

**LEVELS OF ORGANIZATION**

**Atoms**

**Molecules**

**Cells**

**(All organisms are made up of one or more cells)**

**Tissues**

**Organs**

**Organism**

**(an individual living thing)**

**Population**

**(group of individuals of same species)**

**Community**

**(populations of many species)**

**ECOSYSTEM**

**(Communities + Abiotic factors)**

**BIOSPHERE**

**\*\*\*\*\* BIOLOGY ENCOMPASSES ALL OF  
THESE LEVELS OF ORGANIZATION**

**Biotic: living**

**Abiotic: non-living**

# **CHARACTERISTICS OF LIFE**

**1) All organisms are composed of CELLS**

- the cell is the basic unit of life
- organisms can be:
  - a) UNI-CELLULAR- single cell; or,
  - b) MULTI-CELLULAR- more than one cell

**2) All organisms are COMPLEX and HIGHLY ORGANIZED**

- all organisms are composed of ORGANIC MOLECULES(large CARBON-BASED molecules)
- all organisms share similarities in chemical composition

**3) All organisms contain GENETIC INFORMATION**

- contained in DNA(Deoxyribonucleic Acid) which provides "instructions" to the cells

**4) All organisms require ENERGY:**

- a) AUTOTROPHS- get energy from the Sun or chemicals
- b) HETEROTROPHS- get energy from other organisms

**\*\*\* PLANTS are AUTOTROPHS**

**\*\*\* ANIMALS AND FUNGI ARE HETEROTROPHS**

**\*\*\* "TROPH" means "to feed"**

**5) All living things require NUTRIENTS:**

- Heterotrophs get Energy AND Nutrients together in the form of FOOD
- Autotrophs get Energy from the Sun BUT get their NUTRIENTS FROM THE PHYSICAL ENVIRONMENT

**\*\*\* ALL ORGANISMS ARE INTER-DEPENDENT  
ON EACH OTHER FOR ENERGY AND NUTRIENTS**

**6) All living things undergo DEVELOPMENT**

- all organisms have a LIFE CYCLE of events from Birth to Death
- "grow" and "develop" do not mean the same thing

- "DEVELOP" means structures within organisms can change and produce other structures
- the GROWTH of organisms INVOLVES Development



- 7) REPRODUCTION is a characteristic of all living things
- Reproduction is the production of OFFSPRING from one OR more parents
  - the FUNCTION is to PERPETUATE the species of organisms
  - there are 2 main types of reproduction:
    - a) SEXUAL- sperm + egg= zygote
      - two parents
    - b) ASEXUAL- genetically identical offspring
      - one parent

**\*\*\* ASEXUAL REPRODUCTION IS MORE COMMON IN PLANTS THAN IN ANIMALS;**

**WHEN SEEN IN ANIMALS, IT IS MORE COMMON IN INVERTEBRATES(animals without backbones) THAN IN VERTEBRATES(animals with backbones)**

- 8) Living things SENSE CHANGES in the environment and RESPOND:

- all organisms RESPOND to INTERNAL and EXTERNAL STIMULI

- 9) Life evolves and through evolution **LIVING ORGANISMS ARE ADAPTED TO THEIR ENVIRONMENTS**

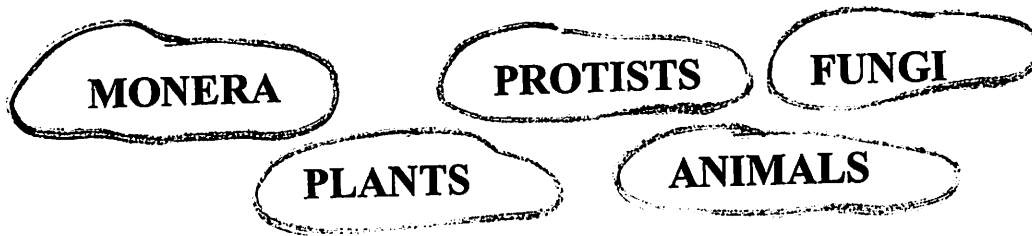
\*\*\* Evolve= to change over time

\*\*\* Evolution= lineages of organisms changing from one generation to the next

- 10) Living things maintain INTERNAL STABILITY even though their environment is changing( this is HOMEOSTASIS- "steady state")

## **5 KINGDOM CLASSIFICATION SCHEME**

(this has been replaced by a "Domain" system)



- we classify into progressively smaller categories called TAXA(singular: "TAXON"); they are:

**KINGDOM**

**PHYLUM(DIVISION in Plants/Fungi)**

**CLASS**

**ORDER**

**FAMILY**

**GENUS**

**SPECIES**

**\*\*\* a mnemonic device for remembering this could be:**

**"Keep Pots Clean Or Family Gets Sick"**  
**and**

**"Keep Dishes Clean Or Family Gets Sick"**

# **EVOLUTION AND NATURAL SELECTION**

## **(a preview)**

- **EVOLUTION** is a major theoretical concept in the biological sciences
- **NATURAL SELECTION** is the mechanism for evolutionary change in populations
- there are differences among individuals in a population in **SURVIVAL** and **REPRODUCTION**
- organisms that have inherited features which allow them to be well-suited to their environment have greater survival and reproduction----so their offspring become more numerous in the next generation

### **NATURAL SELECTION(a summary)**

- 1) Individuals that have features that make them better suited to their environments(**ADAPTATIONS**) leave more offspring than others without those features.
- 2) Individuals with those adaptations become more numerous in subsequent generations
- 3) Over time, the **GENETIC COMPOSITION** of a population **CHANGES**: in other words, the population is "EVOLVING"

**\*\*\*POPULATIONS EVOLVE, NOT  
INDIVIDUALS**

# **Micro-Evolution**

## **Vs**

# **Macro-Evolution**

- many of the conflicts/misunderstandings surrounding the teaching of evolutionary theory are related to the failure to distinguish between "micro-evolution" and "macro-evolution"
- beginning around 1927, biologists began to distinguish between macro- and micro- evolutionary phenomenon

### **MICRO-EVOLUTION:**

- changes occur within a species over time; these change are observable by scientists; in essence, they are factual
- examples include:
  - Bacterial adaptations
  - Insect adaptations
  - Selective breeding of domestic plants and animals

### **MACRO-EVOLUTION:**

- refers to changes between species over long periods of time
- broad, universal changes in life forms(across species and even Kingdoms) from the earliest primitive organisms to the full biodiversity which exists today
- these changes are not directly observable by scientists and must rely on indirect evidence, hypothetical examples, observation and inference, computer modeling, fossil evidence, and biochemical comparisons

## **COMMON METRIC** **PREFIXES**

**KILO-** means "1000" of a unit of measure  
**EXAMPLE:** 1 kilogram = 1,000 grams

**CENTI-** means "1/100" of a unit of measure  
**EXAMPLE:** 1 centimeter = 1/100 meter

**MILLI-** means 1/1000 of a unit of measure  
**EXAMPL.:** 1 millimeter = 1/1000 meter

**NOTE:** a cubic centimeter (called a "cc" in medicine) is the same as a milliliter

$$1\text{cc} = 1\text{ mL}$$

**1 centimeter cubed = 1 milliliter**