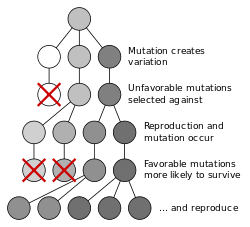
ORIGIN OF LIFE

**Cell theory**

Cell theory states that the [cell](http://en.wikipedia.org/wiki/Cell_biology) is the fundamental unit of [life](http://en.wikipedia.org/wiki/Life), and that all living things are composed of one or more cells or the [secreted](http://en.wikipedia.org/wiki/Secretion) products of those cells (e.g. [shells](http://en.wikipedia.org/wiki/Animal_shell)). All cells arise from other cells through [cell division](http://en.wikipedia.org/wiki/Cell_division). In [multicellular organisms](http://en.wikipedia.org/wiki/Multicellular_organisms" \o "Multicellular organisms), every cell in the organism's body derives ultimately from a single cell in a fertilized [egg](http://en.wikipedia.org/wiki/Egg_(biology)). The cell is also considered to be the basic unit in many pathological processes. In addition, the phenomenon of [energy flow](http://en.wikipedia.org/wiki/Energy_transfer) occurs in cells in processes that are part of the function known as [metabolism](http://en.wikipedia.org/wiki/Metabolism). Finally, cells contain hereditary information ([DNA](http://en.wikipedia.org/wiki/DNA)), which is passed from cell to cell during cell division.

**Evolution**

[](http://en.wikipedia.org/wiki/File:Mutation_and_selection_diagram.svg)

[Natural selection](http://en.wikipedia.org/wiki/Natural_selection) of a population for dark coloration.

[***Evolution***](http://en.wikipedia.org/wiki/Evolution)

A central organizing concept in biology is that life changes and develops through evolution, and that all life-forms known have a [common origin](http://en.wikipedia.org/wiki/Common_descent). The theory of evolution postulates that all [organisms](http://en.wikipedia.org/wiki/Organism) on the [Earth](http://en.wikipedia.org/wiki/Earth), both living and extinct, have descended from a common ancestor or an ancestral [gene pool](http://en.wikipedia.org/wiki/Gene_pool). This last universal common ancestor of all organisms is believed to have appeared about [3.5 billion years ago](http://en.wikipedia.org/wiki/Timeline_of_evolution). Biologists generally regard the universality and ubiquity of the [genetic code](http://en.wikipedia.org/wiki/Genetic_code) as definitive evidence in favor of the theory of universal common descent for all [bacteria](http://en.wikipedia.org/wiki/Bacterium), [archaea](http://en.wikipedia.org/wiki/Archaea" \o "Archaea), and [eukaryotes](http://en.wikipedia.org/wiki/Eukaryote) .

Introduced into the scientific lexicon by [Jean-Baptiste de Lamarck](http://en.wikipedia.org/wiki/Jean-Baptiste_de_Lamarck) in 1809, evolution was established by [Charles Darwin](http://en.wikipedia.org/wiki/Charles_Darwin) fifty years later as a viable scientific model when he articulated its driving force: [natural selection](http://en.wikipedia.org/wiki/Natural_selection). ([Alfred Russel Wallace](http://en.wikipedia.org/wiki/Alfred_Russel_Wallace) is recognized as the co-discoverer of this concept as he helped research and experiment with the concept of evolution.)[.](http://en.wikipedia.org/wiki/Biology#cite_note-26) Evolution is now used to explain the great variations of life found on Earth.

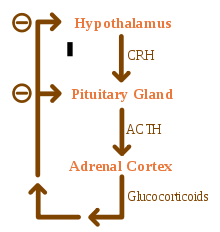
Darwin theorized that species and breeds developed through the processes of [natural selection](http://en.wikipedia.org/wiki/Natural_selection) and [artificial selection](http://en.wikipedia.org/wiki/Artificial_selection) or [selective breeding](http://en.wikipedia.org/wiki/Selective_breeding). [Genetic drift](http://en.wikipedia.org/wiki/Genetic_drift) was embraced as an additional mechanism of evolutionary development in the [modern synthesis](http://en.wikipedia.org/wiki/Modern_synthesis) of the theory.

