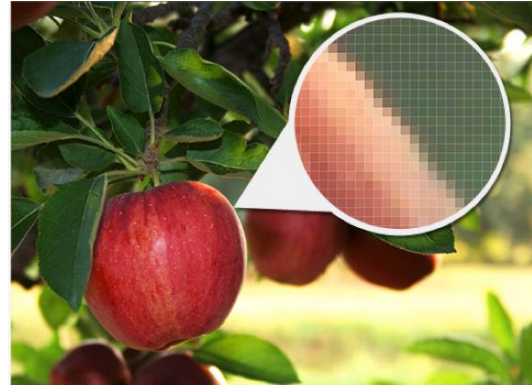


Reflect

When you look at some objects, you discover that they are made up of individual parts, such as the pieces in puzzles or the segments in plastic toys. However, other objects need a closer look with a magnifying glass or microscope to see their small parts. For example, when you look through a hand lens at a computer picture, you will see that it is made up of thousands of tiny squares of color, called pixels. What are the smallest units in living things?



A computer graphic is made up of tiny parts called *pixels*. What are the parts that make up living things?

The cell is the basic unit of life.

Cells are the smallest unit in living things, but most cells are too small to be seen with the naked eye. So, what evidence do we have that living things are made of cells, if cells cannot be seen? Prior to the invention of the **microscope**, the existence of cells was unknown.

microscope – a scientific tool that uses a combination of lenses to make a small object appear bigger than it is



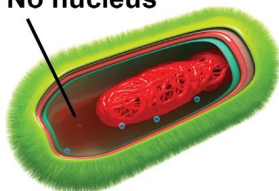
In 1665, English scientist Robert Hooke looked through an early microscope that magnified the image of thin slices of cork to 30 times its original size. He saw many small compartments and coined the structures *cells*. Hooke was actually observing the cell walls of cork tissue taken from the bark of an oak tree.

In 1670, Dutch scientist Antonie van Leeuwenhoek looked at pond water through a microscope and saw tiny living things. He was the first to describe these single-celled organisms, and he called them *animalcules*.

What Do You Think?

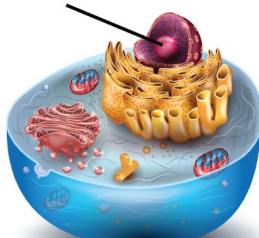
Prokaryote

No nucleus



Eukaryote

Nucleus



How can you sort organisms based on the types of cells living things contain? Organisms composed of only one cell that have no nucleus are called *prokaryotes*, whereas all other cells having a nucleus, whether found in single- or many-celled organisms, are called *eukaryotes*.

Reflect

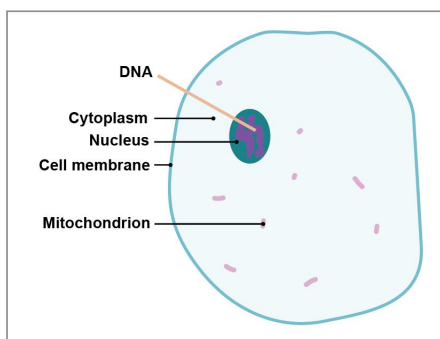
The cell is the basic unit of life.

One of the most important internal characteristics that scientists use to classify organisms is the cell. All organisms are made up of one or more cells. Organisms that consist of one single cell are called *unicellular*, whereas organisms that consist of many different numbers and types of cells are called *multicellular*. The prefix *uni-* means “one”; the prefix *multi-* means “many.”

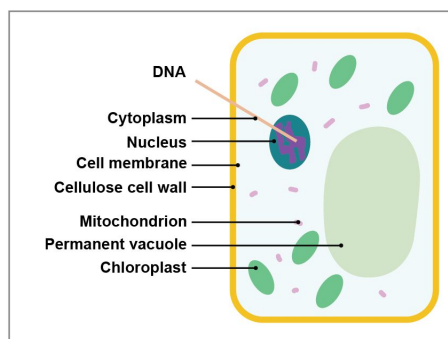
A *cell* is the basic unit of life; it is surrounded by a cell membrane that keeps the cell intact. Inside all eukaryotic cells are specialized structures called *organelles* that carry out specific functions inside the cell.

All cells also have genetic material called *DNA*, which contains instructions for making new organisms and for carrying out all functions that keep a cell alive. In some cells, DNA is packaged inside a *membrane* in an organelle called a *nucleus*. In other cells, it floats freely in the cytoplasm.

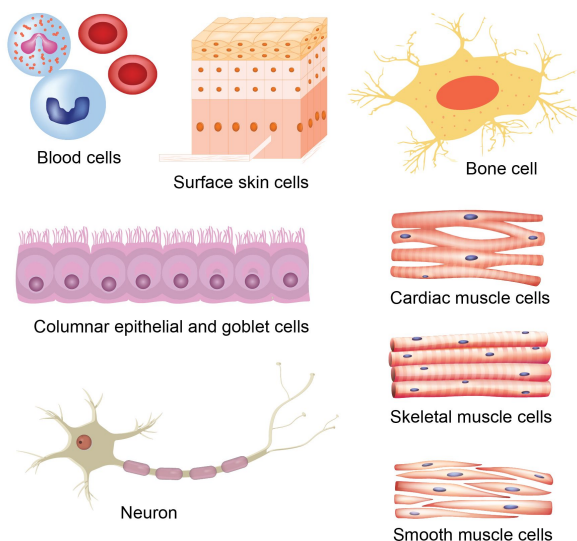
Basic animal cell



Basic plant cell



What Do You Think?

