

**Abiotic** *adj.* Devoid of life; inanimate; non-living component of the environment including soil, water, air, light, and nutrients.

**Aerobe** *n.* An organism (as a bacterium) that lives only in the presence of oxygen.

**Aerobic** *adj.* Of or indicating a process, such as respiration, dependent on molecular oxygen or air. *Antonym:* **Anaerobic**

**Aerobic Respiration** *n.* Respiration under anaerobic conditions.

**Anaerobic** *adj.* Relating to a process that occurs with little or no oxygen present.

**Anaerobic Respiration** Respiration under anaerobic conditions. The terminal electron acceptor, instead of oxygen in the case of regular respiration, can be: CO<sub>2</sub>, Fe<sup>2+</sup>, fumarate, nitrate, nitrite, nitrous oxide, sulphur, sulphate, etc. Note that anaerobic respiration still uses the electron transport chain to dump the electron while fermentation does not.

**Amoeba** *n.* A common name describing the one-celled organisms classified under the order Amoebida of the class Sarcodina. An amoeba has a constantly changing form and moves and eats by extending pseudopods, or long fingers of itself, from its body cytoplasm.

**Amino Acid** *n.* Any of a class of 20 molecules that are combined to form proteins in living things. The sequence of amino acids in a protein and hence protein function are determined by the genetic code.

**Anabolism** *n.* The constructive part of metabolism concerned especially with macromolecular synthesis.

**Anabolic Pathway** *n.* A reaction or series of reactions in a metabolic pathway that synthesize complex molecules from simpler ones, usually requiring the input of energy. This is the opposite of a catabolic pathway.

**Angiosperm** *n.* Seed plant that reproduces via flowers, which produce seeds within an ovary.

**Anoxic** *adj.* Absence or lack of oxygen.

**Apoptosis** *n.* A genetically determined destruction of cells from within due to activation of a stimulus or removal of a suppressing agent or stimulus that is postulated to exist to explain the orderly elimination of superfluous cells.

**Arabidopsis** *n.* Arabidopsis is a member of the mustard (Brassicaceae) family, which includes cultivated species such as cabbage and radish. Arabidopsis is not of major agronomic significance, but it offers important advantages for basic research in genetics and molecular biology.

**Archaea** *n.* Microorganisms of a domain (Archaea) comprising the archaeobacteria when considered as equal in taxonomic rank to the other prokaryotes and the eukaryotes.

**Archaeobacteria** *n.* This is a super-classification of odd bacteria that are neither prokaryotes nor eukaryotes; some scientists believe they represent a separate kingdom. The primary genus is *Archaeobacteria*, whose members fall in three categories: microbes that can live in extremely salty environments (halophiles), microbes that produce methane (methanogens), and microbes that can live in extremely hot environments (thermophiles). All are of interest to biotechnologists because they have unique biochemical features (e.g., the enzymes of the thermophiles are extremely stable at high temperatures).

**Assimilation** *n.* Incorporation of a substance by organisms; absorption and conversion of energy and nutrient uptake into constituents of an organism.

**Autosome** *n.* A chromosome other than a sex chromosome. *adj.*: **Autosomal**

**Autotroph** *n.* Organisms that produce organic material from inorganic chemicals and some source of energy. Plants are **autotrophic** *adj.*

**Bacteria** *pl.n.* *Singular –rium* Microorganisms, usually single-celled, occurring in a wide variety of forms. Most bacteria are either free-living saprophytes, bringing about decomposition, or parasites, many of which cause disease.

**Biomass** *n.* The total mass of living matter within a given volume of environment, usually expressed as dry weight per unit area.

**Biomimetics** *n.* The study of the formation, structure, or function of biologically produced substances and materials (as enzymes or silk) and biological mechanisms and processes (as protein synthesis or photosynthesis) especially for the purpose of synthesizing similar products by artificial mechanisms which mimic natural ones

**Biophotonics** *n.* The science of generating and harnessing light (photons) to image, detect and manipulate biological materials.

**Biosynthesis** *n.* **1.** The creation of molecules in living organisms. **2.** The production of a chemical compound by a living organism.

