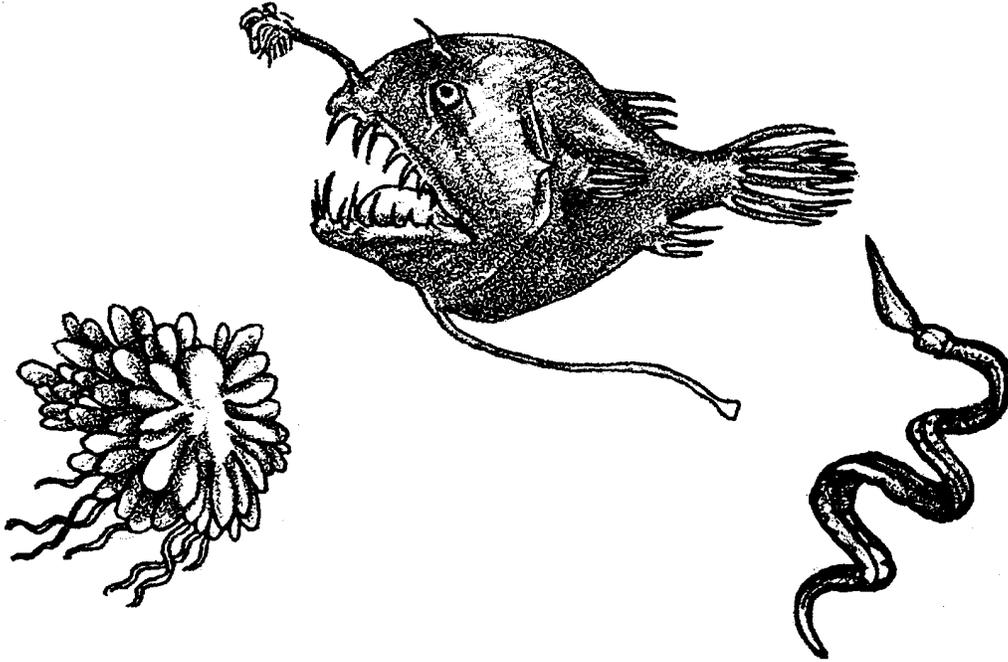
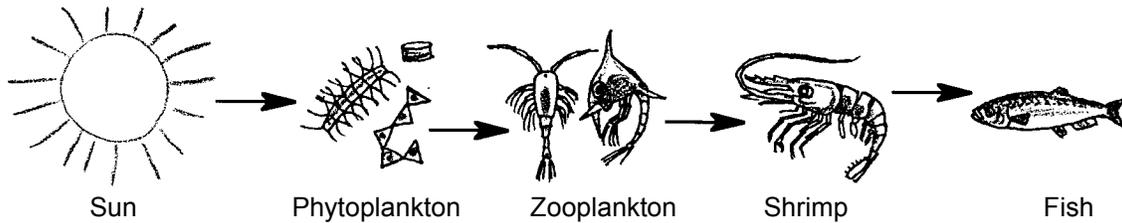


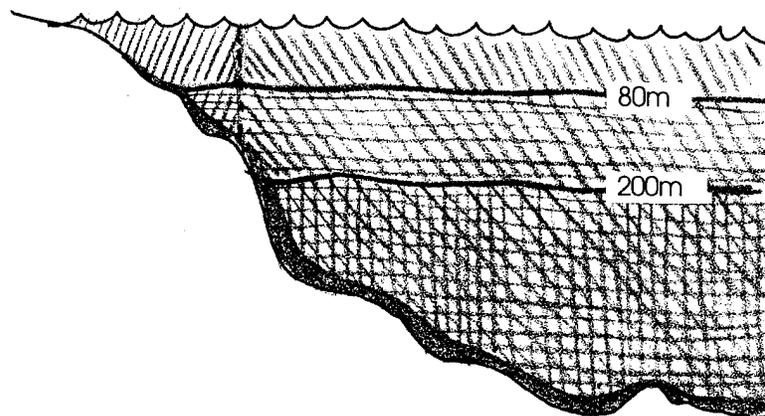
Creatures of the Abyss



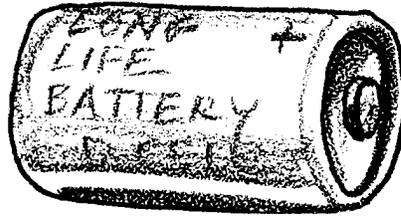
Sunlight is the source of energy for the phytoplankton that drift in the great ocean currents and that feed the zooplankton, fish, sharks and great baleen whales that cross the oceans. The sun fuels food webs in rocky shore tidepools and along wave swept sandy beaches, too. The giant kelp forests and all their inhabitants could not survive without the energy of the sun.



That sunlight, however, cannot penetrate deeper than a few hundred feet into the water, yet the deepest areas of the ocean are **thousands** of feet deep. These are the regions scientists long thought of as dark and lifeless. Without sunlight for phytoplankton or seaweeds, it seemed there could be no life in the abyssal regions of the oceans.



Let's look at why sunlight is so important. Sunlight is energy. All living things need ENERGY and NUTRIENTS. Food is like a battery, storing ENERGY.



All living things are able to break the bonds that hold molecules of food together so that they can get the energy stored in the food. This process of breaking food apart to get energy is called cellular respiration. All living things respire all the time.