**Genetics**

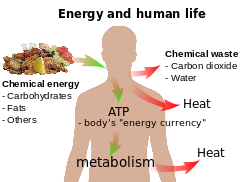
[Genes](http://en.wikipedia.org/wiki/Gene) are the primary units of inheritance in all organisms. A gene is a unit of [heredity](http://en.wikipedia.org/wiki/Heredity) and corresponds to a region of [DNA](http://en.wikipedia.org/wiki/DNA) that influences the form or function of an organism in specific ways. All organisms, from bacteria to animals, share the same basic machinery that copies and translates DNA into [proteins](http://en.wikipedia.org/wiki/Protein). Cells [transcribe](http://en.wikipedia.org/wiki/Transcription_(genetics)) a DNA gene into an [RNA](http://en.wikipedia.org/wiki/RNA) version of the gene, and a [ribosome](http://en.wikipedia.org/wiki/Ribosome) then [translates](http://en.wikipedia.org/wiki/Translation_(biology)) the RNA into a protein, a sequence of [amino acids](http://en.wikipedia.org/wiki/Amino_acid). The [translation code](http://en.wikipedia.org/wiki/Genetic_code) from RNA codon to amino acid is the same for most organisms, but slightly different for some. For example, a sequence of DNA that codes for [insulin](http://en.wikipedia.org/wiki/Insulin) in humans also codes for insulin when inserted into other organisms, such as plants.

DNA usually occurs as linear [chromosomes](http://en.wikipedia.org/wiki/Chromosome) in [eukaryotes](http://en.wikipedia.org/wiki/Eukaryote), and circular chromosomes in [prokaryotes](http://en.wikipedia.org/wiki/Prokaryote). A chromosome is an organized structure consisting of [DNA](http://en.wikipedia.org/wiki/DNA) and [histones](http://en.wikipedia.org/wiki/Histone" \o "Histone). The set of chromosomes in a cell and any other hereditary information found in the [mitochondria](http://en.wikipedia.org/wiki/Mitochondria), [chloroplasts](http://en.wikipedia.org/wiki/Chloroplasts), or other locations is collectively known as its [genome](http://en.wikipedia.org/wiki/Genome). In eukaryotes, genomic DNA is located in the [cell nucleus](http://en.wikipedia.org/wiki/Cell_nucleus), along with small amounts in [mitochondria](http://en.wikipedia.org/wiki/Mitochondrion) and [chloroplasts](http://en.wikipedia.org/wiki/Chloroplast). In prokaryotes, the DNA is held within an irregularly shaped body in the cytoplasm called the [nucleoid](http://en.wikipedia.org/wiki/Nucleoid" \o "Nucleoid). The genetic information in a genome is held within genes, and the complete assemblage of this information in an organism is called its [genotype](http://en.wikipedia.org/wiki/Genotype).

**Homeostasis**

[](http://en.wikipedia.org/wiki/File:ACTH_Negative_Feedback.svg)

Homeostasis is the ability of an [open system](http://en.wikipedia.org/wiki/Open_system_(systems_theory)) to regulate its internal environment to maintain stable conditions by means of multiple [dynamic equilibrium](http://en.wikipedia.org/wiki/Dynamic_equilibrium) adjustments controlled by interrelated regulation mechanisms. All living [organisms](http://en.wikipedia.org/wiki/Organism), whether [unicellular](http://en.wikipedia.org/wiki/Single_celled) or [multicellular](http://en.wikipedia.org/wiki/Multicellular" \o "Multicellular), exhibit homeostasis.

[](http://en.wikipedia.org/wiki/File:Energy_and_life.svg)

Basic overview of [energy and human life](http://en.wikipedia.org/wiki/Bioenergetics).

**Energy**

The survival of a living organism depends on the continuous input of [energy](http://en.wikipedia.org/wiki/Energy). Chemical reactions that are responsible for its structure and function are tuned to extract [energy](http://en.wikipedia.org/wiki/Chemistry#Energy) from substances that act as its food and transform them to help form new cells and sustain them. In this process, [molecules](http://en.wikipedia.org/wiki/Molecule) of [chemical substances](http://en.wikipedia.org/wiki/Chemical_substance) that constitute [food](http://en.wikipedia.org/wiki/Food) play two roles; first, they contain energy that can be transformed for biological [chemical reactions](http://en.wikipedia.org/wiki/Chemical_reaction); second, they develop new molecular structures made up of biomolecules.

