Biology 1306/1406 – Modern Concepts in Bioscience II

Hello and welcome to the weekly resources for BIO-1306/1406 - Biology 2

This week is Week 9 of class, and typically in this week of the semester, your professors are covering the topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

We also invite you **to look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester.**

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel, or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours (M-Th 9am8pm on class days at 254-710-4135).

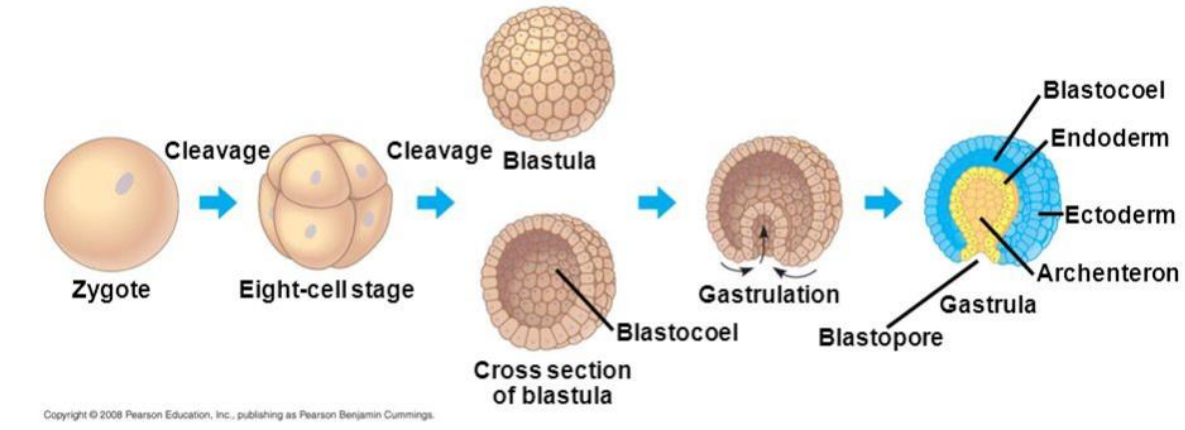
Keywords: Animal Diversity, Embryonic Development, Invertebrates, Plant Nutrition and Population Ecology

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



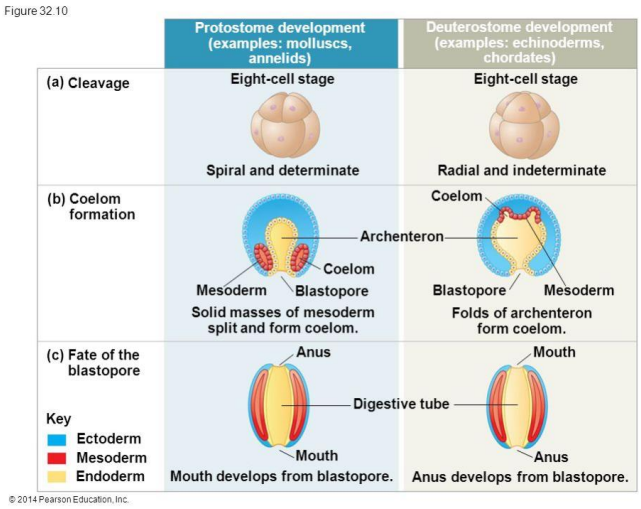
Animals are multicellular, heterotrophic eukaryotes with tissues that develop from **embryonic layers**. The stages of **embryonic development** are shared among all animals and proceeds through many cleavages, or successions of mitotic cell division without cell growth, meaning that cells divide into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

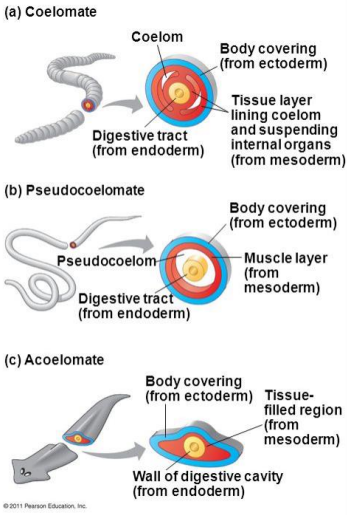
Animals can also be characterized by their **body plans**. Sponges have **no symmetry**, meaning

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

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).





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

Phylum	Description
Echinodermata (sea stars, sea urchins)	Coelom; bilaterally symmetrical larvae and five-part body organization as adults; unique water vascular system; endoskeleton
Chordata (lancelets, tunicates, vertebrates)	Coelom; have notochord; dorsal, hollow nerve cord; pharyngeal slits; post-anal tail (see Figure 34.3)

Echinoderms and Chordata are Deuterostomes

Phylum	Description
Nematoda (roundworms)	Hemocoel; cylindrical body with tapered ends; no circulatory system; undergo ecdysis
Arthropoda (spiders, centipedes, crustaceans, and insects)	Hemocoel; reduced coelom. Have segmented body, jointed appendages, and exoskeleton made of protein and chitin

Ecdysozoans are the most diverse animal group

Phylum	Description
Cnidaria (hydras, jellies, sea anemones, corals)	Unique stinging structures (nematocysts) housed in specialized cells (cnidocytes); diploblastic; radially symmetrical; gastrovascular cavity (digestive compartment with a single opening)