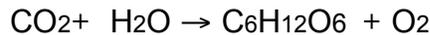
Living organisms use this energy they get from food to grow, to move and to keep functions in their bodies operating. For example, humans need energy to breathe, fight disease, think, reproduce and keep many other similar functions in their bodies operating.

In sunlight-based food webs, plants harness light energy through photosynthesis. The plants are the battery makers; they make the food that stores the sun's energy.

This formula depicts photosynthesis:



or, written another way:

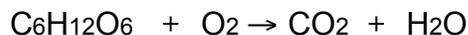


The plant takes in carbon dioxide and water. It harnesses sunlight energy and uses it to rearrange the atoms in the carbon dioxide and water to make glucose and oxygen. The oxygen is a waste product. The glucose is an energy rich molecule. Glucose stores the energy from the sun.

Plants later use this glucose, breaking it apart so the plant can use the energy stored in the glucose for growth or some other activity.

When animals feed on plants or on each other, they digest their food until it is broken back into glucose molecules. Then, just like plants, they break the glucose apart so they can use the energy stored within. This process, in both plants and animals, is cellular respiration. The glucose is broken into carbon dioxide and water and the energy released.

The formula for cellular respiration looks like this:



1. What do living things use energy for?

- 2 a. What are the ingredients for photosynthesis?
- b. What are the waste products of photosynthesis?
- c. What is the valuable end product of photosynthesis and why is it important?

- 3 a. What are the ingredients for cellular respiration?
- b. What are the waste products of cellular respiration?
- c. What do living things get from cellular respiration that they need to stay alive?

Living organisms use NUTRIENTS as building materials.

If we took any living thing apart into molecules and atoms, we would find that every organism is built almost entirely of carbon atoms. A few of many other atoms make up the rest of the organism. These include, for example, calcium, iron, magnesium, sodium, and potassium. Do any of these sound familiar? You may have taken a vitamin today that included some of these nutrients. We try to eat a variety of foods that include these nutrients, these building blocks that our bodies use to build bone, muscle, blood, skin and all the other parts of our bodies.

All living things need NUTRIENTS. Carbon atoms and other atoms will make the parts of the organism. While animals get nutrients from the food they eat, plants must absorb nutrients from the water or soil in which they live. This is why plants do better in our gardens when we fertilize them. We are providing nutrients the plants will use as building blocks.

- 4 a. What do living things use nutrients for?
- b. Where do animals get nutrients?
- c. Where do plants get nutrients?

Most of the life in the ocean, then, is ultimately dependent on sunlight. Phytoplankton and algae capture solar energy and then are food for zooplankton, fish and so many other animals of the sea.

Now consider the deep sea. In those vast waters, there is no light. It would seem, then, that there would be no organisms to begin food chains, no source of energy and no flow of nutrients.

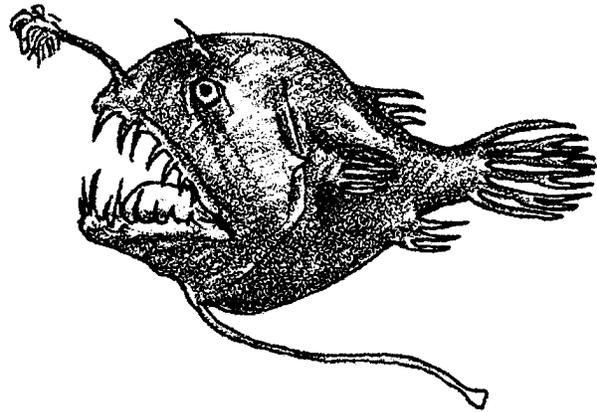
This is almost true.

When surface organisms die, their bodies decompose. The resulting decayed organic material, called detritus (dee-try-tus), sinks. One can see this falling detritus in videos filmed on submersibles exploring the deep sea. It looks so much like falling snow that biologists call it “marine snow.”

Detritus is like slightly used batteries. There’s still some energy and some nutrients stored in that marine snow.

So, who lives in these dark waters? Who makes a living feeding on the marine snow?

Every once in awhile, fishermen trawling for their catch and oceanographers on research vessels have dredged up bizarre fish from deep waters. The fish never survive the drastic temperature and pressure changes of the trip up from the depths. Now, with the development of submersibles, biologists have visited these creatures in their own habitat and brought back footage of bizarre beings that inhabit the deep, dark, cold waters. Let’s take a look at some of those animals.



Obtain a set of Deep Sea Animal picture cards showing an assortment of animals researchers have discovered in the deep sea. Also obtain a set of Deep Sea information cards.

Now, see if you can match the picture cards with the correct information cards. These are the creatures of the real abyss.

When you have matched all your cards, start to look for patterns in these deep sea animals. Notice their shapes, sizes and colors. Look for typical body parts. Think about what an animal must be like to survive in the deep.

- 5 a. Which of the deep sea animals could fit in the palm of your hand?
- b. Which of the deep sea animals are larger than you are?
- 6 a. Which of the deep sea animals bioluminesce?
- b. Why do you think these animal bioluminesce?
- 7 a. Which of the deep sea animals feed on detritus, or marine snow?
- b. Which of the deep sea animals feed on other deep sea animals?
- c. These deep sea animals are part of sunlight-based food webs. Explain how this can be so when they live in the dark regions of the oceans?