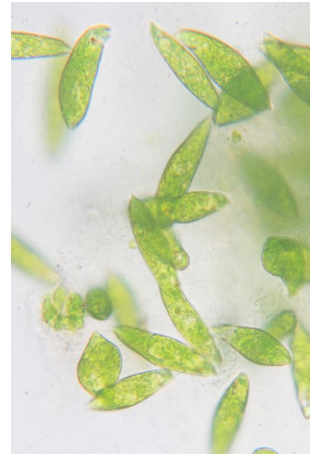
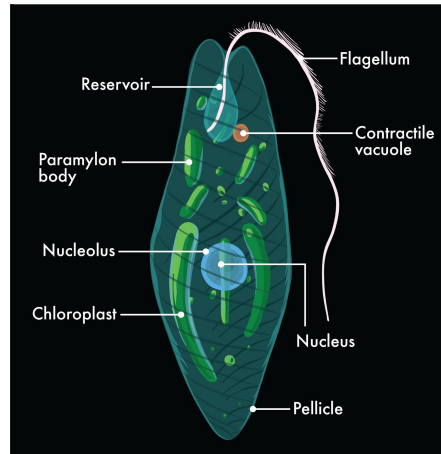


Scientists estimate that the average adult human has somewhere between 10 and 100 trillion cells! Cells come in many different sizes, types, and shapes and serve many different functions. Where do you think you can find these cells in the body? You probably already know where blood, skin, bone, and muscle cells are found simply by their names. However, you may not know that epithelial cells line organs such as the mouth and esophagus, while goblet cells are specialized epithelial cells that produce mucus. Neurons are nerve cells. There are approximately 200 different kinds of cells in the human body.

Reflect

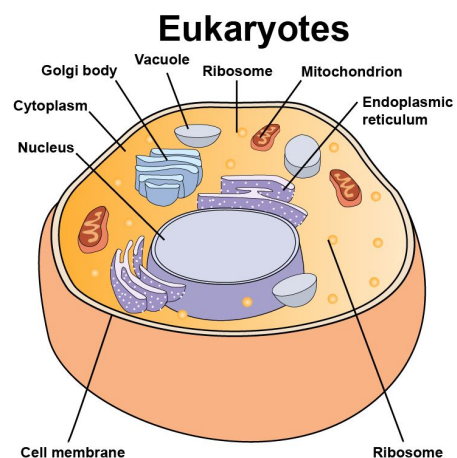
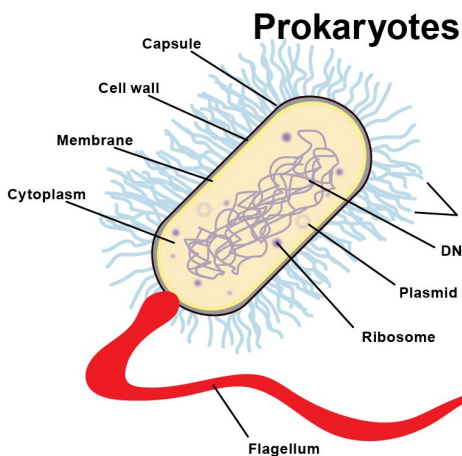
Living things can be made up of one or more cells.

Not all organisms are complex. Some are very simple and made up of only one cell. Take a look at this *Euglena*. A *Euglena* is an organism made up of a single cell. Unlike humans, it does not have specialized organs, such as a brain or stomach. However, it can move through its environment using its whiplike *flagellum* and many other structures. The *Euglena* is a eukaryotic cell because it has a nucleus. All this is in a single cell!



Euglena are single-celled organisms found in pond water.

There are two main types of cells.



Prokaryotic cells include all species of bacteria. Prokaryotic cells have the basic structures common to all cells, which include a cell membrane surrounding the cytoplasm and DNA. However, prokaryotic cells do not have membrane-enclosed organelles such as mitochondria or a nucleus. Prokaryotic cells do contain ribosomes, but there is debate as to whether or not a ribosome counts as a type of organelle. Therefore, the question of whether or not prokaryotic cells contain any organelles is still up for debate.

Eukaryotic cells include the cells of plants, animals, fungi (such as mushrooms), and protists (such as the unicellular microorganisms *Euglena* and *Amoeba*). Similar to prokaryotic cells, eukaryotic cells have a cell membrane, cytoplasm, and DNA. However, eukaryotic cells are more complex. They have something that prokaryotic cells do not: organelles surrounded by membranes. These include mitochondria and a nucleus, where DNA is stored.

Try Now

Scientists can classify things into two categories: living and nonliving. Of the living things, scientists can further classify things into unicellular and multicellular subcategories. Sort the items below into their appropriate categories.

- Computer**
- Human**
- Euglena**
- Tree**
- Baseball**
- Aluminum can**
- Bacteria**
- Fern**
- Phone**
- Bear**
- Amoeba**
- Penguin**

| Nonliving | Living | |
|-----------|-------------|---------------|
| | Unicellular | Multicellular |
| | | |