10.1

Photosynthesis

Now that we have managed to learn about harvesting energy from electrons, let's spend some time learning in more detail how the energy was trapped in the electrons in the first place. The process of capturing energy from the sun to energize electrons and then store them in covalent bonds is called **photosynthesis**. Interesting, unless broken down and released, that energy can be stored indefinitely. For example, consider fossil fuel energy (coal, natural gas) that is being harvested from products 100s of millions of years old. There are not a lot of organisms capable of capturing sun energy to harness it. Organisms that fit into this category are called **autotrophs** and consist of plants, algae, and a few bacteria (and maybe Celestial beings!). Autotrophs, in particular photoautotrophs, can literally produce food from the sun! The rest of the world's organisms fit into the category called **heterotrophs** because they rely on captured energy from the autotrophs to survive.

Photoautotrophs use specialized structures during photosynthesis, some that capture CO_2 and H_2O and then release O_2 called **stomata**, and some that capture light energy called **chlorophyll**. The stomata are small openings, typically on the underside of leaves (minimizes water loss), that are surrounded by cells that respond to osmotic changes. These cells will shrink or swell, depending on osmotic conditions, which in turn regulates the pore size of the stomata. Chlorophyll is a pigment molecule located in structures called thylakoid membranes of the chloroplast (an organelle found within the plant cell). Like mitochondria, chloroplasts have a double membrane (outer and inner leaflets) and sandwiched between the two layers are the thylakoid structures (stacked discs) with the embedded chlorophyll pigment. The chlorophyll pigment has the ability to absorb light energy and convert that energy into chemical energy.

What then, is light energy?