**Biotic** *adj.* Living components of the Earth.

**Catabolic Pathway** *n.* A series of reactions in a metabolic pathway that break down complex compounds into simpler ones, usually releasing energy in the process. This is the opposite of an anabolic pathway.

**Cell Membrane** *n.* Lipid bi-layer that encloses the cytoplasm of a cell; also called the plasma membrane.

**Chloroplast** *n.* An organelle in plants and some bacteria responsible for energy production via photosynthesis. Compare with Mitochondria.

**Chlorophyll** *n.* The green pigment molecule responsible for trapping light energy in photosynthesis.

**Chromosomes** *n.* The self-replicating genetic structures of cells containing the cellular DNA that bears in its nucleotide sequence the linear array of genes. In prokaryotes, chromosomal DNA is circular, and the entire genome is carried on one chromosome. Eukaryotic genomes consist of a number of chromosomes whose DNA is associated with different kinds of proteins.

**Circumnutation** *n.* An elliptical or spiral direction of growth shown by certain plant parts, such as the apex of a growing tendril.

**Confluent** *adj.* **1.** A flowing together. **2.** Merging together so as to form a mass. Example: When adherent cells have completely covered the growth substrate and are touching each other.

**Convergence** *n.* Independent development of similar characters (as of bodily structure or cultural traits) often associated with similarity of habits or environment.

**Cotyledon** *n.* Leaf-like structure of a plant embryo in which food is stored.

**Cutaneous** *adj.* Of, relating to, or affecting the skin.

**Dicot** *n.* A type of plant that has two cotyledons (seed leaves).

**Differentiation** *n.* The process by which cells become structurally and functionally specialized during embryonic development.

**Diploid** *adj.* A full set of genetic material, consisting of paired chromosomes one chromosome from each parental set. Most animal cells except the gametes have a diploid set of chromosomes. The diploid human genome has 46 chromosomes. Compare haploid.

**DNA** *n.* A polymeric chromosomal constituent of living cell nuclei, having two long chains of alternating phosphate and deoxyribose units twisted into a double helix and joined by hydrogen bonds between the complementing bases adenine and thymine or cytosine and guanine, each of which projects toward the axis of the helix from one of the strands where it is bonded in a sequence that determines individual hereditary characteristics.

**Ecosystem** *n.* **1.** The dynamic and interrelating complex of plant and animal communities and their associated non-living environment. **2.** The physical and climactic features and all the living and dead organisms in an area that are interrelated in the transfer of energy and material. **3.** An interacting complex of a community and its environment functioning as an ecological unit in nature. Differs from "system" in being a more rigorous definition that encompasses and requires assumptions of energetics, ecological interactions, species adaptations and so forth.

**Embryogenesis** *n.* **1.** A process of differentiation which results in the formation of embryo-like structures from undifferentiated cells. **2.** Process which leads to the formation of embryos.

**Endoplasmic Reticulum** *n.* Cytoplasmic organelle that modifies, sorts, and transports substances made by the cell.

**Entropy** *n.* A measure of the randomness, disorder, or chaos in a system.

**Enzyme** *n.* Any numerous proteins or conjugated proteins produced by living organisms and functioning as biochemical catalysts in living organisms.

**Eukarya** *n.* The phylogenetic domain containing all eukaryotic organisms.

**Eukaryote** (or Eucaryote) *n.* **1.** An organism in which the genetic material is enclosed by a membrane to form a nucleus. Eukaryotes include all organisms except bacteria, blue-green algae, and viruses. **2.** A cell with a nucleus

**Eutrophic** *adj.* Refers to a body of water with high nutrient content and high productivity.

**Eutrophication** *n.* The process by which a body of water becomes enriched in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.

**Evapotranspiration** *n.* Sum of the loss of moisture by evaporation from land and water surfaces and by transpiration from plants.

**Extreme Halophile** *n.* An organism whose growth is dependent on large amounts (generally more than 10% in solution) of salt (sodium chloride, NaCl).

**Fermentation** *n.* The chemical decomposition of a substance, usually a carbohydrate, due to the action of enzymes produced by bacteria, yeasts or molds. Fermentation usually occurs in an oxygen-free environment, and typically involves the conversion of starch or sugar into ethyl alcohol.

