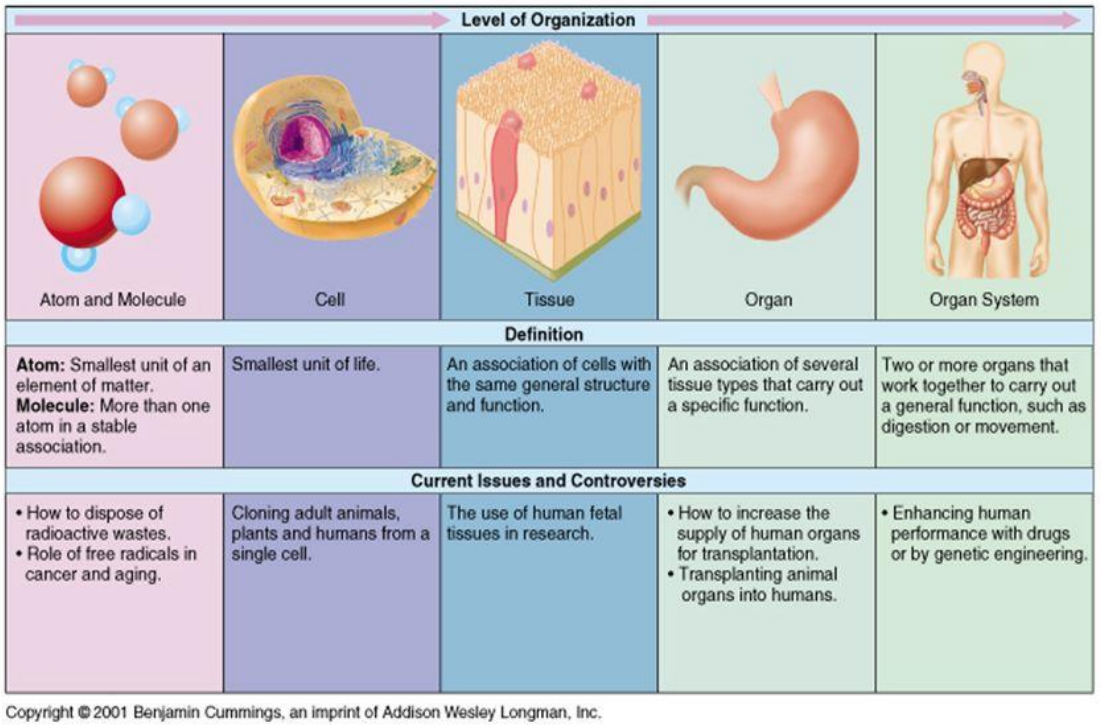
تصنيف الممالك الستة للكائنات الحية



مستويات التنظيم في الكائنات الحية

Levels of Organization:

CELLS → TISSUE → ORGAN → ORGAN SYSTEM → ORGANISM



Level of Organization				
Atom and Molecule	Cell	Tissue	Organ	Organ System
Definition				
Atom: Smallest unit of an element of matter. **Molecule:** More than one atom in a stable association.	Smallest unit of life.	An association of cells with the same general structure and function.	An association of several tissue types that carry out a specific function.	Two or more organs that work together to carry out a general function, such as digestion or movement.
Current Issues and Controversies				
• How to dispose of radioactive wastes. • Role of free radicals in cancer and aging.	Cloning adult animals, plants and humans from a single cell.	The use of human fetal tissues in research.	• How to increase the supply of human organs for transplantation. • Transplanting animal organs into humans.	• Enhancing human performance with drugs or by genetic engineering.

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مستويات التنظيم في الكائنات الحية

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Lower Level of Organisation

Atomic and molecular levels
Molecules are made of atoms of elements like carbon, nitrogen, hydrogen, sulphur. These non-living things combine to form **protoplasm** which is living matter of cell.

