BIOL 300 – Foundations of Biology
Fall 2017 – Telleen
Lecture 1

I. What is Life?

A. Biology is the study of Life and Living Things, so before we can really begin, we need to answer the question "**What is Life?**"

A. And how do we distinguish it from non-life?

B. This turns out to not be as straightforward as you might imagine

C. There isn't really any universal agreement about the definition of life (although most scientists will agree for the most part about what things are alive).

D. There are many different sets of criteria to define life, but here we'll go with the textbook and look at what is common to most of the lists

E. Possible criteria for Defining Properties of Life:

1. From OpenStax text:
    a. Order
    b. Response to Stimuli
    c. Reproduction
    d. Adaptation
    e. Grow and Development
    f. Regulation
    g. Homeostasis
    h. Energy Processing
2. From another Intro Biology Text:
    a. Made of Cells – Living organisms contain one or more cells
    b. Growth – Increase in size
    c. Reproduction – Increase in number
    d. Responsiveness – Ability to react to environment
    e. Metabolism – Controlled chemical reactions
3. A little searching will turn up even more variants!
4. What do you think are the most important criteria?

F. These criteria work for the majority of "living" things, but what about viruses?

II. Classifying the Diversity of Life

A. Living organisms are classified using a system based on that of Carolus Linneaus

B. Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species

C. Each grouping in known as a **taxon** (plural is **taxa**).

D. Three **Domains** (based on the work of Carl Woese)

1. **Bacteria** – Unicellular, No nucleus, Live in non-extreme environments
2. **Archaea** – Unicellular, No nucleus, Live in extreme environments
3. **Eukarya** – Unicellular and/or multicellular, Nucleus present, Live in non-extreme environments, Microbes include algae, fungi, protozoa

E. Taxonomy

1. **Taxonomy** is the science of classifying and naming organisms
2. Binomial system of nomenclature: Linnaeus
3. **Species** – a group of organisms with many common characteristics; narrowest classification
4. **Genus** – a category consisting of one or more species
5. Scientific species name is *Genus species* (this is **binomial nomenclature**)
    e.g. *Escherichia coli, Homo sapiens,* etc.

F. Phylogenies and the Common Root of Life on Earth

1. Various different approaches all tell us that all known life on Earth is related and shares a common ancestor(more on evidence for this later in the semester!)
2. One way to visualize the relationships between organisms is using a **phlyogenetic tree**, or **phylogeny**, which is a diagram showing the evolutionary relationships among biological species based on similarities and differences in genetic or physical traits or both
3. A phylogenetic tree is composed of branch points, or nodes, and branches. The internal nodes represent ancestors and are points in evolution when, based on scientific evidence, an ancestor is thought to have diverged to form two new species. The length of each branch can be considered as estimates of relative time.