

Leah McAleer

## Biology 1306/1406 – Modern Concepts in Bioscience II

Week of January 25, 2021

Hey y'all! My name is Leah McAleer, I'm a sophomore Pre-Med Business Fellows and Finance major at Baylor and one of the lead Biology tutors at the Tutoring Center. I will be creating resources and materials that you can use to supplement classwork in your learning of Biology II this semester! These materials will serve to summarize the topics covered in your class, one week at a time, and are an excellent study tool to use for preparation. Please feel free to reach out to me through the Tutoring Center if you have any questions. Professors teach chapters in different orders, so I will indicate which chapter I am referencing throughout the resources. For the purposes of these materials, Biology 1306 and 1406 students will be learning the same material, so all resources are relevant for both classes.

**Keywords:** Evolution, Natural Selection, Speciation, Phylogeny, Body Plans and Germ Layers!

**Remember that the Tutoring Center offers free individual and group tutoring for this class. Our Group Tutoring sessions will be every Thursday from 7:00-8:00 PM. You can reserve a spot at <https://baylor.edu/tutoring>. I hope to see you there!**

This week in Biology 1306, we will be covering Campbell Chapters 22, 23, 24, 25, 26 and 32.

### Evolution

#### Campbell Chapter 22, 23

**Evolution** describes **Descent with Modification**, or the change in a species over time. While changes can occur in individual organisms, **only populations can evolve**. Evolution occurs through the action of **Natural Selection** in which individual organisms which are more suited to their environments are more likely to survive long enough to reproduce than other individuals of the same species who are less suited to the same environment. Over time, these individuals who survive to reproduce shape the characteristics of the population. Evolution is a very slow process but can produce large changes in a population over time.

•**For natural selection to occur:** members of the same population must **vary in their inherited traits**, individuals with favorable inherited traits must have a **higher probability of survival and reproduction**, therefore producing more offspring than other individuals, and the species must **produce more offspring than the environment can support**, meaning many “less fit” offspring die before reproducing.

Outcome of Natural Selection: Traits which are reproductively favorable accumulate in a population

**Homology-** related species can have characteristics which function differently, but have an underlying similarity arising from a common ancestor ex. Human hand and bird wing

**Convergent Evolution-** independent evolution of similar features in individuals who do not share a common ancestor. These features are **Analogous**, meaning they have the same function, and likely are in response to similar environments, but are unrelated.

**Hardy Weinberg Equilibrium-** assesses whether evolution is occurring in a population.

- For a population to be in Hardy Weinberg Equilibrium**, there must be no mutations, no natural selection, random mating, no gene flow, and a large population size. If these criteria are met, the population is **Not evolving**, and the following equation can be used:  
• **$p+q=1$**  where  $p$  is the frequency of the dominant allele and  $q$ , the recessive allele

**Genetic Drift:** chance events which change allele frequencies unpredictably

**The Origin of Species, Macroevolution : Cambell chapter 24**

**Macroevolution** describes how species evolve. According to the **Biological Species Concept**, members of a **Species** can interbreed and form viable, fertile offspring. When species become **Reproductively Isolated** and can no longer interbreed, **Speciation**, or two new species arising from one, can occur. Reproductive Isolation can be either Prezygotic, or before the creation of a zygote, or Postzygotic, after the creation of a zygote.

**Prezygotic Isolating Mechanisms** include: Behavioral Isolation, Mechanical Isolation, Habitat Isolation, Temporal Isolation, and Genetic Isolation

**Postzygotic Isolating Mechanisms** include: Hybrid breakdown, Reduced hybrid fertility, and Reduced hybrid viability

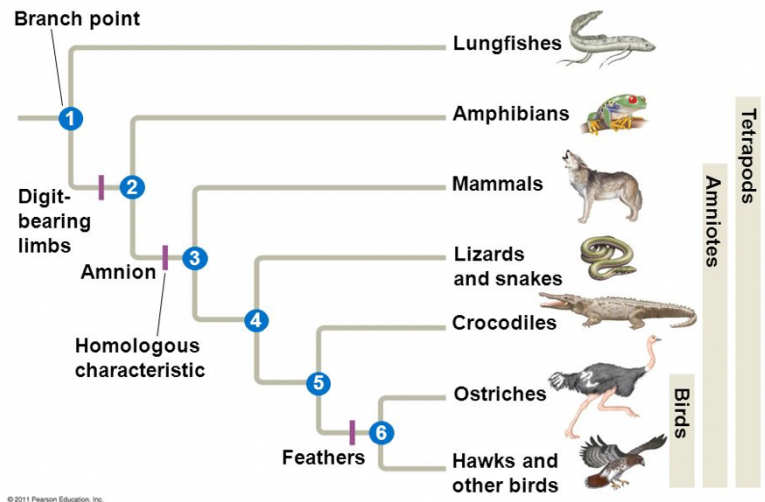
•**Allopatric Speciation** occurs when members of a population are kept **APART** by a geographic barrier; **Sympatric isolation** occurs when the members of a population are not geographically isolated and are in the **SAME** area