**Fertilization** *n.* **1.** The act or process of initiating biological reproduction. **2.** The process in which two gametes unite to form a zygote.

**Fibroblast** *n.* A connective-tissue cell of mesenchymal origin that secretes proteins and especially molecular collagen from which the extracellular fibrillar matrix of connective tissue forms

**Flagellum** *n plural -gella* **1.** Any of various elongated filiform appendages of plants or animals: as **a** : the slender distal part of an antenna **b** : a long tapering process that projects singly or in groups from a cell and is the primary organ of motion of many microorganisms. **2.** A whip-like appendage found on sperm and some bacteria, fungi, and protozoans, which the cells use for locomotion. Composed of the protein flagellin.

**Gamete** *n.* Mature male or female reproductive cell (sperm or ovum) with a haploid set of chromosomes (23 for humans).

**Gametophyte** *n.* A plant, or phase of a plant's life cycle, that bears gametes.

**Gene** *n.* A hereditary unit located on a chromosome that codes for a protein or RNA molecule. Genes are capable of replication and recombination, exist in a number of different forms, called alleles, and can undergo mutation.

**Genotype** *n.* The genetic make-up of an organism, with reference to a single trait or a set of traits.

**Glycolysis** *n.* The enzymatic breakdown of a carbohydrate (such as glucose) by way of phosphate derivatives with the production of pyruvic or lactic acid and energy stored in high-energy phosphate bonds of ATP.

**Gravitaxis** *n.* Oriented movement by a motile organism in response to gravity as the stimulus.

**Gravitropism** *n.* The response of plants to the pull of gravity, including the tendency for plant roots to grow downward in the direction of gravity and plant shoots to grow upward against gravity.

**Gravity** *n.* **1.** The gravitational attraction of the mass of the earth, the moon, or a planet for bodies at or near its surface. **2.** A fundamental physical force that is responsible for interactions which occur because of mass between particles, between aggregations of matter (as stars and planets), and between particles (as photons) and aggregations of matter, that is  $10^{39}$  times weaker than the strong force, and that extends over infinite distances but is dominant over macroscopic distances especially between aggregations of matter.

**Gymnosperm** *n.* Any plant of the class Gymnospermae, which includes the coniferous trees and other plants having seeds not enclosed within an ovary.

**Haploid** *adj.* A single set of chromosomes (half the full set of genetic material), present in the egg and sperm cells of animals and in the egg and pollen cells of plants. Human beings have 23 chromosomes in their reproductive cells. Compare diploid.

**Heterotroph** *n.* Organisms that require a supply of organic matter or food for energy.

**Heterozygous** *adj.* Having the two alleles at corresponding loci on homologous chromosomes different for one or more loci.

**Homozygous** *adj.* Having the two genes at corresponding loci on homologous chromosomes identical for one or more loci

**Hypergravity** *n.* Condition wherein the force of gravity is greater than or is increased above that on the surface of the earth. This is expressed as being greater than 1 g.

**Hypogravity** *n.* Condition wherein the force of gravity is less than or is decreased below that on the surface of the earth. This is expressed as being between 0 and 1 g.

**Inorganic** *adj.* **1. a.** Involving neither organic life nor the products of organic life. **b.** Not composed of organic matter; especially , mineral. **2.** Of or pertaining to the chemistry of noncarbon compounds not usually classified as organic. **3.** Not arising in normal growth; artificial. **4.** Lacking system or structure.

**In Situ** *adv. or adj.* In the natural or original position or place.

**Invertebrate** *adj.* Having no backbone or spinal column; not vertebrate.

**Keratin** *n.* A tough, fibrous protein substance forming the outer layer of epidermal structures such as hair, nails, or horns.

**Kinesthetic** *n.* A sense mediated by end organs located in muscles, tendons, and joints and stimulated by bodily movements and tensions. Also: sensory experience derived from this sense.

**Lipid** *n.* A fatty, waxy or oily compound that is characteristically insoluble in water but readily soluble in organic solvents. Lipids contain carbon, hydrogen and oxygen, but have far less oxygen proportionally than carbohydrates.

