**CELLS**

http://www.britannica.com/EBchecked/topic/101396/cell/37398/The-nucleus

A cell, in biology, is the basic *membrane-bound* unit that contains the fundamental molecules of life and of which all [living things](http://www.britannica.com/EBchecked/topic/344848/living-things) are composed. A single cell is often a complete organism in itself, such as a [bacterium](http://www.britannica.com/EBchecked/topic/48203/bacteria) or [*yeast*](http://www.britannica.com/EBchecked/topic/652395/yeast)*.* Other cells acquire specialized functions as they mature. These cells cooperate with other specialized cells and become the building blocks of large [multicellular organisms](http://www.britannica.com/EBchecked/topic/396985/multicellular-organism), such as animals and humans. Although cells are much larger than atoms, they are still very small. The smallest known cells are a group of tiny bacteria called [mycoplasmas](http://www.britannica.com/EBchecked/topic/400296/mycoplasma%22%20%5Co%20%22mycoplasmas); some of these single-celled organisms are spheres about 0.3 micrometre in diameter, with a total mass of 10−14 gram—equal to that of 8,000,000,000 hydrogen atoms. Cells of humans typically have a mass 400,000 times larger than the mass of a single mycoplasma bacterium, but even human cells *are only about 20 micrometres across.* It would require a sheet of about 10,000 human cells to cover the head of a pin, and each human organism is composed of more than 75,000,000,000,000 cells.

This article discusses the cell both as an individual unit and as a contributing part of a larger organism. As an individual unit, the cell is capable of metabolizing its own nutrients, synthesizing many types of molecules, providing its own energy, and replicating itself in order to produce succeeding generations. It can be viewed as an enclosed *vessel*, within which innumerable [chemical reactions](http://www.britannica.com/EBchecked/topic/108802/chemical-reaction) take place simultaneously. These reactions are under very precise control so that they contribute to the life and procreation of the cell. In a multicellular organism, cells become specialized to *perform* different functions through the process of differentiation. *In order to do* this, each cell keeps in constant communication with its neighbours. As it receives nutrients from and expels wastes into its surroundings, it adheres to and cooperates with other cells. Cooperative assemblies of similar cells form tissues, and a cooperation between tissues in turn forms [organs](http://www.britannica.com/EBchecked/topic/431855/organ), which carry out the functions necessary to sustain the life of an organism.

Special emphasis is given in this article to animal cells, with some discussion of the energy-synthesizing processes and extracellular components peculiar to [plants](http://www.britannica.com/EBchecked/topic/463192/plant). For detailed discussion of the biochemistry of plant cells, *see* [photosynthesis](http://www.britannica.com/EBchecked/topic/458172/photosynthesis). For a full treatment of the genetic events in the cell nucleus, *see* [heredity](http://www.britannica.com/EBchecked/topic/262934/heredity).

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*membrane-bound: racchiuso in una membrana*

