

## ORGANIZING LIFE

### **How did life come to exist on earth?**

- billions of years ago atmosphere was water (H<sub>2</sub>O) vapor, Nitrogen, Methane, Ammonia, Carbon Dioxide, and Hydrogen.
- no ozone layer to protect from sun's UV radiation
- free Oxygen began to form by release of O<sub>2</sub> by water vapor
- \*approximately the time in earth's history that life began

### **Where did early life forms live? why?**

- in the oceans, several meters below the surface
  - the water provided protection from UV radiation

### **How did early life forms get nutrition?**

- first forms of life were probably consumers
  - = obtain energy by eating other organisms
- later, some consumers changed to obtain their energy by chemosynthesis
  - = chemical process in which energy from chemical rxns of different nutrients is used to synthesize food
- as nutrients were used up, photosynthesis evolved
  - = chemical process that uses light, carbon dioxide, and water to synthesize food and produce oxygen
  - \* these organisms were the 1<sup>st</sup> producers!\*
    - = makes its own food
    - as the producers released more and more Oxygen, the Ozone layer was formed around the earth

**Multicellular organisms eventually evolved from the earlier unicellular life forms (eating one another and combining genetic information?). After millions of years, the biosphere became a complex system with diverse life forms.**

### **Classification**

- - grouping of things for practical purposes based on similarities
- - recognize relationships by comparisons or all available characteristics of each species

### **Taxonomy**

- - science of grouping and naming organisms
- - purpose = to use information from many different sources in order to classify organisms
- - modern taxonomy attempts to produce a system of natural classification
  - - based on evolutionary relationships
    - - means that closely related organisms have more characteristics in common than those that are less related
    - relationships are determined by:
      1. phylogeny (evolutionary history)
      2. development
      3. biochemistry
      4. behavior
  - organisms are grouped into a series of categories, each one larger than the previous one

### **Why don't we just use the common names?**

- common names can be misleading... an organism with a common name may not have the same common name in another region OR a common name may refer to more than one organism, depending on the region.

- using Latin to specify each organism takes away the possibility for confusion b/c it is a “dead language” -> it will never change.

### Scientists

- 1. Aristotle
  - - classified all living things into plants or animals
- 2. Carolus Linnaeus
  - - developed the modern classification system based on close relationships of organisms
    - Binomial Nomenclature
      - 2 word naming system (genus & species)
    - selected characteristics that lead to more natural groupings of species
- 3. Ernst Haeckel
  - placed unicellular organisms into Kingdom Protista
  - separated bacteria from the rest of the unicellular organisms b/c they had no nucleus
    - presence or absence of a nucleus in a cell distinguishes 2 major types of cellular organization
      - prokaryote = no nucleus
      - eukaryote = true nucleus

Phylogeny “phylon” – related group “geny” - origin

- evolutionary history of a species
- scientists began to compare modern-day organisms to fossils of similar forms as they classified organisms
- evolution of a species is represented by branching into six kingdoms from a common origin
  - the 6 kingdoms can be distinguished by the method in which they obtain food, their cellular structures, and chemical makeup of their cells

## THE 6 KINGDOMS

### ARCHAEBACTERIA

- primitive bacteria that live in extreme environments
- similar to the extreme conditions of a newly formed earth
  - i.e. very hot, very cold, high salinity (salt content)

### EUBACTERIA or BACTERIA

- contains only unicellular prokaryotes
- appeared about 3.5 bya according to the fossil record
- over 10,000 known species (named and described)
- obtain food by chemosynthesis or photosynthesis
- many have a cell wall and flagella or cilia
  - flagella = long whip-like structure for movement
  - cilia = short numerous hair-like structures for movement

### PROTISTA

- combination of different characteristics -> some plant-like, some animal-like, some fungus-like
- eukaryotes without complex organ or tissue systems
- lives in or near water
- producers or consumers
- 1<sup>st</sup> appeared in fossil record about 1 bya
- most are unicellular, but seaweeds are multicellular

### FUNGI

- used to be classified as plants
  - have a close association w/plants

- believed that ancient partnerships with plants were vital to the survival of early plant species
- some species of fungi live in association with the roots of plants and provide the plants with nutrients
- unicellular (yeasts) or multicellular (mushrooms, puffballs, truffles)
- eukaryotes
- decomposers
- over 100,00 known species (named and described)
- 1<sup>st</sup> appeared in fossil record about 400 mya

### **PLANTS**

- multicellular
- producers
- eukaryotes
- defined tissue systems with specific functions
- ancestors were most likely the green algae of Kingdom Protista
- 1<sup>st</sup> appeared in fossil record about 400 mya
- about 500,000 known species (named and described)
- provide earth with Oxygen for life processes in organisms
  - also important to formation of earth's protective Ozone layer

### **ANIMALIA**

- multicellular
- consumers
- eukaryotes
- have the most complex body structures of all kingdoms
- over 1 million known species (named and described)
- some are microscopic, others are among the largest organisms on earth
- 1<sup>st</sup> appeared in fossil record about 700 mya