**History of Life on Earth : Campbell chapter 25, 26**

Chemical and physical processes, along with natural selection, made the origin of life possible on early Earth. In their experiment, **Miller and Urey** found that organic compounds, or biotic molecules, could be synthesized from abiotic factors. This led to the theory that life originated near Alkaline **Hydrothermal Ocean Vents**. The first organic macromolecules thought to be synthesized near these ocean vents are **RNA Polymers**. This is due to the fact that RNA Polymers will self-generate if monomers are present. These early molecules were packaged into **Protocells**, or droplets with membranes that maintain an internal chemistry different than that of the surroundings. From these protocells came single celled organisms and eventually multicellular organisms who later colonized land. Once on land, the rise and fall of dominant groups reflects **plate tectonics**, which can cause allopatric speciation, **mass extinctions**, like at

the end of the **Permian** period, and adaptive radiation following a mass extinction where the survivors of the extinction adapt into important ecological niches.

- **Phylogenies** show evolutionary relationships between organisms.
- **Phylogenetic trees** show a hypothesis about the evolutionary history of a group of organisms. Each **branch point** represents common ancestry:



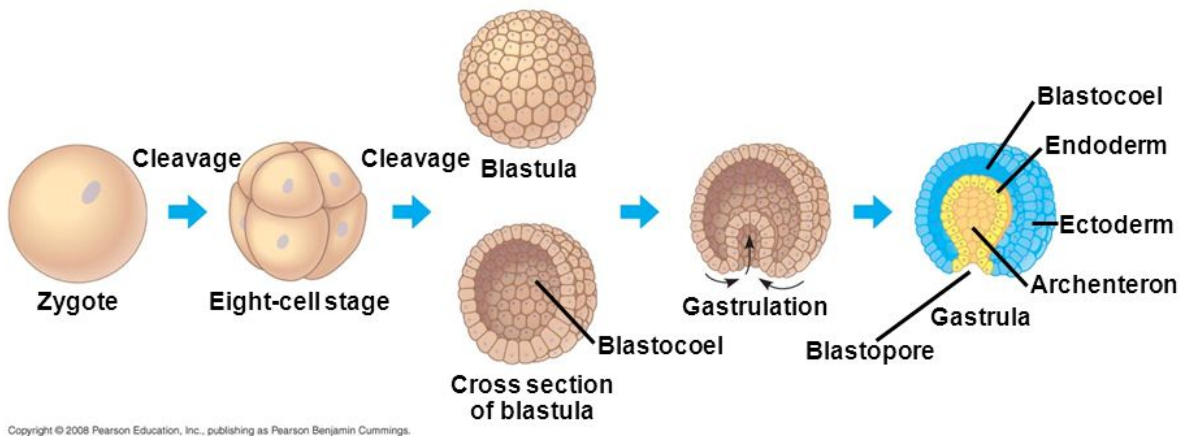
All diagrams, tables, and external information is property of Campbell Biology and Pearson Education Inc.

**The Geologic Record**- a time scale which divides the history of Earth into four eons and further subdivisions.

Watch this video, starting at 3:30 : <https://www.youtube.com/watch?v=rWp5ZpJAIAE> to review the geologic record.