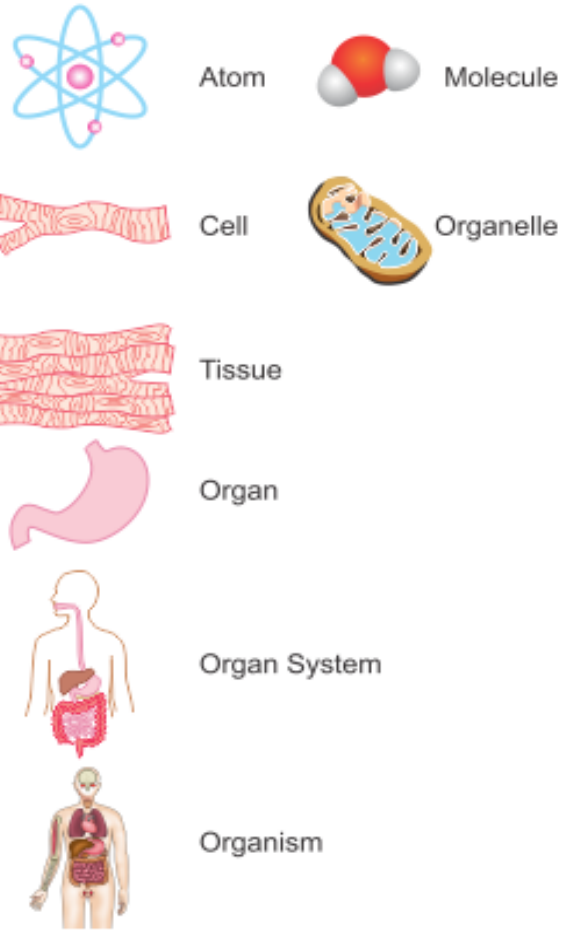
Cellular level
All living things are made up of cells. These are structural and functional unit of life.

Tissue level
The cells organized to form tissue. A tissue is a group of cells which are similar in structure and a specific function.

Organ level
Many tissues combine to form an organ, which performs a particular function.

Organ system level
Group of organs work together to perform life activities. e.g. the organs of digestive system work together to digest food.

Organism level
Several organ systems together to form a multicellular organism. The different organ systems work together to keep the organism alive.



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OR2

All Living Things…

1. Are made of cells
2. Use matter & energy
3. Maintain homeostasis
4. Grow & Develop
5. Reproduce
6. Have DNA
7. Respond to their environment
8. AS A GROUP, living things evolve, (change over time)

مميزات الكائنات الحية (الصفات المشتركة)

All living things share some basic properties.

- ✓**Cellular Organization**
- ✓**Reproduction**
- ✓**Metabolism (Obtain and Use Energy)**
- ✓**Homeostasis**
- ✓**Heredity**
- ✓**Responsiveness**
- ✓**Growth and Development**
- ✓**Adapt Through Evolution**

الصفات المشتركة للكائنات الحية

Characteristics of Life

All living things exhibit:

1. GROWTH & DEVELOPMENT
- *get bigger, more complex, or develops in some way*

2. ENERGY METABOLISM
- *eat, breathe, excrete waste; energy usage*

3. HOMEOSTASIS
- *maintain a relatively controlled internal environment*

4. ADAPTATION
- *adjust over time due to mutation and natural selection which improves survival*

5. RESPONSE TO STIMULI
- *respond to things in their external environment (often as movement)*

6. ORGANIZATION
- *made of one or more cells with complex structures and chemical processes*

7. REPRODUCTION
- *generate offspring; DNA provides the blueprint*

1. Made of 1 or more cells

- ***Unicellular*** (one cell)
  - ex. Bacteria
- ***Multicellular*** (many cells)
  - ex. Animals, plants

2. Need energy to survive

- ***Autotrophs*** - get energy from sun
- ***Heterotrophs*** - get energy by consuming nutrients from their environment




3. Respond to stimuli in their environment

- ***Stimuli*** - factors in the environment that living things react to (ex. Light, temperature, sound, etc.)