Cnidarians are an ancient phylum of eumetazoan

Lophotrochozoans have the widest range of animal body forms

Phylum	Description
Platyhelminthes (flatworms)	No body cavity; dorsoventrally flattened; gastrovascular cavity or no digestive tract
Syndermata (rotifers and acanthocephalans)	Hemocoel; rotifers have alimentary canal (digestive tube with mouth and anus) and jaws (trophi); acanthocephalans are parasites of vertebrates
Ectoprocta and Brachiopoda	Coelom; have lophophores (feeding structures bearing ciliated tentacles)
Mollusca (clams, snails, squids)	Hemocoel; reduced coelom; three main body parts (muscular foot, visceral mass, mantle); most have hard shell made of calcium carbonate
Annelida (segmented worms)	Coelom; body wall and internal organs are segmented (except digestive tract, which is unsegmented)

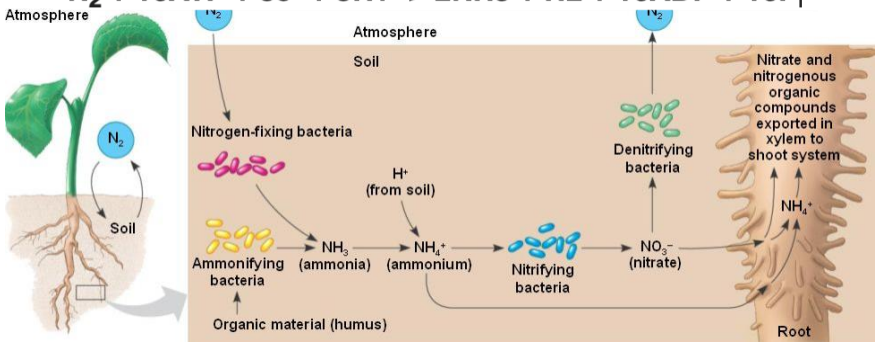
Sponges are basal animals that lack tissues.

Phylum	Description
Porifera (sponges)	Lack tissues; have choanocytes (collar cells—flagellated cells that ingest bacteria and tiny food particles)

Highlight Two: Plant nutrition often involves relationships with other organisms
Campbell Ch. 37.3

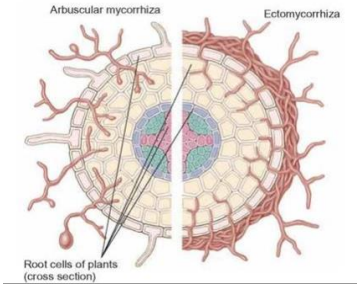
Mutualistic relationships are common between plants, soil, and other organisms.
Rhizobacteria- live in close proximity to the **rhizosphere** (soil surrounding plant roots)
Endophytes- live in between cells within the plant
Nitrogen Cycle: nitrogen containing substances are removed from the air and soil, are utilized by organisms, and then returned back to the air and soil for reuse
Nitrification: ammonia (NH_3) is oxidized into nitrate (NO_3^-) and then nitrate is further oxidized into (NO_2^-).
Ammonium (NH_4^+) can be used as a nitrogen source and is derived using 2 different methods:

$N_2 + 16ATP + 8e^- + 8H^+ \rightarrow 2NH_3 + H_2 + 16ADP + 16P_i$



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/UrP1E-yM7Cs

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

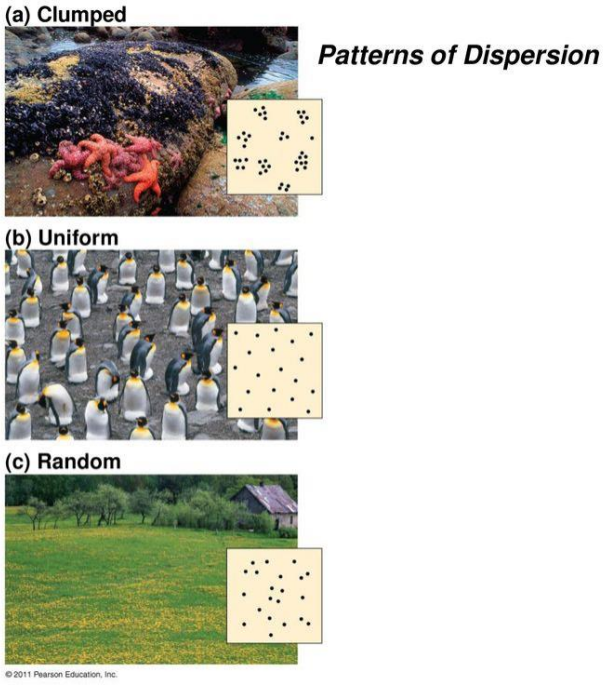
Bodies of water and mountain ranges can affect regional climate conditions. **Ocean currents** heat or cool overlying air masses that pass across land. The high specific heat of water helps moderate the climate. Similarly, **mountains** can influence the air flow over land. Warm air goes up the mountain, 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

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

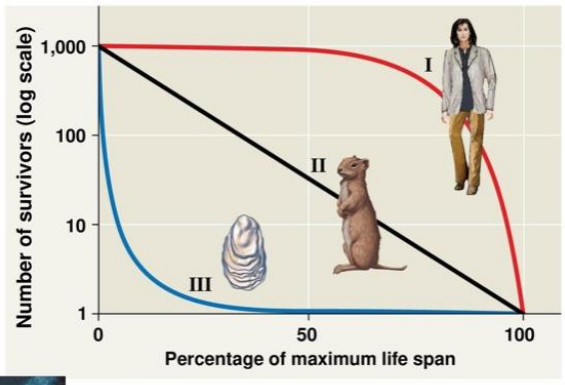
There are three different types of dispersion we will discuss:

- **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

Figure 40.16 Idealized survivorship curves: types I, II, and III



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