ECOLOGY, LECTURE 7: LANDSCAPES, BIOMES, & THE GLOBAL ECOSYSTEM (1222–1236, 1159–1171)

Before reviewing the **biomes** of the world, we first reviewed some of the major planetary **climate systems** and related phenomena, including the great **ocean conveyor belt**, and the patterns of global **air circulation** that produce high precipitation at the equator and belts of aridity at 30° north and south latitude. We looked at the **moderating influence** of water bodies on local landforms, and we noted the patterns of rainfall on the **windward** and **leeward** sides of highlands.

We briefly reviewed the **hydrological cycle** and three **biogeochemical cycles** (carbon, nitrogen, phosphorus). You should be able to follow an H_2O molecule from its place in the oceans through the hydrological cycle and back to the sea.

Carbon is required in relatively great abundance by living organisms. The carbon captured by plants in photosynthesis is roughly equal to the quantity respired by living cells. **Fossil fuels** derive from the remains of ancient organisms (e.g., coal deposits primarily represent the remains of plants from the Carboniferous), and they are a major reservoir of carbon. The burning of fossil fuels releases carbon into the atmosphere and is a critical factor in global climate change. **Nitrogen** is an important limiting nutrient for many plant communities. The main reservoir of nitrogen is the atmosphere, and nitrogen enters ecosystems primarily through the action of nitrogen fixing bacteria. **Nitrifying bacteria** convert nitrogen into a form readily assimilable by plants, and **denitrifying bacteria** return nitrogen atoms to the atmosphere. **Phosphorus** is another mineral essential to organic systems. Unlike carbon and nitrogen, however, phosphorus does not have any significant store in atmosphere; ultimately, phosphorous derives from the weathering of bedrock.

Before reviewing the aquatic biomes of the world, we looked at the patterns of **zonation** in lakes and oceans. These zones are defined in terms of light penetration (**photic** and **aphotic**), distance from shore and depth (e.g., **intertidal** and **littoral**), and whether open water or water bottom (**pelagic** or **benthic**). The distinction between marine water and fresh water is based on salt concentration; **estuarine** waters may be **brackish**. Aquatic systems rich in nutrients are **eutrophic**, and those that are nutrient poor are **oligotrophic**.

The distribution of terrestrial biomes on the continents correlates closely with precipitation and temperature (this can be visualized on a **climograph**). We briefly examined the major features of the world's biomes, noting the distribution of deserts (in relation to global air circulation patterns) and **chaparral** (in relation to a unique combination of rainy winters and long, dry summers). You should have a general familiarity with the **physiognomy** of these systems and their distribution around the globe. For fun, we looked at the ecozones of California, an extraordinarily diverse region of North America. The geological and microclimatic heterogeneity of California supports diverse plant and animal communities.

Where two biomes or communities overlap, you have an **ecotone**. In some cases, ecotones are inhabited by organisms not present in adjacent communities. Ecotonal systems tend to be relatively diverse and productive.

Finally, we reviewed several ecosystem concepts, including **trophic efficiency**, the **pyramids of mass and energy**, and **net primary production** (**gross primary production** minus **respiration**). We finished by looking at the relative productivity of Earth's ecosystems (Fig. 55.6) and the relationship between net primary production and evapotranspiration in terrestrial ecosystems (Fig. 55.8).