4. All living things reproduce

Sexual - two sex cells required (sperm and egg)

Asexual - only one parent cell is needed

5. Grow and develop

- Each cell divides to make new cells (cell division) – results in growth
- Some cells become specialized and perform different jobs than others (differentiation)

6. Maintain homeostasis

- ***Homeostasis*** – a relatively stable internal environment (within a certain range)

  - (ex. Human body temperature (approximately 98.6 degrees F))

7. Have a universal genetic code

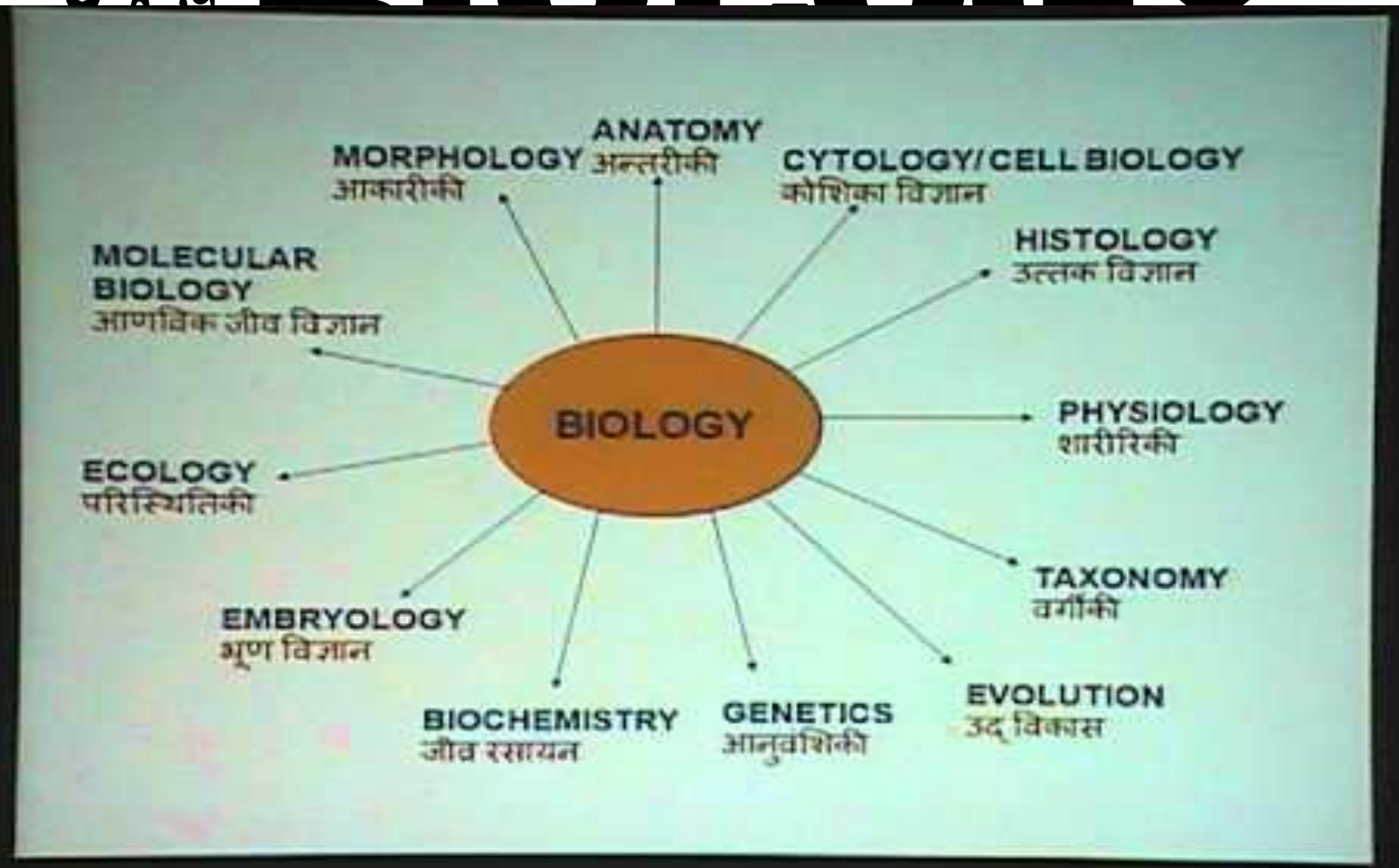
- All living things have DNA
- DNA passes on genetic information from one generation to the next

