Biology 1305 – Modern Concepts in Bioscience – ICB Textbook
Week of October 4th, 2020
Marco Franco

Hello everyone!! I hope you are all enjoying the Biology ICB class. Remember we continue to have group Tutoring for this class each week. If you cannot make it to Group Tutoring, also know that these resources are available to you in the tutoring center website. If you wish to attend group tutoring, make sure you reserve a spot via the tutoring center website.

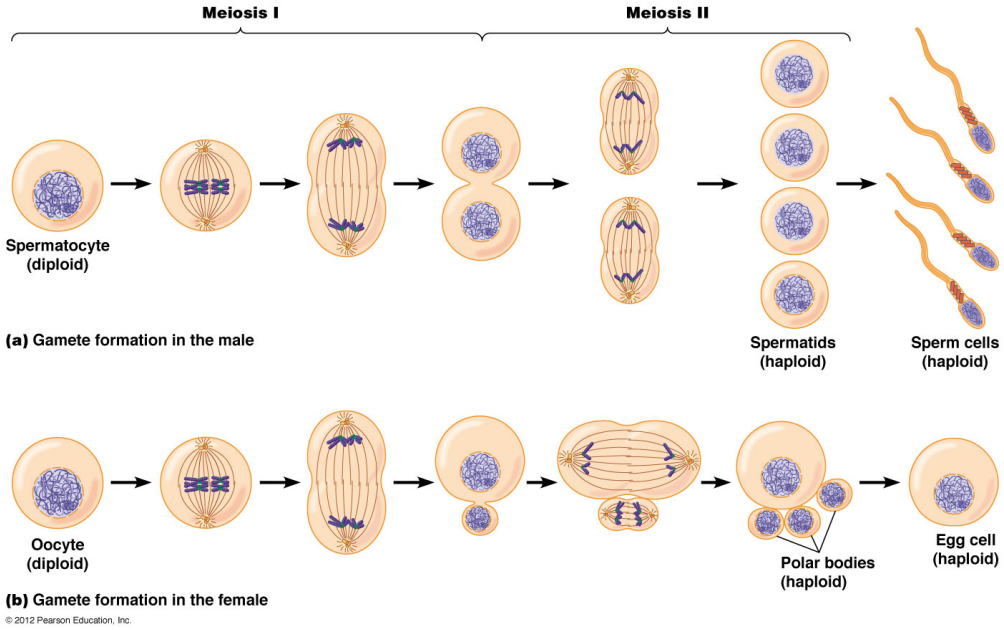
Our Group Tutoring sessions will be every Tuesday from 6:00 – 7:00 PM. You can reserve a spot at https://baylor.edu/tutoring. I hope to see you there!

Last week, we went over the addition and multiplication rules for probability and how eukaryotic cell division differs from that of prokaryotes. That resource can be found here: **https://www.baylor.edu/support_programs/index.php?id=967950**

This week, we will jump into **How two parents produce non-identical offspring, covering the concept of meiosis. We will then start going over the concept of evolution and some cool experiments related to the beginning of life.**

First**, how can two parents produce non-identical offspring?** To answer this question we will need to jump a little more in depth into genetics. As we know, eukaryotic cell division differs from that of prokaryotes, and this process is known as Mitosis. However, **mitosis is limited to somatic (non-sexual) cells, and will always produce identical cells.** This is not the case for gametes (sexual cells), as they will produce non-identical cells in a division process called MEIOSIS. The sexual cells produced by Meiosis undergo different genetic changes that allow offspring to be different from other offspring and from the parents.

Let's see a diagram for **MEIOSIS**



Notice in the diagram above that **meiosis is divided into meiosis I and meiosis II.** The latter is actually a mitotic process, with some modifications for males and females. **Notice that in males, four functional gametes (sperm cells) are produced, whereas in females only one functional gamete (egg) is produced. Nonetheless, the products of meiosis are haploid cells.**

Check out this video to see further details about Meiosis:
https://www.youtube.com/watch?v=oYgw5xQYxns

Major points of MEIOSIS:

1. During prophase I, maternal chromosomes pair with paternal chromosomes, forming paired chromosomes called Homologs.
2. Recombination and ***crossing over*** of DNA also happens in prophase I.
3. Recombination is a **random** process; thus, no chromatids will be identical. This means that prophase I is the reason why siblings look different, even when having the same parents.

So, **how can two parents produce non-identical offspring?** The answer is MEIOSIS and, more specifically, prophase I.