**Living System** *n.* “Living Systems” are usually described with attributes (e.g. motility, metabolism, heart beat, etc). Each of these attributes may be missing in various organisms, so they are not entirely comprehensive descriptions. A more accurate description is that living systems show “negative entropy” or ”order”, i.e. they are the “least probable state”.

**Luminosity** *n.* **1.** The quality or state of being [luminous](#). **2.** The relative quantity of light or the relative brightness of something. **3.** The relative quantity of radiation emitted by a celestial source (as a star).

**Lysosome** *n.* Any of a number of particles in the cytoplasm of cells that contain enzymes capable of breaking down substances in the cell.

**Macromolecular** *n.* A very large molecule (as of a protein or rubber).

**Macronutrient** *n.* A chemical element (as nitrogen, phosphorus, or potassium) of which relatively large quantities are essential to the growth and health of a plant

**Mammalia** *pl.n.* A class of vertebrate animals of more than 15,000 species, including humans, distinguished by self-regulating body temperature, hair, and in the females, mammae. **Mammals** *s.n.*

**Meiosis** *n.* The cellular process that results in the number of chromosomes in gamete-producing cells being reduced to one half and that involves a reduction division in which one of each pair of homologous chromosomes passes to each daughter cell and a mitotic division. Compare **Mitosis**.

**Meristem** *n.* A formative plant tissue usually made up of small cells capable of dividing indefinitely and giving rise to similar cells or to cells that differentiate to produce the definitive tissues and organs.

**Mesenchyme** *n.* Loosely organized undifferentiated mostly mesodermal cells that give rise to such structures as connective tissues, blood, lymphatics, bone, and cartilage

**Mesenchymal** *adj.* Of, resembling, or being mesenchyme.

**Mesoderm** *n.* A middle layer of tissue in a developing animal embryo which will eventually become the muscles and other connective tissues, the blood vessels and blood cells (if any), and various other organs, structures, and systems (depends on the organism). Animals with this layer of tissue as an embryo are known as triploblastic animals, which includes all animals except for sponges, placozoans, jellyfish, and comb jellies.

**Mesophile** *n.* Organism living in the temperature range around that of warm-blooded animals, usually between 20-45 degrees C.

**Mesoscale** *adj.* Of intermediate size; *especially* : of or relating to a meteorological phenomenon approximately 10 to 1000 kilometers in horizontal extent.

**Metabolism** *n.* **1. a.** The complex of physical and chemical processes involved in the maintenance of life. **b.** The rate at which such processes function. **2.** The functioning of any specified substance within the living body. **3.** The sum of all the energy yielding (catabolism) and energy consuming (anabolism) reactions in an organism.

**Microbe** *n.* A minute life form, esp. a disease-causing microorganism.

**Microbial Mat** *n.* **1.** A technique of immobilizing cells by growing microbes in a thin layer of a living or nonliving substance. **2.** A layered culture of microbes.

**Micronutrient** *n.* **1.** Trace element or a chemical element present in minute quantities; especially: one used by organisms and held essential to their physiology. **2.** An organic compound (as a vitamin) essential in minute amounts to the growth and health of an animal

**Mitochondria** *pl. n Singular –dria* Any of various round or long cellular organelles of most eukaryotes that are found outside the nucleus, that produce energy for the cell through cellular respiration, and are rich in fats, proteins, and enzymes.

**Mitosis** (also **karyokinesis**) *n.* **1.** A process that takes place in the nucleus of a dividing cell, involves typically a series of steps consisting of prophase, metaphase, anaphase, and telophase, and results in the formation of two new nuclei each having the same number of chromosomes as the parent nucleus. Compare **Meiosis**.

**Monocot** *n.* Any plant of the Monocotyledonae, one of the two major divisions of angiosperms, characterized by a single embryonic seed leaf that appears at germination. Included among the monocotyledons are such plants as grasses, orchids, and lilies.