8. Adapt and evolve over time

Evolution - gradual change *in a population* of organisms *over time*

Individuals DO NOT evolve

S OF
فروع BIOLOGY



ZOOLOGY

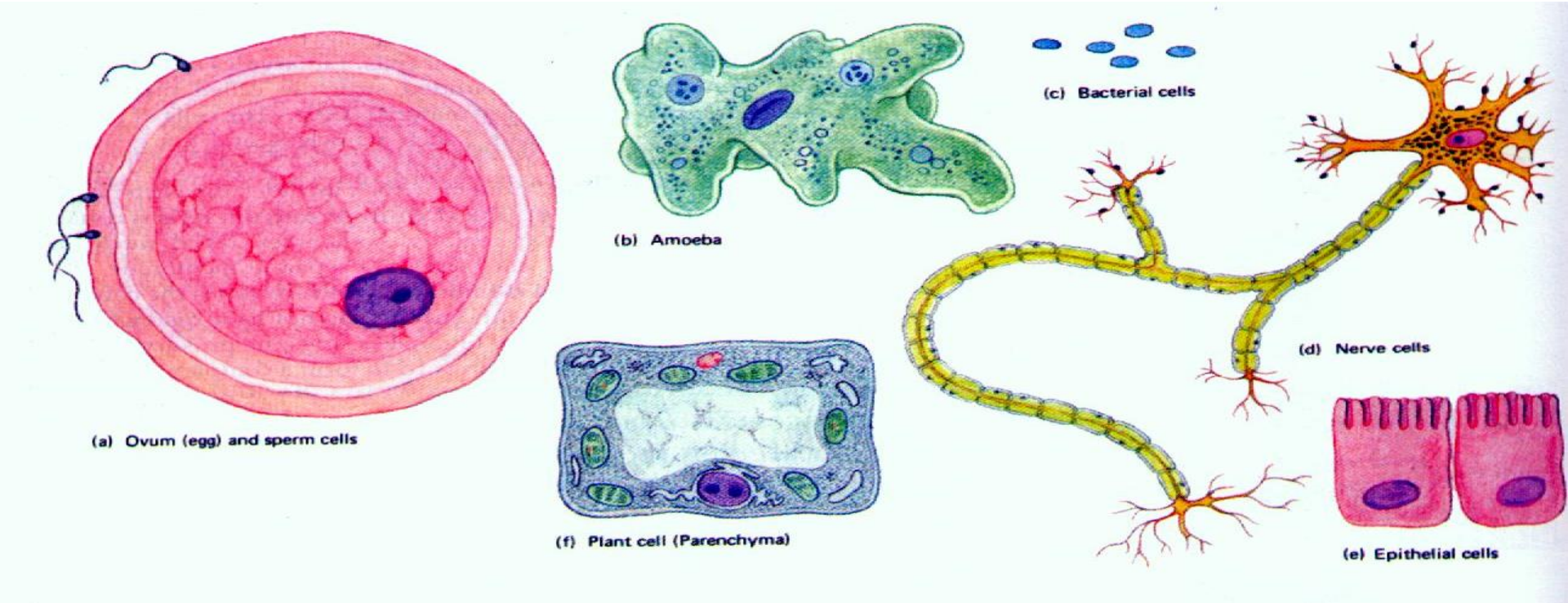
- Zoology deals with animals and animals life, including the study of the structure, physiology, development, and classification of animals.

