

# BIOLOGY

CH1

## Characteristics of Life and Evolution

### MAJOR TOPICS

what is biology?

properties of life

taxonomy

unity and diversity

scientific process

Biology is the study of life  
- life is recognized by what  
living things do

## THE PROPERTIES OF LIFE

### 1. Presence of cells

- cells: the lowest level of organization that can perform all activities for life
- all cells have...

membrane: purpose is to separate the inside and outside of a cell

DNA: contains genetic information

#### • 2 cell types

eukaryotic: more complex, organelles are membraned, DNA is enclosed

prokaryotic: simpler, smaller, no nucleus or membraned organelles

### 2. Order to life - Biological Hierarchy

- life is at all levels, atoms → organelles → cells
- emergent properties: result from the arrangement and interaction of parts within a system

### 3. Response to Physical Environment

- all organisms interact with their environment  
ex. taking in oxygen and nutrients  
ex. releasing wastes and carbon dioxide

### 4. Energy Processing

- organisms use energy
- work: moving, growing, reproducing, requires energy  
ex. plants transform solar energy into chemical energy

### 5. Reproduction - Passing on Traits

- cell division: basis of reproduction, growth, and repair (multicellular organisms)
- cell division process is controlled by DNA

• genes: transmit information from parents → offspring

## 6. Regulation - Homeostasis

• homeo: | same

• stasis: to stay

• feedback mechanisms

negative feedback: as change occurs, a process is created to slow and stop the change; as it works, less of the product is produced

positive feedback: as change occurs, a process is created that stimulates the change and produces more and more product

## 7. Evolution

• makes sense of biology

• explains unity, diversity, similarity

• taxonomy: branch of biology that names and classifies species

!!!

Dumb Kings Play Chess On Flat Glass Squares

Domain - Kingdom - Phylum - Class -  
Order - Family - Genus - Species

## 3 DOMAINS of LIFE

Bacteria

Archaea

Eukarya

prokaryotes  
single-celled  
microscopic

eukaryotic org  
multicellular  
unicellular protista  
plantae  
fungi  
animalia

## WHY ARE THEY NAMED

chordates: internal skeleton

vertebrates: spinal cord

mammals: mammary glands

## FEEDBACK

### Positive

• amplifies  
output signal

• less frequent

• boosts the  
stimulus

• blood clot  
mammal birth

### Negative

• inhibits,  
slows process

• more frequent

• stabilizes

• regulating  
temp, hormone  
PH levels

# UNITY OF LIVING ORGANISMS

Heritable changes in DNA happen over time + accumulate

# DARWIN EXPLAINS the duality of unity + diversity through his theories

- individuals vary in traits which are heritable
- more offspring are produced than survive
- each species suits its environment
- individuals best suited for their environment are more likely to survive and reproduce
- survival of the fittest: not always the strongest, but the best suited for the environment survive
- natural selection: beneficial traits are kept (according to nature), resulting in adaptation

## SCIENTIFIC HYPOTHESIS and DATA

### TERMS

science: latin, means "to know"

inquiry: the search for information and explanation

qualitative data: descriptions rather than measurements

quantitative data: measurements; mostly tables and graph

data: recorded observations of items of information

hypothesis: a tentative answer to a well-framed question

testable: able to perform an experiment

falsifiable: possible to be wrong

### The Scientific Process

1. make observations
2. form logical hypothesis
3. test hypothesis → experiment

observations → questions → hypotheses → predictions ↻

a hypothesis must be falsifiable + testable, supernatural + religious explanations are outside the bounds of science

### EXAMPLE:

Observation: your flashlight doesn't work

Question: why doesn't your flashlight work

↻ Hypothesis: batteries are dead  
Hypothesis: bulb is burnt out

BOTH are testable ✓

## Failure to falsify a hypothesis does not prove that hypothesis.

- observations + experiments must be repeatable
- develop a theory
- in science, a theory: is supported by a large body of evidence. in comparison to a hypothesis, and can lead to new testable hypotheses.
- theories are broad + general, hypotheses are specific

## Variables

- a controlled experiment compares an experimental group w/ a control grp
- dependent variable: changes as a result of the experiment; growth rate, reproduction rate, etc
- independent variable: changes the scientist makes; time, temp, nutrient levels, water levels, chemical levels.
- controlled variables: all other possible variables that may affect the experiment and are kept the same for both control + exp. group.

### POSITIVE

#### control group

- positive results, you know there will be results
- Shows scientist what positive result will look like

### NEGATIVE

#### control group

- doesn't receive variables
- not the same results as experimental group
- no results