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Understanding More about Cells

The Discovery of Cells

Most Cells are too small to see with the naked eye. A typical human body cell is many times smaller than a grain of sand! Scientists became aware of cells only after microscopes were invented in the 1600s. When the English scientist **Robert Hooke** used one of the first microscopes to observe a thin slice of cork in 1665, he saw " a lot of little boxes." These little boxes reminded him of the small rooms in which monks live, so he called them cells. Later Hooke observed the same pattern in the stems and roots of carrots and other plants. What Hooke still did not know, however, was that cells are the basic unit of living things.

Ten years later, the Dutch Scientist **Anton van Leeuwenhoek** focused a microscope on what seemed to be clear pond water and discovered a wondrous world of living creatures. He named them "animalcules," or tiny animals. Today we know that they were not animals, but single-celled protests, among the most diverse of all living things.

Formation of the Cell Theory

It took scientists more than 150 years to fully appreciate the discoveries of Hooke and Leeuwenhoek. In 1838, the German botanist Matthias Schleiden concluded that cells compose not only the stems and roots but every part of a plant. A year later, the German zoologist Theodor Schwann made the same claim about animals. And in 1858, a German physician, Rudolph Virchow, observed that cells come only from other cells. The observations of Schleiden, Schwann, and Virchow form what is known today as the cell theory. The Cell Theory is stated in three parts:

1. All living things are composed of one or more cells.
2. In organisms, cells are the basic units of structure and function.
3. Cells are produced only from existing cells.

A Short History of Cells

The oldest fossils we have of cells are those of tiny cyanobacteria. These Prokaryotic cells lived at least 3.5 billion years ago**. Prokaryotes** are single-celled organisms that lack internal membrane-bound compartments. The term *prokaryote* is from the Greek *pro*, meaning "before," and *karyote*, meaning "kernel." Early cells were simple and small. Like their fossil ancestors, modern prokaryotes are very small and do not have internal compartments. Without separate compartments that isolate materials, cells cannot carry out many specialized functions. In prokaryotes, the genetic material is a single, circular molecule that is not enclosed in a membrane-bound compartment. For nearly 2 billion years—half the age of Earth—prokaryotes were the only organisms that existed.

The first Cells with internal compartments evolved about 1.5 Billion Years Ago. These cells are called **Eukaryotic** cells. The term *eukaryotic* comes form the Greek words *eu*, meaning "true," and *karyote*, meaning "kernel" or nucleus." Eukaryotes have a **nucleus**, a membrane—bound internal compartments called organelles that carry out specific functions. Such organization allows *eukaryotic* cells to function in more complex ways than do *prokaryotic* cells.

How Eukaryotes Evolved

Most biologists who study eukaryotic cell structure think that eukaryotes evolved from prokaryotes. Many of the organelles of eukaryotes resemble bacteria, perhaps engulfed long ago by much larger cells. Scientists hypothesize that bacterial "trespassers" remained inside these cells, gradually losing their ability to live independently. These invading bacteria became organelles, and eukaryotic cells were the result. The fact that some organelles have their own distinctive DNA provides additional evidence for this hypothesis.

All living cells that are not bacteria are eukaryotes. Your cells are eukaryotic, as are tree cells and elephant cells. The "animalcules' seen by van Leeuwenhoek also were eukaryotic.

Write answers to the questions below in a complete sentence on a separate piece of paper. ***These answers must be <u>TYPED</u>.***

1. Which scientists used one of the first microscopes to observe a thin slice of cork? What did he call the little boxes he saw?
2. Which scientist was the first to see living cells?
3. What observations were used to develop the cell theory? What is the cell theory?
4. What function do organelles serve?
5. In prokaryotes, DNA exists as a single molecule. Why is it not considered an organelle?
6. Which cells function in more complex ways and have internal compartments that carry out specific functions-a prokaryotic or eukaryotic cells?
7. Explain the process of how most scientists believe that eukaryotic cells have evolved.