BOTANY

- Botany is the study of plants

CYTOLOGY or CELL BIOLOGY

- **Cytology or Cell biology is the study of cells.**



ECOLOGY

- Ecology is the science which studies the releationship of living things between each other and their environment.
- Also ecology is concerned with pollution. Such as air and water pollution

GENETICS

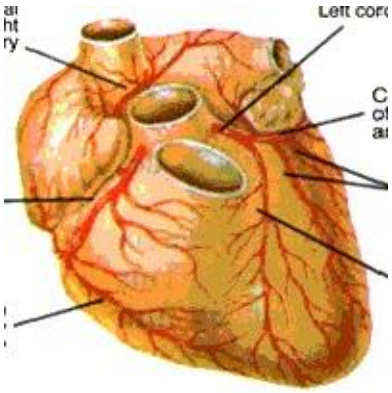
- **Genetic is a science that deals with heredity, especially the mechanisms of hereditary transmission and the variation of inherited characteristics among similar or related organisms.**

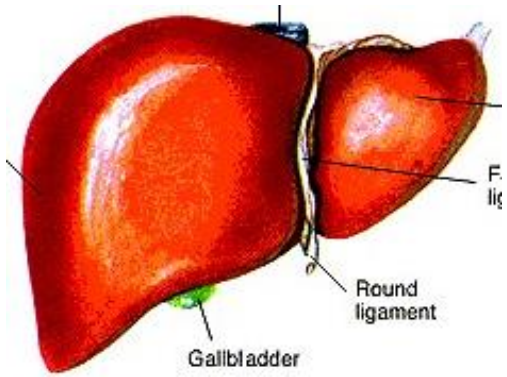
or

Genetics is the study of how features is passed to offspring from their parents.

Anatomy

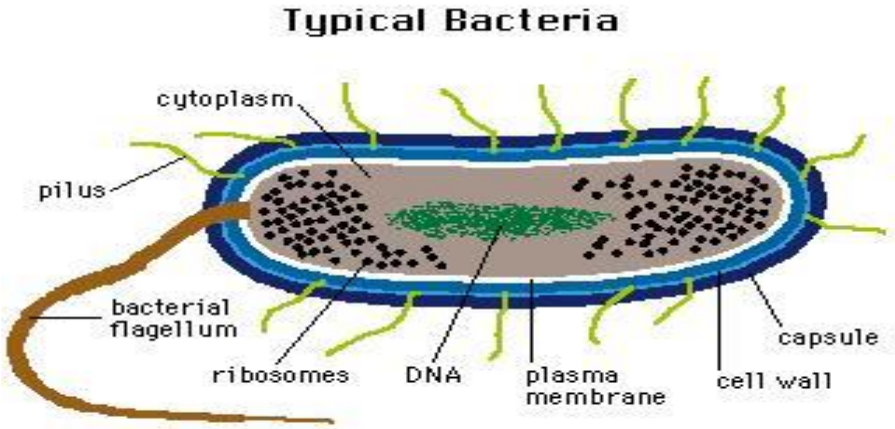
- **Anatomy is the study of the inner organs of the body (kidney, hert, liver etc.)**





MICROBIOLOGY

- Microbiology deals with microorganisms and their effects on other living organisms..
- For ex. Bacteria.



taxonomy

- **Taxonomy is the study of the classification of living organisms.**
- **Classification is made groups of organisms.**



