Lecture Note Handout – Chapters 7 and 8

Chapter 7: Living things and Classification

I. Characteristics of living things

a. **All living things are composed of cells**
   i. Unicellular organisms are microscopic and include Archaebacteria, Eubacteria and most organisms from the Kingdom Protista.
   ii. Multicellular organisms include small microscopic colonial organisms composed of only a few cells (i.e. *Volvox* sp.) up to the largest of all living animals, the blue whale which is composed of trillions and trillions of cells.

b. **All living things are composed of the four basic chemicals of life:**
   i. **Proteins** which are composed of amino acids
   ii. **Carbohydrates**: made of long chains of simple 5 and 6 carbon sugars
   iii. **Lipids**: composed of fatty acids
   iv. **Nucleic Acids** which include DNA (deoxyribonucleic Acid and RNA (Ribonucleic Acid)

c. All living things utilize energy
   i. Living things must grow, repair cellular damage, maintain homeostasis, etc. This requires the use of energy. Energy is released as a result of **Aerobic** (in the presence of Oxygen) respiration or **anaerobic** (in the absence of Oxygen) respiration.
      1. Aerobic respiration: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_20$
      2. Anaerobic respiration
         a. **Alcohol Fermentation**:
         b. Lactic Acid Fermentation

d. All living things grow and develop
   i. **Growth** is the process of an organism getting larger (ie after mitotic division cells grow to become "full size")
   ii. **Development** is the process a Multicellular organism undergoes when the cells specialize into specific cell types. (ie embryos developing cardiac, bone, lung and digestive cells)

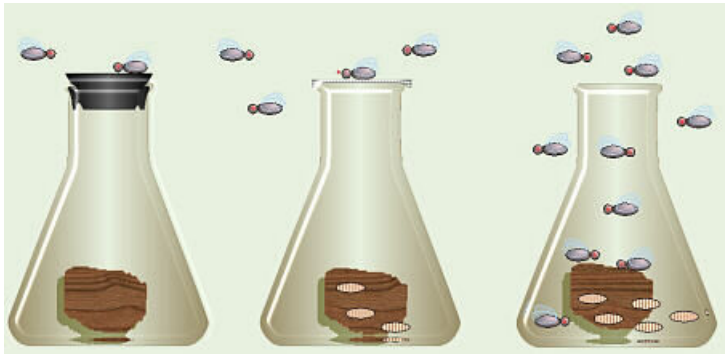
e. All living things respond to their environment
   i. A change in the environment which causes the organism to react is a **Stimulus**
   ii. Its reactions to the stimulus is called a **response**

f. All living things must be able to reproduce
   i. **Asexual** reproduction – mitotic cell divisions resulting in genetically identical offspring
   ii. **Sexual** reproduction – results in genetically diverse organisms

II. Life comes from Life

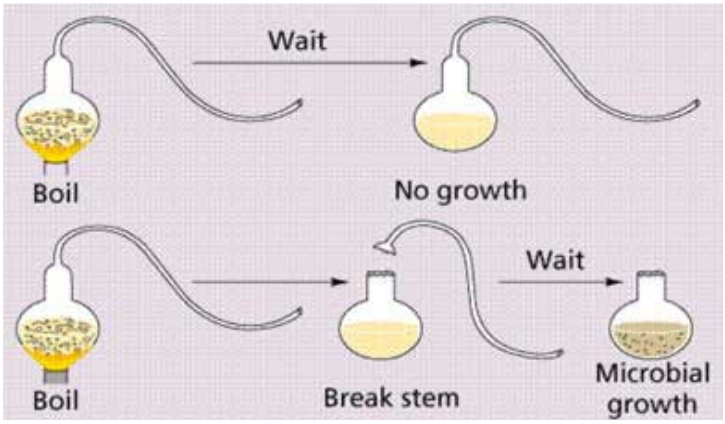
a. Four hundred years ago people believed that living things came from nonliving things
   i. Flies and maggots came from decaying meat
   ii. Frogs came from the mud
   iii. **Spontaneous generation** – the believe that living things came from nonliving sources

b. **Francesco Redi** helped disproved the idea of "Spontaneous generation".
   i. Experiment using decaying meat, jar, flies and cheese



cloth. He kept everything the same in the experiment but used the cheese cloth as the variable. He covered one of the jars with the cheese cloth to keep the flies away from the meat. At the end of the experiment, flies grew out of the meat w/out the cheese cloth.

