Hey everyone! It’s almost time for test 3! Take a deep breath, and let’s get started

**Keywords:** Animal Diversity, Embryonic Development, Invertebrates, Plant Nutrition and Population Ecology

Our Group Tutoring sessions will be every **Wednesdays from 6:45-7:45 PM in Sid Rich 075.** You can reserve a spot at [https://baylor.edu/tutoring](https://baylor.edu/tutoring). I hope to see you there!

**Topic of the Week:**
This week in Biology 1306, we will be covering Animal Diversity.

Campbell Chapters 32, 33, 37, 52, and 53

**An Overview of Animal Diversity - 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 again.

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

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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).

![Diagram of body cavities](image)

**Highlight One: An Introduction to Invertebrates – Campbell Ch. 33**

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echinodermata (sea stars, sea urchins)</td>
<td>Coelom; bilaterally symmetrical larvae and five-part body organization as adults; unique water vascular system; endoskeleton</td>
</tr>
<tr>
<td>Chordata (lancelets, tunicates, vertebrates)</td>
<td>Coelom; have notochord; dorsal, hollow nerve cord; pharyngeal slits; post-anal tail (see Figure 34.3)</td>
</tr>
<tr>
<td>Nematoda (roundworms)</td>
<td>Hemocoele; cylindrical body with tapered ends; no circulatory system; undergo ecdysis</td>
</tr>
<tr>
<td>Arthropoda (spiders, centipedes, crustaceans, and insects)</td>
<td>Hemocoele; reduced coelom. Have segmented body, jointed appendages, and exoskeleton made of protein and chitin</td>
</tr>
<tr>
<td>Cnidaria (hydras, jellies, sea anemones, corals)</td>
<td>Unique stinging structures (nematocytes) housed in specialized cells (cnidocytes); diploblastic; radially symmetrical; gastrovascular cavity (digestive compartment with a single opening)</td>
</tr>
</tbody>
</table>

**Echinoderms and Chordata are Deuterostomes**

**Ecdysozoans are the most diverse animal group**

**Cnidarians are an ancient phylum of eumetazoan**
**Highlight Two: Plant nutrition often involves relationships with other organisms**

**Campbell Ch. 37.3**

**Mutualistic relationships** are common between plants, soil, and other organisms.

**Rhizobacteria**- live in close proximity to the **rhizosphere** (soil surrounding plant roots)

**Endophytes**- live in between cells within the plant

**Nitrogen Cycle**: nitrogen containing substances are removed from the air and soil, are utilized by organisms, and then returned back to the air and soil for reuse

**Nitrification**: ammonia ($NH_3$) is oxidized into nitrate ($NO_2^-$) and then nitrate is further oxidized into ($NO_3^-$).

**Ammonium** ($NH_4^+$) can be used as a nitrogen source and is derived using 2 different methods:

1. Nitrogen-fixing bacteria convert gaseous nitrogen (found in air) into ($NH_3$), which can acquire a hydrogen from the soil and produce ammonium
2. **Ammonification**: decomposers convert organic nitrogen from dead sources into ammonium

**Nitrogen Fixation**: atmospheric nitrogen ($N_2$) is reduced to ($NH_3$) by bacteria

-Nitrogen fixation by **Rhizobium bacteria** requires an **anaerobic environment**, which can only be accomplished inside the root cortex; this is why the Rhizobium bacteria assume the **bacteroid** form.

**Mycorrhizae**: a **mutualistic symbiotic** fungus which increases root SA to facilitate absorption

**Ectomycorrhizae**- form a thick sheath of branching **hyphae** (mycelia) over the surface of the root; usually formed in woody plant species

**Arbuscular Mycorrhizae**- embedded within the root

Check out this video for further explanation of the **Nitrogen Cycle**: https://youtu.be/UrP1EyM7Cs

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Other Nutritional Adaptations of Plants:

**Epiphytes** - a plant that grows on another plant (commensalistic relationship)

**Parasitic Plants** - absorb water, minerals, and sometimes photosynthetic products from their living hosts

**Carnivorous Plants** - do have photosynthetic capabilities but supplement their diet by capturing and ingesting insects and other small organisms