ORNITHOLOGY

Ornithology is the study of birds. •

ENTOMOLOGY

- Entomology is the study of insects.
- Such as mosquito and spider

Parasitology

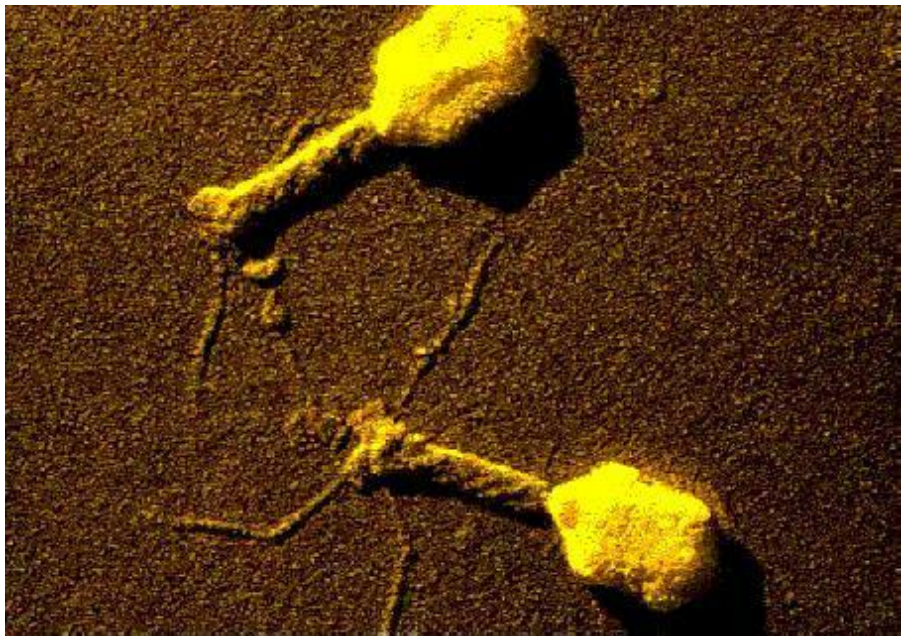
- Parasitology is the study of parasites and parasitism.
- Parasites are harmful organisms for living things.