**Muscle Contraction** *n.*

**Slow Twitch** - The contraction of postural muscles (red muscles), which have an aerobic metabolism (i.e. dependent on a supply of oxygen)

**Fast Twitch** - The contraction of muscles of locomotion, which can have either a strictly glycolytic (anaerobic) metabolism or a mixed aerobic/anaerobic metabolism.

**Nanotechnology** *n.* The art of manipulating materials on an atomic or molecular scale especially to build microscopic devices.

**Nastic** *adj.* Of, relating to, or constituting a movement of a plant part caused by disproportionate growth or increase of turgor in one surface

**Nitrogen Fixation** *n.* **1.** The conversion by certain fungi and soil bacteria of atmospheric nitrogen or inorganic nitrogen compounds into organic compounds assimilable by plants. **2.** The process of combining atmospheric nitrogen gas with hydrogen to form ammonia, making nitrogen in the atmosphere available to plants.

**Non-motile** *adj.* Not moving or having the power to move spontaneously.

**Nucleolus** *n.* The organelle that houses the NDA of eukaryotic cells.

**Nucleotide** *n.* A sub-unit of DNA or RNA consisting of a nitrogenous base (adenine, guanine, thymine, or cytosine in DNA; adenine, guanine, uracil, or cytosine in RNA), a phosphate molecule, and a sugar molecule (deoxyribose in DNA and ribose in RNA). Thousands of nucleotides are linked to form a DNA or RNA molecule.

**Nutrient** *n.* Any substance required by organisms for normal growth and activity.

**Nyctinasty** *n.* A movement of a plant or plant part in response to the onset of darkness, for example, the shutting of the petals of a flower at night.

**Organelle** *n.* A membrane-bound body found in the cytoplasm of the cell that performs specific cellular functions. Examples: mitochondrion, chloroplast, lysosome, or ribosome.

**Organic** *adj.* **1.** Of, pertaining to, or derived from living organisms. **2.** Having properties associated with living organisms. **3.** Of or designating carbon compounds.

**Otolith** *n.* Calcareous concretion in the inner ear of a vertebrate or in the otocyst of an invertebrate.

**Oxic** *adj.* Containing oxygen, aerobic. Usually used in reference to a microbial habitat.

**Phagocyte** *n.* A cell, as a leukocyte, that engulfs and digests foreign bodies, as cells and microorganisms, in the bloodstream and tissues.

**Phagocytosis** *n.* Envelopment and digestion of foreign bodies, as bacteria, by phagocytes.

**Phagosome** *n.* An intracellular membrane-bound vesicle containing material ingested by the process of phagocytosis.

**Phenotype** *n.* The observable constitution of an organism; the visible properties of an organism that are produced by the interaction of the genotype and the environment.

**Phloem** *n.* Soft-walled vascular cells in plants that conduct carbohydrates throughout the plant.

**Photosaccharide** *n.* **Photo-** The effect of light or radiant energy on. –**Saccharide** Any of a series of compounds of carbon, hydrogen, and oxygen in which the atoms of the latter two elements are in the ratio of 2:1, especially sugars and other carbohydrates containing the group  $C_6H_{10}O_5$ .

**Photosynthesis** *n.* **1.** The process by which chlorophyll-containing cells in green plants convert incident light to chemical energy and synthesize organic compounds from inorganic compounds, especially carbohydrates from carbon dioxide and water with the simultaneous release of oxygen. **2.** A similar process occurring in certain bacteria.

**Phototropism** *n.* Growth or movement of a plant part in response to a source of light. Also **phototropy**.

**Phylogeny** *n.* **1.** The evolutionary history of a kind of organism. **2.** The evolution of a genetically related group of organisms as distinguished from the development of the individual organism. **3.** The evolutionary history of a particular taxonomic group, usually a species.

**Pituitary Gland** *n.* A gland at the base of the brain, which regulates metabolism, reproductive function, growth, lactation, water balance, expulsion of milk from the breast during suckling. Also **hypophysis**.

**Placentation** *n.* **1.** The development of the placenta and attachment of the fetus to the uterus during pregnancy. **2.** The morphological type of a placenta.

**Pollination** *n.* In flowering plants, transportation of pollen grains from a male reproductive structure to a female reproductive structure.