### Highlight Three: Ecology and the Biosphere and Population Ecology

**Campbell Chapters 52, 53**

Like many chapters in this course, 52 and 53 are very definition heavy. To start, we must be able to differentiate between different types of ecology:

- **Organismal**: how an organism’s structure, physiology and behavior meet
- **Population**: factors affecting population size and why it changes
- **Community**: interactions between species (competition and predation) affect the community
- **Ecosystem**: energy flow and chemical cycling between organisms and environment
- **Landscape**: factors affecting and controlling the exchange of materials, energy and organisms
- **Biome**: major life zones characterized by vegetation type in terrestrial biomes or physical environment in aquatic biomes

**Understand the differences between:**

- **Abiotic**: non-living factors
- **Biotic**: living factors
- **Microclimate**: fine, localized patterns ex. Shade under a canopy
- **Macroclimate**: global, regional and landscape level patterns ex. Mountain sides
- **Climograph**: plot of the annual mean temperature and precipitation in a particular region. DETERMINES WHAT TYPE OF BIOME WILL EXIST IN THAT AREA
- **Thermocline**: abrupt temperature changes between warm upper layer of water and cooler deeper water
- **Seasonal Turnover**: semiannual mixing of water due to climate change causes oxygen rich surface water to go to the bottom and nutrient rich water to the surface
- **Disturbance**: an event (storm, fire, etc.) which changes a community, removing organisms from it and altering resource availability
- **Climate**: the most significant influence on the distribution of organisms in the area; long term prevailing weather conditions in an area
- **Climate change**: change in global climate lasting 3 decades or more
- **Iteroparity**: organisms that reproduce a few offspring more than once ex. Dogs
- **Semelparity**: organisms that reproduce once but have many offspring ex. Salmon

Bodies of water and mountain ranges can affect regional climate conditions. **Ocean currents** heat or cool overlying air masses that pass across land. The high specific heat of water helps moderate the climate. Similarly, **mountains** can influence the air flow over land. Warm air goes up the mountain, cools and rains. The **leeward side** doesn’t get much moisture, so a desert is made on the other side of the mountain.

To learn more about major aquatic biomes, check out this video:

https://www.youtube.com/watch?v=4fMemcd-VXw

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To learn more about terrestrial biomes, check out this video: https://www.youtube.com/watch?v=4kQSXIWsUtg

There are three different types of dispersion we will discuss:

- **Dispersal** is the movement of individuals or gametes away from their areas of origin or centers of high population density. There can be a difference between where a species could live (Potential Range) and where it actually lives (Actual Range).
- **Density** is the number of individuals per area.
- **Dispersion** is the pattern among spacing among individuals in that area.

**Survivorship Curves** describe the death patterns in types of communities.

- **Type 1**- low death rates at the beginning and middle, then steep at the end ex. humans
- **Type 2**- constant death rate over the lifespan
- **Type 3**- high death rate in young, but flattens out for those who survive

Population sizes can also be “selected” in different ways. Those that undergo **density dependent selection**, or selection for traits that maximize reproductive success in crowded environments are **R-selected Populations**. Those that undergo **density independent selection** are **K-selected Populations**.

Remember, there is always a tradeoff between reproduction and survival. There is competition. Among individuals in the population and the resources available that limit that population.

**CHECK YOUR LEARNING**

1. Does it rain more on the windward or leeward side of a mountain?
2. What survivorship curve makes sense for sea turtles? (high early death rate that decreases over time)
3. What is the difference between iteroparity and semelparity?

**THINGS YOU MAY STRUGGLE WITH**
1. Vocabulary! These chapters are all about memorization. Make sure that you can differentiate between the similar concepts presented by your professor.
2. The differences between Protostomes and Deuterostomes. These are crucial to understand. Check out our YouTube page for more information! Go to YouTube, search Baylor Tutoring Center and go to the Bio 2 folder.
3. Differentiating between biomes: Make flashcards, draw pictures, and learn the distinct features of each biome. Learning the type of animals which lived in the biomes helped me differentiate between them. Be patient with yourself and spend time on this.

**Study Tips:**

*** Review all vocabulary in each chapter and make sure you understand what the terms mean***

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 an appointment.

Answers:
1. Windward
2. Type 3
3. Iteroparity-organisms who produce a few offspring more than once
   Semelparity- organisms which produce many offspring once