Hey everyone, we are now over halfway through the semester! Keep working hard, and it’ll pay off when final exams begin. I hope exam two went well for everyone!

**Keywords:** Reproductive Isolation, Protocell, Phylogenies, Moss life cycle, seed, gymnosperm, angiosperm, double fertilization

Our Group Tutoring sessions will be every Thursday from 7:00-8:00 PM. You can reserve a spot at [https://baylor.edu/tutoring](https://baylor.edu/tutoring). I hope to see you there!

This week in Biology 1306, we will be covering Campbell Chapters ch 24, 25, 26, 29, and 30

**The Origin of Species, Macroevolution : Campbell Ch. 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 Speciation** occurs when the members of a population are not geographically isolated and are in the SAME area

**History of Life on Earth : Campbell Ch. 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:

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.

Plant Diversity I: How Plants Colonized Land – Campbell Ch. 29

There is a significant amount of evidence indicating that plants descended from Charophytes (green algae). This evidence includes: 1) Rings of proteins that synthesize the cellulose microfibrils of the cell wall; 2) Structure of flagellated sperm; 3) Formation of a phragmoplast- structure of microtubules that forms between the 2 splitting daughter nuclei in cell division

Traits that are specific to Plants:
1. Alternation of Generations
Check out this video: https://www.youtube.com/watch?v=iRKu2MN4T04
2. Multicellular, dependent embryos
3. Walled spores produced in sporangia
4. Multicellular gametangia
Gametangia- gametes within multicellular organs
Archeogonia- female gametangia; releases a single egg that is kept in the bulbous part of the organ
Antheridia- male gametangia; produces sperm and releases them into the environment
5. Apical meristems (described in chapter 30)

Lycophytes (Phylum Lycophyta)- require a host to grow (epiphyte); sporophytes can have upright stems with many small leaves or can have ground-hugging stems; contains Club Mosses, Spikemosses, and Quillworts
Monilophytes (Phylum Monilophyta)- megaphyll leaves and branching roots; contains Ferns, Horsetails and Whisk Ferns

Vascular and Non-vascular Plant Life Cycles

Vascular Plants: Lycophytes and Monilophytes
Non-Vascular Plants (Bryophytes): Liverworts, Mosses, Hornworts

Non-Vascular (MOSS) Plant Life Cycle: haploid (n) gametophytes are the dominant stage of the life cycle
Protonema - small filaments with a large surface area to increase water and nutrient absorption; protonema produces buds which go on to produce the antheridia (male structure)

Gametophore - gamete producing structure
Gametophyte anchored by rhizoid (similar to roots except they are not composed of tissues and do not play a primary role in water and nutrient absorption)

For fertilization to occur, a film of water is required
Sporophyte - consists of a foot, a seta, and a sporangium
Peristome - teeth-like structures open and close to allow for intermittent dispersal of the spores

For a further explanation of the Life Cycle of a Moss, check out this video: https://youtu.be/o1z0Vfo62Lg

Seedless Vascular Plant Life Cycle:
Xylem - brings up the water and minerals with tracheids
Tracheids - lignified vascular tubes that carry water and minerals from the roots into the leaves
Phloem - stacked cells (tube) that distribute sugars, amino acids
Roots - absorb water and nutrients and anchor the plant in the soil
Leaves - primary photosynthetic organ
Lycophytes have microphylls (small, spine shaped leaves)
All other vascular plants have megaphylls (larger and highly branched leaves)
Sporophylls - leaves with sporangia

For a further explanation of the Life Cycle of a Fern and the differences between the Moss Life Cycle, check out this video: https://youtu.be/Fhk-Y0duNjg

Plant Diversity II: Evolution of Seed Plants – Campbell Ch. 30
Seed Plants: larger, more complex plants displaying sporophyte dominant cycles and using
Sporophyte: the diploid (2n) stage of the seed plant’s life cycle which is enlarged and is the ‘structure’ we associate with a plant
Gametophyte: the haploid (n) stage of the seed plant’s life. The male gametophyte is the sperm-containing pollen grain and the female is the egg-containing archegonia/ovules
Seed: a plant embryo and its food supply stored within a
Heterospory: describes the fact that seed plants produce multiple types of gametes**

Important Characteristics of Seed Plant Evolution:

Heterosporous spore production (all seed plants)
Megasporangium on megasporophyll → Megaspore → Female gametophyte → Eggs
Microsporangium on microsporophyll → Microspore → Male gametophyte → Sperm
Evolution of seed plants is a result of the development of protective seeds and the continuing decrease in the size of gametophytes. The reduced **gametophyte** is better protected from the environment (ex. UV radiation) due to the larger **sporophyte**. This **prevents dehydration and potential UV damage** of the gametic genome. Seeds allow plant embryos to be **dormant**, meaning they only grow when the conditions are correct to foster development. This and other structural features allow for the **transport** of seeds to better growing environments.

**Gymnosperm**: naked seed of **conifers**. The mature **sporophyte** (2n), bear pollen cones (♂) and ovulate cones (♀), where **gametophytes** (n) are formed. Check out this video to learn more about **gymnosperm life cycles**: [https://www.youtube.com/watch?v=2gWEgrMwMe0](https://www.youtube.com/watch?v=2gWEgrMwMe0)

**Angiosperms**: flowering plants, which utilize male and female components of the sporophyte (**stamen** and **carpels**, respectively) to form the male and female gametophytes. A pollen grain (2 components: the **tube cell** (n) and the **generative cell** (n) ) from an anther may be transferred to a stigma. The tube cell forms a tube down the style to an ovule while the generative cell divides **mitotically** to form 2 sperm nuclei. At the female gametophyte, one sperm nucleus will fertilize the egg, and the **discharged** nucleus will fertilize the **polar nuclei** to form the **endosperm** (3n).

**Double Fertilization**: the two sperm nuclei fertilize the egg and polar nuclei of the female gametophyte

**Cotyledon**: one or two embryonic seed leaves

For **Monocots** vs. **Eudicots** or more about **double fertilization**, please check out these videos: [https://www.youtube.com/watch?v=xe99TGcebxo; (double fertilization {4:38-6:38})](https://www.youtube.com/watch?v=xe99TGcebxo); [https://www.youtube.com/watch?v=HLYPm2idSTE](https://www.youtube.com/watch?v=HLYPm2idSTE)

**Study Tips:**

*** Review all vocabulary in each chapter and make sure you understand what the terms mean. Be sure that you can walk through the various life cycles of plants!***

**That’s All Folks.**

If you have any questions, feel free to reach out to the tutoring center or use the link at the top of the resource to make a Microsoft Teams appointment.

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