Mycology

Mycology is the study of fungi. •

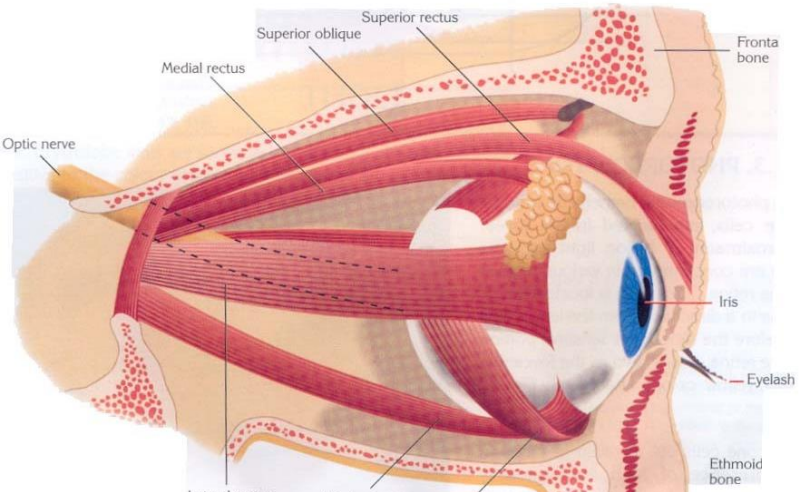
virology

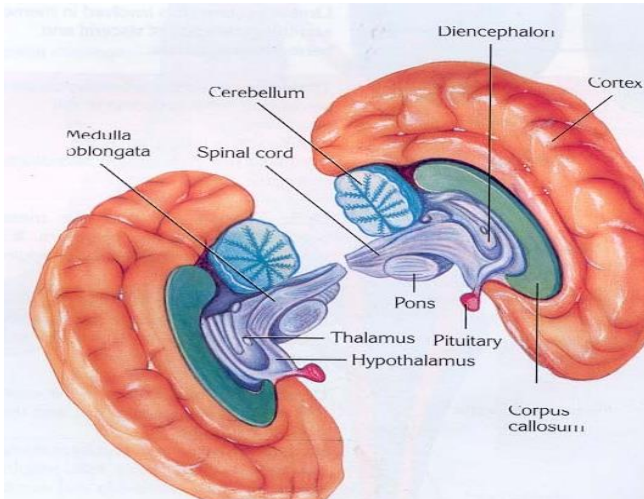
- **Virology is the study of viruses.**



Physiology

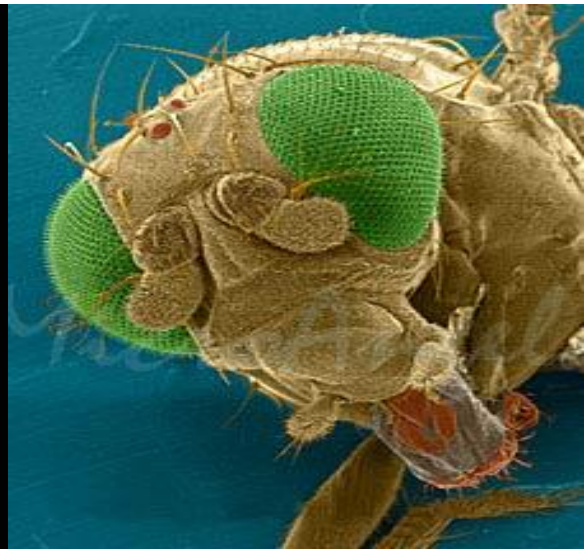
- **Physiology is the biological study of the function of living organisms and their parts..**





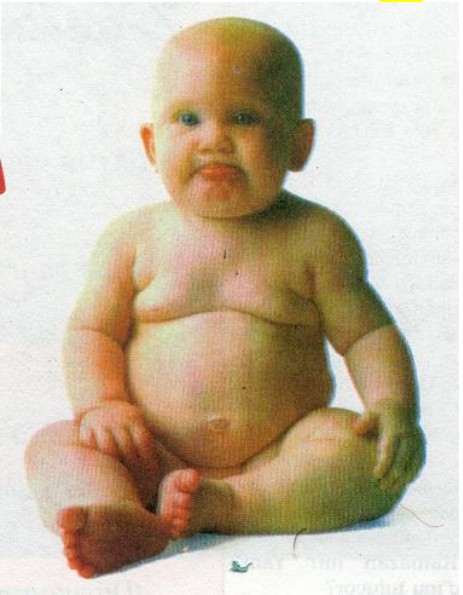
morphology

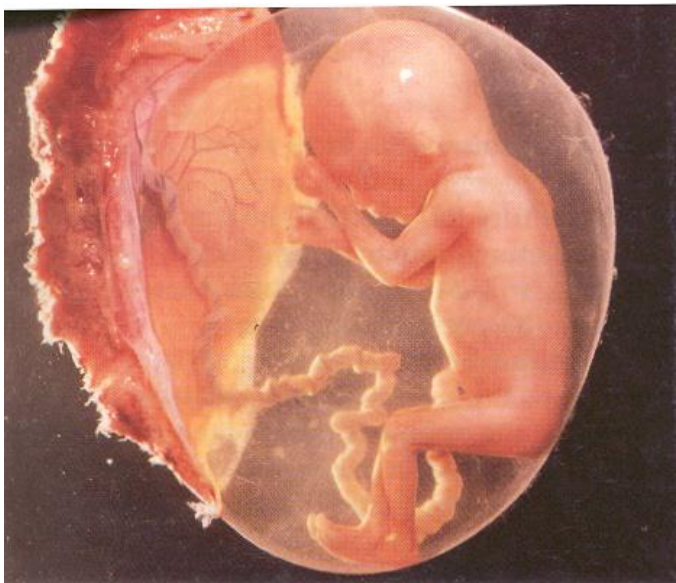
- **Morphology is concerned with phenotype (Apearance) of living things.**



Embryology

- Embryology studies the developmental patterns of organisms from zygote to birth.





Molecular Biology

The branches of biology that deals with the formation, structure, and function of macromolecules essential to life, such as nucleic acids and proteins.