### Campbell Ch. 32

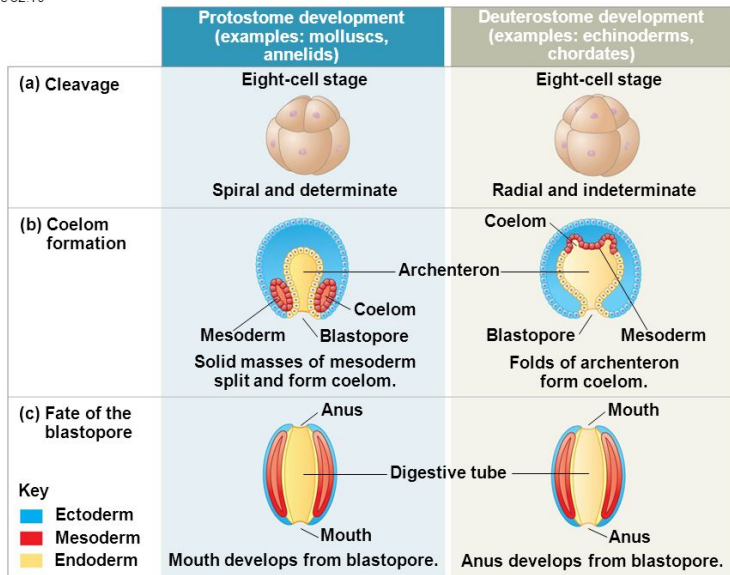
Animals are multicellular, heterotrophic eukaryotes with tissues that develop from **embryonic layers**. The stages of **embryonic development** are shared among all animals and proceeds through many cleavages, or successions of mitotic cell division without cell growth, meaning that cells divide into two cells over and over.



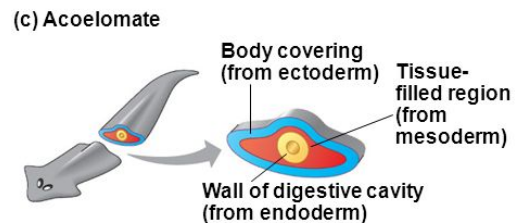
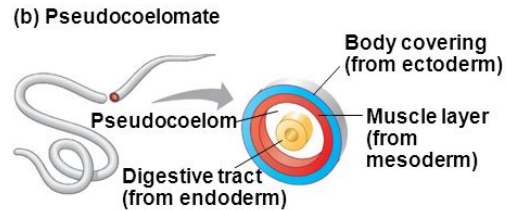
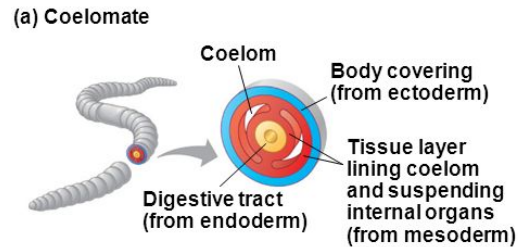
Animals can also be characterized by their **body plans**. Sponges have **no symmetry**, meaning that anyway they are divided, the two pieces are not identical. **Radial Symmetry** can be seen in cnidarians, where the top and bottom of the organism are identical. **Bilateral symmetry** can be divided down the middle, and into top and bottom and is associated with **cephalization**, or the isolating of nerve tissue into a head.

Following Gastrulation, **germ layers** are created. The **ectoderm** is the outer covering of the embryo and gives rise to the outer covering of the animal and the Central Nervous System. The **endoderm** is the inner most germ layer and gives rise to the digestive tract. The **mesoderm** lies between the ectoderm and the endoderm in all bilaterally symmetric animals and gives rise to most other tissues. Animals can have only endoderm and ectoderm, and are **diploblastic**, or in the case of all bilaterally symmetric animals, can have all three and be **triploblastic**. Below is a diagram of the body cavities of triploblastic animals. Similarly, these triploblastic animals either develop as **Protostomes** or **Deuterostomes**, depending on the fate of the blastopore, and the location of Mesoderm (see below).

Figure 32.10



© 2014 Pearson Education, Inc.



© 2011 Pearson Education, Inc.

### Study Tips:

1. For chapters 22 and 23, review the vocabulary presented throughout the chapters, also, be familiar with some genetics vocabulary such as gene, allele, crossover, etc. Practice a couple of Hardy Weinberg problems as well and make sure that you are confident in how to solve them.
2. For chapter 24, brush up on the different types of reproductive isolating mechanisms and be sure that you can identify Prezygotic Mechanisms versus Postzygotic Mechanisms.
3. Check out this video on Natural Selection: <https://www.youtube.com/watch?v=0SCjhI86grU>

**That's it for this week. Please make sure to check out other resources available to you through the Tutoring Center and make sure you reach out for further help; the biology tutors at the Tutoring Center will be happy to give you a hand!**

All diagrams, tables, and external information is property of Campbell Biology and Pearson Education Inc.