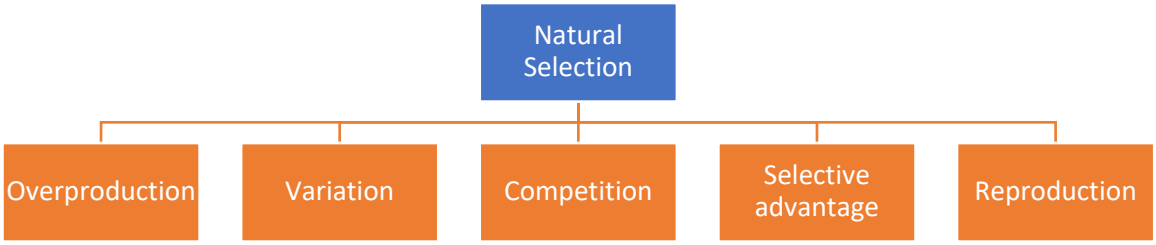
EVOLUTION AND ORIGIN OF CELLS

Now, let's look into the beginning of Chapter 4 in the ICB book. This chapter deals with evolution and all of the hypotheses, theories and experiments that have shown evidence for how organisms evolve and how life began.

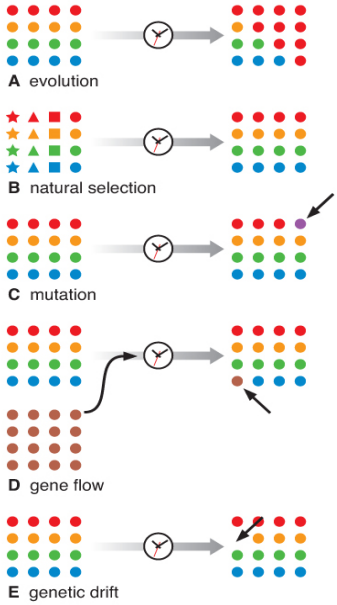
Please be ready to have the following definitions fresh in your head – they are the basis for what this chapter talks about:

- **Evolution:** change in allele frequency in a population over time
- **Theory:** a widely accepted concept that has been tested multiple times; in other words, a hypothesis with strong evidence to be supported.
- **Natural Selection:** Adaptation to environmental change to continue surviving and reproducing

Use the following flow chart to understand the tenets of natural selection



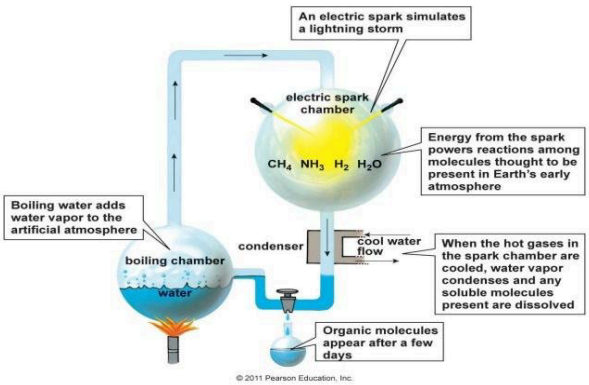
Next, it is important to know the **four mechanisms of evolution: Natural Selection, Mutation, Gene Flow and Genetic Drift.** THIS IS A SPECIFIC LEARNING OBJECTIVE IN CLASS, SO MAKE SURE YOU KNOW THIS. Use the diagrams below to guide you in defining the concepts in easy, understandable ways.



Evolution and the four mechanisms of evolution

A, Depiction of evolution where circles represent individuals in a population with different alleles (colors). The frequency of alleles changes over time.
B, Natural selection favors circles that are allowed to reproduce.
C, Mutation is the appearance of a new allele through DNA change.
D, Gene flow is the arrival of a new allele from a different population.
E, Genetic drift is the arbitrary loss of an allele through a process not related to natural selection. Original

Now, could abiotic molecules form biologically important molecules? To answer this, please remember the specifics about the four macromolecules of life: Carbohydrates, Lipids, Proteins and Nucleic acids.
The experiment that provided evidence that abiotic molecules may indeed form important biological molecules is known as the **Stanley Miller's experiment**.
This experiment gives us an idea about how organic molecules, involved in maintaining life, were originated from abiotic molecules such as NH3, CH4, and H2 and other abiotic factors like temperature, pH, and pressure.
The goal of the Miller/Urey experiments was to mimic the abiotic conditions of the early Earth in the laboratory, and measure if organic molecules could form from the interactions of the abiotic molecules.



From these experiments, they were able to identify amino acids, which were the evidence that chemistry allows for the formation of organic molecules.
More details about the Miller's experiment are found here: https://www.youtube.com/watch?v=UyzScxiGK20

That's it this week. Please reach out if you have any questions and don't forget to visit the Tutoring Center website for further information.