[*yeast*](http://www.britannica.com/EBchecked/topic/652395/yeast)*: lievito*

*are 20 micrometres across: sono larghi 20 micrometri.*

*Vessel: qui: recipiente (anche: vascello, unità navale)*

*Perform: compiere, eseguire*

*In order to do: per poter fare*

*Assembly: gruppo, insieme*

**Are all cells complete organisms?**

**Are mycoplasmas bigger or smaller than a human cell?**

**How much bigger is a cell than an atom?**

**What does an individual cell do?**

**What is a group of similar cells called?**

**The nature and function of cells**

[A cell](http://www.britannica.com/EBchecked/topic/37/A-cell) is enclosed by a plasma [membrane](http://www.britannica.com/EBchecked/topic/374264/membrane), which forms a selective barrier that *allows* nutrients to enter and *waste products* to leave. The interior of the cell is organized into many specialized compartments, or [organelles](http://www.britannica.com/EBchecked/topic/431912/organelle%22%20%5Co%20%22organelles), each surrounded by a separate membrane. One major organelle, the [nucleus](http://www.britannica.com/EBchecked/topic/422009/nucleus%22%20%5Co%20%22nucleus), contains the genetic information necessary for cell growth and reproduction. Each cell contains only one nucleus, whereas other types of organelles are present in multiple copies in the cellular contents, or [cytoplasm](http://www.britannica.com/EBchecked/topic/148950/cytoplasm%22%20%5Co%20%22cytoplasm). Organelles include mitochondria, which are responsible for the energy transactions necessary for cell survival; [lysosomes](http://www.britannica.com/EBchecked/topic/353184/lysosome), which digest unwanted materials within the cell; and the [endoplasmic reticulum](http://www.britannica.com/EBchecked/topic/187020/endoplasmic-reticulum) and the Golgi apparatus, which play important roles in the internal organization of the cell by synthesizing selected molecules and then processing, sorting, and directing them to their proper locations. In addition, [plant cells](http://www.britannica.com/EBchecked/topic/463311/plant-cell) contain [chloroplasts](http://www.britannica.com/EBchecked/topic/113761/chloroplast), which are responsible for photosynthesis, whereby the energy of sunlight is used to convert molecules of [carbon dioxide](http://www.britannica.com/EBchecked/topic/94900/carbon-dioxide) (CO2) and water (H2O) into [carbohydrates](http://www.britannica.com/EBchecked/topic/94687/carbohydrate). Between all these organelles is the space in the cytoplasm called the [cytosol](http://www.britannica.com/EBchecked/topic/148998/cytosol%22%20%5Co%20%22cytosol). The cytosol contains an organized framework of fibrous molecules that constitute the [cytoskeleton](http://www.britannica.com/EBchecked/topic/148990/cytoskeleton), which gives a cell its shape, enables organelles to move within the cell, and provides a mechanism by which the cell itself can move. The cytosol also contains more than 10,000 different kinds of molecules that are involved in cellular [biosynthesis](http://www.britannica.com/EBchecked/topic/22204/anabolism%22%20%5Co%20%22biosynthesis), the process of making large biological molecules from small ones.

Specialized organelles are a characteristic of cells of organisms known as [eukaryotes](http://www.britannica.com/EBchecked/topic/195150/eukaryote%22%20%5Co%20%22eukaryotes). In contrast, cells of organisms known as [prokaryotes](http://www.britannica.com/EBchecked/topic/478531/prokaryote%22%20%5Co%20%22prokaryotes) do not contain organelles and are generally smaller than [eukaryotic cells](http://www.britannica.com/EBchecked/topic/195150/eukaryote). However, all cells share strong similarities in biochemical function.

**The molecules of cells**

Cells contain a special collection of molecules that are enclosed by a membrane. These molecules give cells the ability to grow and [reproduce](http://www.britannica.com/EBchecked/topic/498542/reproduction%22%20%5Co%20%22reproduce). The overall process of cellular reproduction occurs in two steps: cell growth and cell division. During cell growth, the cell ingests certain molecules from its surroundings by selectively carrying them through its [cell membrane](http://www.britannica.com/EBchecked/topic/463558/cell-membrane). Once inside the cell, these molecules are subjected to the action of highly specialized, large, elaborately folded molecules called [enzymes](http://www.britannica.com/EBchecked/topic/189245/enzyme). Enzymes act as [catalysts](http://www.britannica.com/EBchecked/topic/99128/catalyst%22%20%5Co%20%22catalysts) by binding to ingested molecules and regulating the rate at which they are chemically altered. These chemical alterations make the molecules more useful to the cell. Unlike the ingested molecules, catalysts are not chemically altered themselves during the reaction, allowing one catalyst to regulate a specific chemical reaction in many molecules.

