

THE CELL THEORY

One of the basic principles of biology, the cell theory, is a widely accepted explanation of the relationship between cells and living things. It holds true for all living things, no matter the size. The cell theory states that:

1. All living things are composed of cells
2. Cells are the basic unit of structure and function in living things
3. All cells are produced by existing cells

The development of the cell theory was possible because of advances made to the microscope, along with several contributing scientists. In the 1600's, there was no way for scientists to make direct observations of objects that were too small to be seen by the naked eye. But with the invention of the microscope, an entirely new world was discovered.

Contributing Scientists

Robert Hooke used his own created compound microscope to view thin slices of oak tree cork in 1665. He described what he saw as compartments, or pores, and he called them cells. While he wasn't able to identify the structures and functions of the cells, he did observe several specimens with similar results.






Anton Van Leeuwenhoek was a Dutch lens crafter who sought to improve the design of the microscope. In 1674, he observed pond water and most of his specimens were of unicellular organisms such as bacteria and algae. In his pond water samples, he saw organisms that appeared to be moving, similar to a swimming fish.

Matthias Schleidan was a botanist and studied a variety of plants and their structures,

under the microscope. In 1838 he developed the theory that all plants are made up of cells.

Theodor Schwann added to Schleidan's theory in 1839. He had researched the process of digestion and with his studies, determined that all animals are made up of cells. Schleidan's original theory was then extended to say that, "all living things are composed of cells."

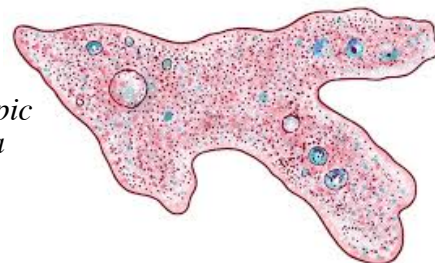
Rudolf Virchow added to the cell theory by stating that, "all cells come from cells" in 1855. His research was based on his studies of disease. Another significant finding was that diseased cells can be produced by healthy cells, as he observed cancer cell growth.

Hooke	Leeuwenhoek	Schleidan	Schwann	Virchow
				
1665 Identified and named cells	1674 Observed live cells	1838 Stated that all plants are made of cells	1839 Stated that all living things are made of cells	1855 Stated that all cells come from other cells

New Knowledge of Cells

Organisms can be classified as being unicellular or multicellular. A unicellular organism consists of only one cell, such as bacteria, fungi, and an amoeba (shown below). Unicellular organisms carry out all of their life processes as one single cell. These organisms are also thought to have existed over 3.8 billion years ago.

Microscopic Amoeba



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Multicellular organisms, such as plants and animals, are made up of many cells. Humans, for example, are made up of approximately 37 trillion cells! Multicellular organisms are far more complex than those made up of only one cell and are typically much larger in size. In most multicellular organisms, cells are organized into tissues, organs, and organ systems. Tissues are a group of specialized cells working together. For example, nerve cells combine to form nerve tissue. When tissues are combined, they create an organ. Nerve tissue, when combined, creates the brain. And when different organs work together to perform major bodily functions, they are called an organ system. The nervous system is made up of the brain, spinal cord, and the nerves of the body.



*Multicellular
Frog*

Cells come in a variety of sizes, depending on the organism and the function of the cell itself. Some cells are as large as a period at the end of a sentence, while others are too small to be seen with the naked eye. Each cell has a special structure, making its components different from other cells. The structures within the cell help determine its function. For example, a cell that contains chloroplast will be able to perform photosynthesis whereas a cell that lacks the chloroplast will get its energy from another source.

Inside each cell are tiny structures called organelles, all of which have a specialized function that allow the cell to carry out necessary processes. Some functions of organelles include the production of energy, storing materials until needed by the cell, and delivery of nutrients from one part of the cell to another.

Additional Notes:

#1

Explain how Robert Hooke and Anton Leeuwenhoek contributed to the development of the cell theory, even though they did not directly participate in it's creation.

#2

Describe why a multicellular organism is considered to be more complex than a unicellular organism.

#3

Describe why a unicellular organism may not have as long of a life span as a multicellular organism. *Be sure to include information about cell structure and function.*

#4

How does the structure of a cell relate to its function? Think of an example to help explain your answer.

#5

Think of your own example (other than the nervous system) to describe how cells are organized within multicellular organisms.

#6

How do you think the cell of a unicellular organism compares to that of a multicellular organism? *Give 2 examples*

#7

Explain what the following means:

All cells are produced by existing cells.

#8

Describe how scientists discovered that *cells are the basic unit of structure and function in living things.*

#9

How do advances in microscopes and technology allow scientists to further investigate cells and their structure/function?

#10

Why do you think the cell theory has yet to be proven false?

#11

Which scientist do you think had the greatest impact on our current understanding of life? Explain your answer.

#12

Describe how unicellular organisms may have existed 3.8 million years ago with such harsh conditions on earth.