The organisms responsible for the introduction of energy into an ecosystem are known as producers or [autotrophs](http://en.wikipedia.org/wiki/Autotroph" \o "Autotroph). Nearly all of these organisms originally draw energy from the sun. Plants and other [phototrophs](http://en.wikipedia.org/wiki/Phototroph" \o "Phototroph) use solar energy via a process known as [photosynthesis](http://en.wikipedia.org/wiki/Photosynthesis) to convert raw materials into organic molecules, such as [ATP](http://en.wikipedia.org/wiki/Adenosine_triphosphate), whose bonds can be broken to release energy.

[Molecular biology](http://en.wikipedia.org/wiki/Molecular_biology) is the study of biology at a molecular level. This field overlaps with other areas of biology, particularly with [genetics](http://en.wikipedia.org/wiki/Genetics) and [biochemistry](http://en.wikipedia.org/wiki/Biochemistry). Molecular biology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA, and protein synthesis and learning how these interactions are regulated.

[Cell biology](http://en.wikipedia.org/wiki/Cell_biology) studies the structural and [physiological](http://en.wikipedia.org/wiki/Physiology) properties of [cells](http://en.wikipedia.org/wiki/Cell_(biology)), including their [behaviors](http://en.wikipedia.org/wiki/Behavior), interactions, and [environment](http://en.wikipedia.org/wiki/Natural_environment). This is done on both the [microscopic](http://en.wikipedia.org/wiki/Microscope) and [molecular](http://en.wikipedia.org/wiki/Molecule) levels, for unicellular organisms such as [bacteria](http://en.wikipedia.org/wiki/Bacterium), as well as the specialized cells in multicellular organisms such as [humans](http://en.wikipedia.org/wiki/Human). Understanding the structure and function of cells is fundamental to all of the biological sciences. The similarities and differences between cell types are particularly relevant to molecular biology.

**Physiological**

Physiology studies the mechanical, physical, and biochemical processes of living organisms by attempting to understand how all of the structures function as a whole. The theme of "structure to function" is central to biology. Physiological studies have traditionally been divided into [plant physiology](http://en.wikipedia.org/wiki/Plant_physiology) and [animal physiology](http://en.wikipedia.org/wiki/Animal_physiology), but some principles of physiology are universal, no matter what particular [organism](http://en.wikipedia.org/wiki/Organism) is being studied. For example, what is learned about the physiology of [yeast](http://en.wikipedia.org/wiki/Yeast) cells can also apply to human cells. The field of animal physiology extends the tools and methods of [human physiology](http://en.wikipedia.org/wiki/Human_physiology) to non-human species. Plant physiology borrows techniques from both research fields.

Physiology studies how for example [nervous](http://en.wikipedia.org/wiki/Nervous_system), [immune](http://en.wikipedia.org/wiki/Immune_system), [endocrine](http://en.wikipedia.org/wiki/Endocrine_system), [respiratory](http://en.wikipedia.org/wiki/Respiratory_system), and [circulatory](http://en.wikipedia.org/wiki/Circulatory_system) systems, function and interact. The study of these systems is shared with [medically](http://en.wikipedia.org/wiki/Medicine) oriented disciplines such as [neurology](http://en.wikipedia.org/wiki/Neurology) and [immunology](http://en.wikipedia.org/wiki/Immunology).

**Evolutionary**

[Evolutionary research](http://en.wikipedia.org/wiki/Current_research_in_evolutionary_biology) is concerned with the origin and descent of [species](http://en.wikipedia.org/wiki/Species), as well as their change over time, and includes scientists from many taxonomically oriented disciplines. For example, it generally involves scientists who have special training in particular [organisms](http://en.wikipedia.org/wiki/Organism) such as [mammalogy](http://en.wikipedia.org/wiki/Mammalogy" \o "Mammalogy), [ornithology](http://en.wikipedia.org/wiki/Ornithology), [botany](http://en.wikipedia.org/wiki/Botany), or [herpetology](http://en.wikipedia.org/wiki/Herpetology), but use those organisms as systems to answer general questions about evolution.