Biological catalysts create [chains](http://www.britannica.com/EBchecked/topic/104439/chain-reaction%22%20%5Co%20%22chains) of reactions. In other words, a molecule chemically transformed by one catalyst serves as the starting material, or substrate, of a second catalyst and so on. In this way, catalysts use the small molecules brought into the cell from the outside environment to create increasingly complex reaction products. These products are used for cell growth and the [replication](http://www.britannica.com/EBchecked/topic/498384/replication%22%20%5Co%20%22replication) of genetic material. Once the genetic material has been copied and there are sufficient molecules to support cell division, the cell divides to create two [daughter cells](http://www.britannica.com/EBchecked/topic/152352/daughter-cell). Through many such cycles of cell growth and division, each parent cell can give rise to millions of daughter cells, in the process converting large amounts of inanimate matter into biologically active molecules.

**The structure of biological molecules**

Cells are largely composed of compounds that contain carbon. The study of how carbon atoms interact with other atoms in molecular compounds forms the basis of the field of organic [chemistry](http://www.britannica.com/EBchecked/topic/108987/chemistry) and plays a large role in understanding the basic functions of cells. Because [carbon](http://www.britannica.com/EBchecked/topic/94732/carbon%22%20%5Co%20%22carbon) atoms can form stable *bonds* with four other atoms, they are uniquely suited for the construction of complex molecules. These complex molecules are typically made up of chains and rings that contain hydrogen, oxygen, and nitrogen atoms, as well as carbon atoms. These molecules may consist of anywhere from 10 to millions of atoms linked together in specific arrays. Most, but not all, of the carbon-containing molecules in cells are built up from members of one of four different families of small organic molecules: sugars, [amino acids](http://www.britannica.com/EBchecked/topic/20691/amino-acid), [nucleotides](http://www.britannica.com/EBchecked/topic/421985/nucleotide), and [fatty acids](http://www.britannica.com/EBchecked/topic/202621/fatty-acid%22%20%5Co%20%22fatty%20acids). Each of these families contains a group of molecules that resemble one another in both structure and function. In addition to other important functions, these molecules are used to build large macromolecules. For example, the sugars can be linked to form [polysaccharides](http://www.britannica.com/EBchecked/topic/469090/polysaccharide) such as [starch](http://www.britannica.com/EBchecked/topic/563582/starch) and [glycogen](http://www.britannica.com/EBchecked/topic/236084/glycogen), the [amino acids](http://www.britannica.com/EBchecked/topic/20691/amino-acid%22%20%5Co%20%22amino%20acids) can be linked to form [proteins](http://www.britannica.com/EBchecked/topic/479680/protein%22%20%5Co%20%22proteins), the nucleotides can be linked to form the [DNA](http://www.britannica.com/EBchecked/topic/167063/DNA) ([deoxyribonucleic acid](http://www.britannica.com/EBchecked/topic/167063/DNA%22%20%5Co%20%22deoxyribonucleic%20acid)) and [RNA](http://www.britannica.com/EBchecked/topic/505043/RNA) ([ribonucleic acid](http://www.britannica.com/EBchecked/topic/505043/RNA%22%20%5Co%20%22ribonucleic%20acid)) of [chromosomes](http://www.britannica.com/EBchecked/topic/116055/chromosome), and the fatty acids can be linked to form the [lipids](http://www.britannica.com/EBchecked/topic/342808/lipid) of all cell [membranes](http://www.britannica.com/EBchecked/topic/374264/membrane).

*Allow: permettere*

*waste products: prodotti di scarto*

*bonds: legami*

**Which organelle contains most of the genetic information?**

**What do mitochondria do?**

**What do** [**lysosomes**](http://www.britannica.com/EBchecked/topic/353184/lysosome) **do?**

**What does the Gorgi apparatus do**

**What is the** [**biosynthesis**](http://www.britannica.com/EBchecked/topic/22204/anabolism) **process?**

**Does a** [**prokaryotes**](http://www.britannica.com/EBchecked/topic/478531/prokaryote) **cell contain organelles?**

**What do enzymes do within a cell?**

**Which element are compounds in a cell mostly made of?**