ii. **Louis Pasteur** also helped disprove Spontaneous generation with the experiment w/ broth that was sterilized by heat and then exposed to air resulting in contamination by bacteria.



c. The needs of living things: Food, Water and Homeostasis
   i. Food obtained by:
      1. **Autotrophs** – plants use chlorophyll and photosynthesis to produce their own food.
      2. **Heterotrophs** are unable to manufacture their own food
   ii. **Homeostasis:** maintenance of stable internal conditions despite fluctuating environmental conditions (ie the human maintaining a body temperature of 98.6 degrees even when the outside temp is -40 or 120 degrees.

III. **Taxonomy:** The classification of living things into groups called **Taxons**
   a. **Aristotle** classified as to the area they mainly lived in: **Land, Air or water**
   b. **Linnaeus** came up w/ the modern day classification system using binomial nomenclature (two names) to give unique **Scientific names** to all living things
      i. System broken into **Kingdoms** which are broken **into Phylum**, which are broken into **Classes**, which are broken into **Orders,** which are broken into **Families**, which are broken into **Genus** which are broken into **species**.
      ii. Unique Scientific name consists of a Genus and a species name
         1. Protocols – **Homo sapiens**
            a. Genus name first, species name second
            b. Genus always capitalized, species always lower case
            c. Name is either italized or underlined

IV. The Six Kingdoms: Archaebacteria, Eubacteria, Protista, Fungi, Plantae and Animalia
   a. Some "lumper" taxonomists still classify all bacteria (Kingdom Archaebacteria and Eubacteria) into a single kingdom **called Monera**
      i. **Archaebacteria**: the Latin name means "Old Bacteria", examples are the methanogens. They are all Prokaryotes (w/out an organized nucleus), and are unicellular, some are autotrophs, most are heterotrophs. Cell wall is present and composed of amino acids or polysaccharides. Many have flagella or cilia and are able to move (locomotion).

ii. **Eubacteria**: the Latin name means "New Bacteria", examples are the bacteria and blue-green algae. They are all Prokaryotes (w/out an organized nucleus), and are unicellular, some are autotrophs, most are heterotrophs. Cell wall is present and composed of amino acids or polysaccharides. Many have flagella or cilia and are able to move (locomotion).

V. Protista: examples include- **diatoms, paramecium, ameba, most algae**

a. What are they?

i. "**Junk drawer**" kingdom – a little bit of everything, some w/ cell walls (composition varies), some w/out. Many have some ability to move (cilia or flagella may be present)
ii. Single cellular to multi-cellular and over 300 ft long.
iii. All are **Eukaryotes**, autotrophs and heterotrophs represented.
iv. All live in moist surroundings
v. Divided into three categories: **Animal-like, Plant-like and Fungus-like**

VI. Fungi – water molds, bread molds, Sac fungi, yeasts, mushrooms and Penicillium sp.

The principle role of Fungus in the environment is to decompose and recycle organic material. Found in most environs on the planet. Usually require moist, dark and warm habitats. Most are Multicellular except for Yeast that are unicellular. The yeast also undergo **Fermentation**- a process that releases energy and whose products are carbon dioxide and alcohol. (Yeast is used to make beer and other alcoholic beverages).

Characteristics:

i. Eukaryotic heterotrophs
ii. Many are Saprophytes or parasites
iii. Most are Multicellular however yeast are unicellular
iv. Most are immobile
v. Cell Wall present and composed of Chitin (except Oomycota)
vi. Sexual and asexual reproduction present

VII. **Plantae**: Prokaryotic Autotrophs w/ cell walls present and composed of Cellulose. Most are unable to move (no locomotion). Most all are Multicellular

VIII. **Animalia**: Prokaryotic heterotrophs w/ out cell walls. Most are able to move during some portion of their life cycle. Most all are Multicellular