LEVELS OF BIOLOGICAL ORGANIZATION

The biosphere. As soon as we are near enough to Earth to make out its continents and oceans, we begin to see signs of life—in the green mists of the planet's forests, for example. This is our first view of the biosphere, which consists of all the environments on Earth that are inhabited by life. The biosphere includes most regions of land; most bodies of water, such as oceans, lakes, and rivers; and the atmosphere to an altitude of several kilometers.

Ecosystems. As we approach Earth's surface, we can begin to make out a forest with an abundance of deciduous trees (trees that lose their leaves in one season and grow new ones in another). Such a deciduous forest is an example of an ecosystem. Grasslands, deserts, and the ocean's coral reefs are other types of ecosystems. An ecosystem consists of all the living things in a particular area, along with all the non-living components of the environment with which life interacts, such as soil, water, atmospheric gases, and light. All of Earth's ecosystems combined make up the biosphere.

Communities. The entire array of organisms inhabiting a particular ecosystem is called a biological community. A community in our forest ecosystem includes many kinds of trees and other plants, a variety of animals, including birds, mushrooms and other fungi, and enormous numbers of diverse microorganisms, which are living forms such as bacteria that are too small to see without a microscope. Each of these forms of life is called a species.

Populations. A population consists of all the individuals of a species living within the bounds of a specified area. For example, our Ontario forest includes a population of sugar maple trees and a population of American black bears. We can now refine our definition of a community as the set of populations that inhabit a particular area.

Organisms. Local living things are called organisms. Each of the maple trees and other plants in the forest is an organism, as is each forest animal such as a squirrel, bear, and insect. The soil teems with microorganisms such as bacteria.

Cells. The cell is life's fundamental unit of structure and function. Some organisms, such as amoebas and most bacteria, are single cells. Other organisms, including plants and animals, are multicellular. Instead of a single cell performing all the functions of life, a multicellular organism has a division of labor among specialized cells. A human body consists of trillions of microscopic cells of many different kinds, including muscle cells and nerve cells, which are organized into the various specialized tissues. For example, muscle tissue consists of bundles of muscle cells. And note again the cells of the tissue within a leaf's interior. Each of the cells you see is about 25 μm (micrometers) across. It would take more than 700 of these cells to reach across a penny. As small as these cells are, you can see that each contains numerous green structures called chloroplasts, which are responsible for photosynthesis.

Organelles. Chloroplasts are examples of organelles, the various functional components that make up cells. In this figure, a very powerful tool called an electron microscope brings a single chloroplast into sharp focus.

Molecules. Chlorophyll is a chemical structure consisting of two or more small chemical units called atoms, which are represented as balls in this computer graphic of a chlorophyll molecule. Chlorophyll is the pigment molecule that makes a maple leaf green. One of the most important molecules on Earth, chlorophyll absorbs sunlight during the first step of photosynthesis. Within each chloroplast, millions of chlorophyll and other molecules are organized into the equipment that converts light energy to the chemical energy of food.

Source: Biology by Campbell