**Postnatal** *adj.* Occurring or being after birth; specifically: of or relating to an infant immediately after birth.

**Prenatal** *adj.* Occurring, existing, or performed before birth.

**Prokaryote** *n.* Any organism in which the genetic material is not bounded by a nuclear membrane but exists free in the cytoplasm; a cell without a nucleus. Prokaryotes consist mainly of the bacteria and blue-green algae. **Prokaryotic** *adj.*

**Proprioception** *n.* **1.** The position or kinesthetic sense that allows you to be aware of the position of your limbs, without the benefit of sight. Involved in mediating muscle synergistic and antagonistic activities. Stretch sensors in skeletal muscles and their tendons sense distortion in response to changes in position or contraction of a muscle. **2.** The reception of stimuli produced within an organism.

**Protein** *n.* Any of a group of complex nitrogenous organic compounds of high molecular weight that have amino acids as their basic structural units and that are found in all living matter and are required for the growth and repair of animal tissue.

**Psychrophilic** *adj.* Thriving at a relatively low temperature. Example: *psychrophilic* bacteria. **Psychrophile** *noun*.

**Pteridophyte** *n.* Any plant of the division Pteridophyta, including the ferns and horsetails, that reproduce by spores and that has vascular tissue.

**RNA** *n.* (Ribonucleic acid) A chemical found in the nucleus and cytoplasm of cells; it plays an important role in protein synthesis and other chemical activities of the cell. The structure of RNA is similar to that of DNA. There are several classes of RNA molecules, including messenger RNA, transfer RNA, ribosomal RNA, and other small RNAs, each serving a different purpose.

**Sedimentation** **1.** The process where particles suspended in solution settle out of the solution and to the bottom of the container. This can occur by gravity alone, or by centrifugation (high-speed spinning).

**Species** *n.* **a.** A fundamental category of taxonomic classification, ranking after a genus. **b.** A group of organisms capable of interbreeding and producing fertile offspring.

**Sporophyte** *n.* A plant, or phase of a life cycle, that bears the spores formed during the sexual reproductive cycle.

**Stomata** *n.* Specialized pores in plant cuticles that enable gas exchange to occur.

**Synthesis** **1 a.** The composition or combination of parts or elements so as to form a whole. **b.** The production of a substance by the union of chemical elements, groups, or simpler compounds or by the degradation of a complex compound. **C.** The combining of often diverse conceptions into a coherent whole; *also* : the complex so formed.

**Thermophilic** *adj.* Of, relating to, or being an organism growing at a high temperature. Examples: thermophilic fermentation, thermophilic bacteria. **Thermophile** *noun.*

**Thigmotropism** *n.* A tropism in which contact especially with a solid or a rigid surface is the orienting factor.

**Transpiration** *n.* The act or process of losing water vapor from the surface of a plant, mainly through open stomata.

**Trophic Level** *n.* **1.** Functional classification of organisms in an ecosystem according to relationships. **2.** A group of organisms that occupy the same position in a food chain in that they obtain their food, ultimately from plants, by the same number of steps.

**Tropism** *n.* Involuntary orientation by an organism or one of its parts that involves turning or curving by movement or by differential growth and is a positive or negative response to a source of stimulation.

**Turgor** *n.* The normal state of turgidity and tension in living cells; especially: the distension of the protoplasmic layer and wall of a plant cell by the fluid contents.

**Vertebrate** *n.* Any member of the subphylum Vertebrata, a primary division of the phylum Chordata that includes the fishes, amphibians, reptiles, birds, and mammals, all of which are characterized by a segmented bony or cartilaginous spinal column.

**Vesicle** *n.* **1.** A small bladder like vacuole, cell, or cavity. **2.** An air-filled cavity found in certain aquatic plants.

**Vestibular Apparatus** *n.* An apparatus in the inner ear that is sensitive to gravity and important (in conjunction with vision) in telling one's body position in space.

**Xylem** *n.* Hard-walled cells in plants that transport water and dissolved minerals up from the roots.

**Zygote** *n.* The single cell formed by the union of a sperm and an ovum or other male and female gametes.